

FLOODS AND LONG-TERM WATER-LEVEL CHANGES IN MEDIEVAL HUNGARY

Andrea Kiss

Doctoral dissertation (PhD)

Submitted to the Central European University

Department of Medieval Studies

Doctor of Philosophy

Supervisor: József Laszlovszky, Central European University

Central European University

Budapest, Hungary

2011

STATEMENT 1

I hereby state that the thesis contains no materials accepted for any other degrees in any other institutions.

STATEMENT 2

I hereby state that the thesis contains no materials previously written and/or published by another person, except where appropriate acknowledgement has been made in the form of bibliographical references.

Kiss, Andrea

Szeged-Budapest

Final version submitted: May, 2011

DE INUNDATIONE

*T*antus ab assiduis, quid vult sibi, nubibus imber?
*Q*uid tempestatum copia tanta parat?
*U*nde tot humores nebulis? tot nubila coelo?
*Q*uando potens madidi, tam fuit aura Noti?
*Q*uisve unquam tantum variae bibit Iridis arcus?
*P*ontus an arcana scandit in astra via?
*S*aepe exhalatos, ima de parte, vapores,
*S*mintheos igniferi sustulit acre iubar.
*N*ec potuit tantum radiis consumere, quantum,
*T*raxerat, in tenues, sed solvit pluvias,
*N*on tamen a levibus, manant tam grandia, causis,
*N*ec de consuetis, rara venire solent.

....

*I*am Savus et Marisus, iam Dravus et ipse Tibiscus,
*I*nter et Arctoas, maximus Hister, aquas;
*T*errarum quamvis longo discrimine distent,
*C*onfusis, inter se coiere, vadis.
*N*oscere nec possis, ubi rus, ubi collis, ubi arbor,
*O*mnia sic facies aequoris una tegit.

....

Janus Pannonius, 1468

Table of contents

1 Preface: basic questions and basic answers.....	12
1.1 Why floods and why medieval Hungary?	12
1.2 About the present work: aims, reasons and the background.....	14
1.3 Structuring and main sections	16
2 An environmental background: floods, modern hydrology and the medieval environment in Hungary	17
2.1 Research on medieval floods, long-term water-level fluctuations and the environment.....	17
2.1.1 Floods and water-level fluctuations in Europe and Hungary: a short literature overview	17
2.1.1.1 Medieval floods: investigations in Europe and Central Europe	17
2.1.1.2 Research on historical floods and long-term water-level changes in Hungary	18
2.2 Floods, inundations, inland excess waters and the environment.....	21
2.2.1 Definitions of hydrological terms discussed	21
2.2.1.1. Flood and inland excess water.....	21
2.2.1.2. Flood types and definitions	21
2.2.2 Main environmental characteristics of waters in the Carpathian Basin	22
2.2.2.1 Main hydrological characteristics of the Danube and the floods.....	25
2.2.2.2 Tributaries and key sections of the Danube: the Carpathian Basin catchment.....	26
2.2.2.3 The Tisza floodplain before water regulation works	29
2.2.2.4 Main hydrological characteristics of the Tisza river and its main tributaries.....	30
2.2.2.5 Inland excess waters	36
2.2.2.6 A conclusion of general characteristics: prevailing flood (and inland excess water) occurrences and their chief causes	38
2.3 Medieval environment and its changes: the human and physical background	39
2.3.1 Demography and the changes of settlement system in medieval Hungary	39
2.3.1.1 Population growth and density as factors for landscape and environmental change	39
2.3.1.2 Social, economic changes and transformations of the settlement system.....	44
2.3.2 Agriculture, land use and forest clearance	49
2.3.2.1 Changes in land use and agriculture – high to late medieval transition	49
2.3.2.2 Serf's land and its desertion	51
2.3.2.3 Territorial expansion and forest clearance	52
2.3.3 Human impact on the water regime	54
2.3.3.1 Medieval hydrology and its natural changes: a general overview	54
2.3.3.2 Water management in medieval Hungary: types and intensity of human impact.....	54
2.3.4 Industrial activities, mining and their possible impacts	57
2.3.4.1 Salt mining and its relation to hydrology and environment	58
2.3.4.2 Ore mining and its relation to hydrology and environment.....	59
2.3.5 Human environment and human impact in the Middle Ages: an overview	60
3 Long-term changes in the hydrological regime	61
3.1 Millennial-scale reconstructions: role of palaeoenvironmental evidence	61
3.1.1 Sedimentary-based long-term, low-frequency evidence: Baláta and Nádas Lakes	61
3.1.2 Millennial stalagmite-based precipitation information: Bükk Mountains.....	62
3.2 Archaeology- and documentary-based information and reconstructions	63
3.2.1 Information on detected groundwater-level changes (archaeology-based)	64
3.2.2 Water-level reconstructions of Lake Balaton: the Middle Ages and beyond	65
3.2.2.1 Balaton-reconstructions on a millennial scale: an overview	65
3.2.2.2 The two reconstructions: 'decent' versus 'popular', 'climate' versus 'human'?	68

3.2.3 Medieval conditions and water levels of Lake Fertő/Neusiedlersee.....	71
3.2.3.1 Long-term water-level changes – only sporadic evidence	71
3.2.3.2 Patchy direct data; extensive water surface versus intensive use of the lake basin?	71
2.1.3.5 Long-term changes in medieval water levels and humidity/wetness: an overview	73
4 Sources and methodology applied	74
4.1 <i>Reporting flood events in medieval Hungary: Sources and main characteristics</i>	74
4.1.2 Legal evidence I (secular): charters	77
4.1.2.1 When flood reported in charters: legal procedure and documentation	78
4.1.2.2 Preservation, published/unpublished evidence and present-day availability	81
4.1.2.3 Length of procedure: legal process of field survey and date of issue	83
4.1.2.4 Legal evidence II (ecclesiastical): Ecclesiastical jurisdiction and canonisation trials	87
4.1.3 Non-legal evidence	88
4.1.3.1 Narrative evidence	88
4.1.3.2 Letters and poems	90
4.1.3.3 Economic evidence	91
4.2 <i>Floods in space and time: distribution and limitation of the available source material</i>	92
4.2.1 Spatial coverage on large- and small-scale level	92
4.2.1.1 Best- and worst-documented areas	92
4.2.1.2 Possible reasons for an uneven spatial distribution	93
4.2.2 Temporal distribution, coverage and sources	94
4.3 <i>Methodological questions</i>	97
4.3.1 Medieval terminology and definitions – most frequently applied words	97
4.3.1.1. 'The' term of flood event: ' <i>inundatio/inundationes aque/aquarium/fluvij</i> '	98
4.3.1.2 Other (flood) terms applied – or not applied	98
4.3.1.3 General hydrological terms applied – an aid (or not) for specifying the flood environment?	100
4.3.2 Methodological questions, problems and possible solutions.....	100
4.3.2.1 Settling statistics	100
4.3.2.2 Dealing with the uncertainties: flood/high-water event or not?	105
4.3.2.3 Practical information: basic resources in finding, localising and dating the events	107
5 Analysis of flood events.....	109
5.1 <i>Basic hydrometeorological analysis of natural flood events</i>	109
5.1.1. Spatial distribution and frequency of flood events: main rivers and catchments	109
5.1.2 Seasonality of flood events.....	111
5.1.3 Detecting great flood and inundation events: questions of magnitude	113
5.1.3.1 Number and magnitude of flood events: a robust decadal analysis	114
5.1.3.2 An index-based analysis of annual flood magnitude	115
5.1.4 Types and origin of flood events and inundations	116
5.1.4.1 Probable ice flood (or related flash flood) events	116
5.1.4.2 Torrential water and flash floods	117
5.1.4.3 Floods predominantly caused by prolonged rainfall.....	119
5.1.4.4 Flood/inundation caused predominantly by snowmelt.....	119
5.1.4.5 Probable cases of inland excess waters	120
5.2 <i>Years and decades of highest flood frequencies documented</i>	122
5.2.1 The period of the 1330s-1350s and the years of 1342 and 1343	122
5.2.1.1 Floods of the 1330s.....	122
5.2.1.2 The extraordinary flood decade of the 1340s	123
5.2.1.3 Great and long-lasting floods and a possible long-term consequence: the late 1350s ..	128
5.2.1.4 Floods of the 1330s-1350s: an analytic overview	129
5.2.2 Floods of the period 1390s-1430s.....	130
5.2.2.1 Floods of the 1390s, with special emphasis on 1396 and 1399	130

5.2.2.2 The 1400s: less in quantity, same in quality?	132
5.2.2.3 Floods in the 1410s	132
5.2.2.4 Floods of the 1420s.....	134
5.2.2.5 The 1430s, and the flood years of 1432 and 1440	135
5.2.2.6 The flood period of the 1390s-1430s: an analytic overview	137
<i>5.3 Documented flood events of the largest rivers: present stage of knowledge</i>	139
5.3.1 Floods of the Danube	139
5.3.1.1 A general overview	139
5.3.1.2 Flood or not? Damages of Danube bridge(s) at Bratislava	140
5.3.1.3 Danube floods in Hungary and Austria: is it possible to compare?	141
5.3.2 Floods of the Tisza river	145
<i>5.4 Medium- and long-term information, and hydromorphological impacts reported</i>	147
5.4.1 Medium- and long-term flood-related information.....	147
5.4.1.1 Frequent floods of preceding periods: a high-frequency sign?.....	147
5.4.1.2 Long-lasting water cover; how long term is long-term?	149
5.4.2 Increased precipitation/flood events and their impacts on hydro/geomorphology	150
5.4.2.1 Precipitation, flood and landslide: mere coincidence or main reason(s) found?	150
5.4.2.2 Change in watercourse/riverbed, hydromorphological changes	151
5.4.2.3 Increased sedimentation – caused by flood(s)?	153
<i>5.5 Floods, climate and weather</i>	155
5.5.1 Medieval floods as possible precipitation indicators	155
5.5.1.1 Winter precipitation signal	155
5.5.1.2 Any spring precipitation signal?	157
5.5.1.3 Increased (late spring-)summer precipitation causes flood event	158
5.5.1.4 Autumn precipitation?.....	159
5.5.2 Medieval floods as possible indicators of temperature conditions/variations	160
5.5.2.1 Flood as a winter severity indicator	160
5.5.2.2 The occurrence of winter mild spells	161
<i>5.6 'People and Nature' – Floods, consequences and attitudes</i>	163
5.6.1 Floods: good and bad sides	163
5.6.1.1 When flood is normal and/or good/useful	163
5.6.1.2 Negative effects of floods documented.....	164
5.6.1.3 Floods, problems, solutions: classifying practical human response documented	166
5.6.2 Attitudes towards flood events: 13th-15th century examples.....	167
5.6.2.1 When flood is (not) due to divine intervention: God and flood in a 13th-century canonisation trial	167
5.6.2.2 Apocalyptic vision and animated rivers: humanists' attitudes towards flood	169
6 Conclusions, discussion and outlook.....	173
6.1 General conclusions.....	173
6.2 Discussion	175
6.2.1 Floods and long-term effects: most problematic periods of the first LIA centuries	175
6.2.1.1 Flood peaks of the 14th and 15th centuries in a broader documentary context.....	175
6.2.1.2 Decades with only a few flood reports: less floods or weak documentation?	176
6.2.1.3 Palaeoenvironmental versus documentary: any possibilities for comparison?.....	177
6.2.2 Impacts on society – temporal (and spatial) distribution.....	177
6.2.2.1 Impacts on mining, travel and transportation, public administration, material loss	177
6.2.2.2 General discussion: any impact on settlement and land desertion?	178
6.2.2.3 Concluding short-, medium-, long-term impacts and human response.....	180
6.3 Outlook.....	181
7 Bibliography.....	182

8 Appendix	207
9 A catalogue of floods in medieval Hungary: analysis of individual flood reports	213
9.1 <i>Analysis of 11th-century evidence</i>	213
9.1.1 Natural or artificial inundations? Military campaigns of Henry III: 1043 and 1044	213
9.1.2 Rábca-inundations and military campaigns in 1030, 1042, 1043, 1044, 1063, 1074: 'real' flood events or an usual phenomenon mixed with human impact?.....	214
9.1.3 Floods of a rainy summer: 1051	216
9.1.4 Description of natural phenomena and a possible 'flood' event in 1092	218
9.2 <i>12th-century floods recorded.....</i>	221
9.2.1 Byzantine evidence on a presumable flood event: turn of 1154-1155	221
9.2.2 Flood of the Drava river in 1147	221
9.2.3 Flood of the Danube in 1194?	222
9.3 <i>Recorded flood events in the 13th century</i>	223
9.3.1 The decade of 1220s: (flash) flood in the Carpathians – spring 1229?	223
9.3.2 Floods of the Danube in 1234 and 1235: only 1235 in Hungary?	223
9.3.3 Floods in the decade of 1241-1250.....	225
9.3.3.1 Flood at Vízköz in 1245: case study from south of the Drava river	225
9.3.3.2 Flood along the Danube(?) in 1248	225
9.3.4 Floods in the decade of 1251-1260.....	226
9.3.4.1 (Another) flood in Csallóköz/Žitný Ostrov: 1252	226
9.3.4.2 Flash flood of the Morava river in 1260	227
9.3.5 Floods in the decade of 1261-1270.....	228
9.3.5.1 'Legendary' December–January flood events: 1267/1268 (or 1266/1267)?	228
9.3.5.2 Flood in 1268.....	232
9.3.5.3 Flood of the Dunajec river at the Polish border in 1270	233
9.3.6 Flood in the 1271-1280: An inundation of the Rábca river in 1271?	233
9.3.7 Flood in the decade of 1281-1290: Rainfall and flood in 1285 – events of the Second Mongol Invasion	234
9.3.8 Floods in the 1290s	235
9.3.8.1 Temporary waterflow leading rainwater in Slavonia, (prior to?) 1296.....	235
9.3.8.2 Temporary waterflow leading rainwater: perambulation in Slavonia, 1300	236
9.4 <i>Flood events recorded in the 14th century.....</i>	237
9.4.1 Floods of the period 1301-1310: Frequent flood(s) of the Hron river prior to 1309	237
9.4.2 Floods of the period 1311-1320.....	238
9.4.2.1 Flood(s) in 1316.....	238
9.4.2.2 The same or another: flood in 1317?	239
9.4.3 Flood of the decade 1321-1330	239
9.4.3.1 Flood in 1325.....	239
9.4.3.2 1329 – flood or not?.....	240
9.4.4 Floods of the period 1331-1340.....	240
9.4.4.1 Spring flood in 1334	240
9.4.4.2 Flood reports from 1335.....	240
9.4.4.3 Muddy pasture in the Žitny ostrov area in 1336.....	243
9.4.4.4 Floods reported in 1338	244
9.4.4.5 Flood prior to autumn 1339.....	245
9.4.5 Floods of the period 1341-1350.....	246
9.4.5.1 Floods in 1341	246
9.4.5.2 The year of floods: 1342	247
9.4.5.3 Floods in 1343	252
9.4.5.4 Floods/inundations in 1344	255
9.4.5.5 Floods/inundations reported in 1346.....	258
9.4.5.6 Flood in 1347.....	259

9.4.5.7 Transylvanian flood event in 1348	260
9.4.5.8 Flood and mud in 1349	260
9.4.6 Floods of the period 1351-1360.....	262
9.4.6.1 Great (flash-?)floods destroyed a village some 40 years prior to 1395.....	262
9.4.6.2 Floods in 1356	263
9.4.6.3 Floods or inundations of waters in spring and summer in 1357?	264
9.4.6.4 Floods of waters obstruct reaching parish church in 1358: A Transylvanian case.....	266
9.4.6.5 Flood in 1359.....	266
9.4.7 Floods of the period 1361-1370.....	267
9.4.7.1 ' <i>...aqua et luto obstantibus</i> ' – West-Hanság: spring 1361	267
9.4.7.2 Floods in 1366	268
9.4.7.3 Winter flood in Transylvania, in 1367	269
9.4.8 Floods of the period 1371-1380.....	270
9.4.8.1 Flood in 1372.....	270
9.4.8.2 Floods in 1374	270
9.4.8.3 Floods in 1377	271
9.4.8.4 Flood in 1378.....	272
9.4.9 Floods of the period 1381-1390.....	272
9.4.9.1 Flood in 1381.....	272
9.4.9.2 Spring flood in the North, in 1383?	273
9.4.10 Floods of the period 1391-1400.....	273
9.4.10.1 Flood prior to late 1393	273
9.4.10.2 Late winter flood at the Upper-Danube in 1396	274
9.4.10.3 Floods in 1399	276
9.4.10.4 Flood in Transylvania prior to the end of 1400	279
<i>9.5 15th-century flood events</i>	280
9.5.1 Floods of the period 1401-1410.....	280
9.5.1.1 Flood event(s) in 1402	280
9.5.1.2 Until March 1405: Continuous floods – human impact and/or natural phenomena? ..	282
9.5.1.3 Summer flood in 1406 – on the Danube again	282
9.5.1.4 Flood in early 1408 or before: the Transylvanian Sebes river.....	282
9.5.1.5 Flood in the South: summer 1409.....	283
9.5.1.6 Spring flood or inundation in Fejér county: 1410.....	284
9.5.2 Floods of the period 1411-1420.....	284
9.5.2.1 Flood reported in 1411.....	284
9.5.2.2 Floods in 1412	286
9.5.2.3 Floods of 1413.....	288
9.5.2.4 Great flood of the Danube of 13 July and around: 1414	289
9.5.2.5 Floods in 1416	289
9.5.2.6 Flood in 1417.....	291
9.5.2.7 Flood in 1419.....	292
9.5.3 Floods in the period 1421-1430.....	292
9.5.3.1 Floods recorded in 1421.....	292
9.5.3.2 Floods in 1422 and/or before	295
9.5.3.3 Spring flood in 1423	296
9.5.3.4 Reports from 1424 on frequent flood events	296
9.5.3.5 Two references of former floods, mentioned in 1426.....	298
9.5.4 Floods of the period 1431-1440.....	299
9.5.4.1 Flood reports of 1432.....	299
9.5.4.2 High water level of Lake Fertő in 1434?	301
9.5.4.3 Flood of 1435?.....	302
9.5.4.4 Prolonged floo(s) of the Danube in 1436?	302
9.5.4.5 Great flood in 1437: a winter flood case?	303
9.5.4.6 Perambulation obstructed by uninhabitable wetlands: 1438	304

9.5.4.7 Floods destroyed bridge before 1439.....	305
9.5.4.8 Floods in the year 1440.....	305
9.5.5 Floods in the 1440s	307
9.5.5.1 Torrential rain and flash flood event prior to 14 April, 1443	307
9.5.5.2 Flood at the end of December 1446.....	308
9.5.6 Floods in the period 1451-1460.....	308
9.5.6.1 Flood and accumulation of waters in 1454.....	308
9.5.6.2 Danube flood in 1458.....	310
9.5.7 Floods of the period 1461-1470.....	311
9.5.7.1 ' <i>Maxima inundatio aquarum</i> ' great flood in 1466: east central Great Plain	311
9.5.7.2 Flood in autumn 1468	312
9.5.7.3 'Usual' flood event(s) of preceding two years: 1469 and before on the Tisza	313
9.5.8 Floods reported in the period of 1471-1480	313
9.5.8.1 Flood, snows damaged road before August 1473: Verestorony (Turnu Roşu) pass.....	313
9.5.8.2 Inundation of the Sava river at Szabács in winter 1476.....	314
9.5.8.3 Damages caused by Danube ice in 1477: flood or not?	315
9.5.8.4 High water caused damages on the Danube: summer 1478?	315
9.5.8.5 Drava-Sava flood obstructs the army in autumn 1480.....	316
9.5.9 Floods of the period 1481-1490.....	316
9.5.9.1 High waters and/or strong flux of the Danube in 1481: a spring case	316
9.5.9.2 Ice of the Danube destroyed some piles of the bridge at Bratislava: 1482.....	316
9.5.9.3 Ice (jam) flood on the Danube in 1485, 1486 or 1487?	317
9.5.9.4 Flood event in summer 1490?	317
9.5.10 Floods of the period 1491-1500.....	318
9.5.10.1 Peace treaty and flood in April (or May?) 1494	318
9.5.10.2 Floods in 1495	319
9.5.10.3 Great flood and ice damaged bridge, stopped salt transport – Transylvania 1496	319
9.5.10.4 Floods in 1499	321
9.5.10.5 Strong flux of the (Triple-)Körös river in 1500.....	323

List of Figures

1. Fig. Present-day countries of the medieval Hungarian kingdom.....	12
2. Fig. Potentially flood-endangered areas of the Carpathian Basin before water regulations (overestimated).....	23
3. Fig. Main river and river catchments mentioned in medieval flood reports in the Carpathian Basin..	24
4. Fig. Annual discharge of the Danube and its tributaries (m ³ /s)	27
5. Fig. The Tisza river and its tributaries	31
6. Fig. Population of medieval Hungary (with Slavonia): some estimates	40
7. Fig. Population densities of Hungary at the end of the 15th century on county level (estimated by A. Kubinyi)	41
8. Fig. A complex example of intensive settlement desertion: the changing number and type of settlements in the Buda-Pest agglomeration in the late Middle Ages	48
9. Fig. Estimated ratio of forest cover in the 15th century (estimations are available for 33, out of 75 counties) compilled and edited by P. Szabó.....	53
10. Fig. Mining areas and their relations to main rivers and river catchments in the Middle Ages (with medieval and present-day country borders).....	57
11. Fig. Prevailing water levels of Lake Nádas in the last 1900 years (source of data: Sümegi et al. 2009).....	61
12. Fig. Carbon isotope ($\delta^{13}\text{C}$) based reconstruction of wet-dry and warm-cold phases: 900-1700 (decadal resolution) by Siklósy et al. (2009)	63
13. Fig. Water-level fluctuations of Lake Balaton in the last 2800 years according to Bendefy and V. Nagy 1969.....	66
14. Fig. Water-level changes of Lake Balaton in the past millennium, given by Sági and Füzes (1973)	66
15. Fig. Locations of medieval sites at Lake Balaton, referred in the text (sketch is based on the maps of the First Military Survey, carried out in the area in 1783-1784).....	70
16. Fig. Locations of sites (with years of charter issue) at Lake Fertő and the West-Hanság, mentioned in the text (sketch is based on the maps of the First Military Survey, carried out in the area in 1783).....	72
17. Fig. Temporal coverage of flood-related documentary evidence in medieval Hungary	75
18. Fig. Decadal distribution of medieval source types in which floods were mentioned.....	76
19. Fig. Geographical origin of authors and reports, referring to floods occurred in medieval Hungary .	76
20. Fig. Medieval charter production of 'loca credibilia' compared to that of whole Hungary	81
21. Fig. Duration (days) between the date of perambulation and the date of issuing charters in the 1330s-1340s	84
22. Fig. Number of perambulation procedures according to seasons (a) and months in the 1330s-1340s (b)	85
23. Fig. Spatial distribution of documented flood events (when exact location was reported) in medieval Hungary according to counties (based on the database included in the present work).....	93
24. Fig. Centennial distribution of floods reported in 11th-15th-century documentary evidence.....	95

List of Tables

1. Table Most significant immigrant groups, their predominant traditional occupation and land-use types	43
2. Table Terms applied in medieval sources referring to flood events: the Carpathian Basin (* does not always equivalent to flood event).....	98
3. Table Intensity classification of historical floods in (West) Central Europe.....	103
4. Table Documented main consequences of flood events on the human activities: the 1330s-1350s ..	129
5. Table Documented main consequences of flood events on the human activities: the 1390s-1430s.	

*Note that the cases referring to previous floods might partly concern events of the previous
decade

138

6. Table Previous (frequent) floods reported (* only a potential case; ** discluded from Fig. 28 (see below) due to possible (strong) human influence)	148
7. Table Long-lasting water covers mentioned (*not a clear long-term groundwater-table change sign; floods were reported there in 1342 and 1344 – potentially showing multiannual problems)	149
8. Table Flood data probably holding some signals of winter precipitation conditions.....	156
9. Table Probable flood-related signals of spring precipitation conditions	157
10. Table Probable flood-related signals of summer precipitation conditions	158
11. Table Probable flood-related signals of autumn precipitation conditions	159
12. Table Late medieval floods indicating severe winter conditions.....	160
13. Table Late medieval floods indicating occurrences of winter mild spells	161

List of Appendices

1. App. Map of locations mentioned in the text	207
2. App. Janus Pannonius: De inundatione (the full version; V. Kovács 1972, pp. 371-381)	210
3. App. Floods, flood-related hydromorphological events, damages and administrative changes reported in medieval Hungary	212

1 Preface: basic questions and basic answers

1.1 Why floods and why medieval Hungary?

Up to the present, the Carpathian Basin has been practically left out of European historical flood investigations. It is partly due to the fact that, apart from some isolated attempts, no systematic historical analysis was carried out on floods in the area and thus, basic domestic research is still needed on the subject. This is especially true for the Middle Ages; even if environmental conditions, namely hydrological sensitivity of the area would make the area especially favourable for flood-related research, practically no investigations were carried out up to now, in Hungary and the Carpathian Basin, either. Thus, in the present work a basic, first attempt is made to provide a concise database on medieval flood events in the Carpathian Basin, based on documentary evidence. This database and, therefore, the analysis is not yet complete: it is possible that more evidence may be found in future. Nevertheless, based on the large amount of evidence (almost 130 floods, flood-periods reported) it can be stated that the present database contains majority of the possibly available medieval evidence, and no fundamental changes are expected in the database in the near future, even data collection is still an ongoing process.

As a consequence of hydrological and hydromorphological conditions, floods and inundations play an especially important role in studying past environmental conditions in medieval Hungary, covering almost the entire Carpathian Basin, and even a bit beyond (present day Hungary, Slovakia, SW-Ukraine, W-Romania, N-Serbia, N-Croatia, N-Bosnia – *Fig. 1*). It is clear that in the Middle Ages most flood events remained either unreported or the evidence was lost later. Under present climatic conditions, high waters and/or floods may occur each year – on the large scale, and this was most probably the case in the Middle Ages as well. However, the number, magnitude, frequency and length of these events are rather important issues. It is also an important issue, and therefore likely to be reported in medieval, especially in legal documents, if flood or inundation disturbed human (in our case mainly legal) activities in any way. These are the flood cases which predominantly preserved in medieval documents.



1. Fig. Present-day countries of the medieval Hungarian kingdom

Although floods were reported in many types of sources, while studying medieval Hungary, legal documentation related to landed properties, are of the utmost importance. Since the preparation process and main (obligatory) contents of charters have remained relatively stable and same from the late 13th- and early 14th-century onwards, this largest group of sources referring to flood events can be treated as homogenous source of data covering a long period of time in the later Middle Ages.

Even if the source potential in the later Middle Ages is quite good, there are significant differences in the degree of coverage in medieval Hungary, both in space and time. Moreover, some of the clear flood peaks are probably not included, due to missing evidence or due to the fact that no legal process was carried out in the area. Although this fact also means that it is not a systematic database, and as regards frequency of evidence by no means continuous, available evidence clearly preserved some of the famous medieval flood peaks, great flood events and periods with higher frequencies of flood events.

Before starting any discussion on documented medieval flood events, one might reasonably ask the question that, while studying environmental conditions of Hungary, why choose floods and inundations in the first place for a detailed analysis. This is mainly due to the fact that, among other (short-term) natural phenomena, a flood is one of the most frequently mentioned dynamic natural phenomenon in contemporary evidence. Concerning spatial coverage, another question as well has to be raised and answered: Why the whole of medieval Hungary and even a bit beyond? Why not, for example, Hungary according to present borderlines or other countries of the former kingdom or the crown in separate? There are several reasons of basic importance for choosing the territories that belonged to medieval Hungary (and medieval northern Slavonia):

1. Even if in general a relatively large amount of flood evidence is available, the frequency and amount of evidence are together not big enough to study medieval floods in a representative way. And thus a larger but still, at least from the viewpoint of source types and traditions, quite homogenous unit was worth choosing. What provides this relative homogeneity? First of all the geographical conditions, but especially the unity of catchment areas have to be mentioned: the Danube and the Tisza catchments practically cover the whole Carpathian Basin; that is to say, medieval Hungary (and Slavonia).

2. A second issue of at least the same or even greater importance: similarities in type and nature of documentary evidence. Most of the flood-data is available in domestic legal documents, organised according to the same requirements, under the rule of the same legal system (including Slavonia). Moreover, the second most important type of evidence, namely domestic and foreign narratives, in most cases mention only Hungary as a unit where actual events occurred – without any territorial specification. As such, the second important reason was source homogeneity: the area in question primarily belonged to one territorial and legal unit, customs ad written traditions. This makes investigation much easier, especially due to the fact that the medieval written evidence referring to the Hungarian kingdom, either in the original or as a photocopy, is predominantly available in the collection of the Hungarian National Archives in Budapest.

Hungarian medieval written evidence, at least what has remained to the present day, has some peculiarities which make it rather different from most of the European medieval archives located west of us. Namely, while searching for weather-related (and thus, flood) evidence, one can easily notice that Hungary is almost entirely lacking the source most important in western and central European (but could be actually, eastern as well – e.g. Russian) analyses of medieval climate and weather. Whereas contemporary western narratives 'talkative' and interested enough (for any reason) to provide regular or irregular evidence on natural phenomena, extremes, this information in narratives (except for the 15th century) is almost

entirely missing in Hungary. Nevertheless, in Hungary hundreds of thousands of detailed and less detailed institutional sources, namely charters mainly of a legal nature, providing first class, quality information (e.g. in dating, localisation), which is especially a striking advantage compared to many European medieval narratives in general.

The period of investigations is the 11th-15th centuries, namely the years between 1001 and 1500. The reasons for choosing the period between 1001-1500 were mainly practical: this is the period when in medieval Hungary contemporary documents are available. Practically no flood documentation can be found prior to 1000. 1500 was chosen to be the closing year of investigations partly due to the fact that in the international literature medieval flood-related investigations predominantly use this closing date (therefore, it is easier to compare databases and analysis results), but it is also true that working with 'full' centuries makes any basic statistical analysis easier. These circumstances have to be emphasised due to the fact that, according to present-day classification, the end date of the Middle Ages in Hungary is defined by the year of 1526 (battle of Mohács, fall of the medieval Hungarian kingdom), and for this reason, theoretically, 1526 could have also been the closing date of the present investigations.

In the course of investigations not only floods but in several cases of high water-levels, possible signs of inland excess waters and long-term hydrological information are also discussed.¹ With regards to present countries Hungary, Slovakia, Southwest-Ukraine, West-Romania (Transylvania and the West-Romanian lowlands), North-Serbia (Vojvodina), North-Croatia, East-Slovenia and East-Austria (Burgenland), and in some cases North-Bosnia are included (see *Fig. 1*). Applying contemporary evidence, mainly domestic legal evidence (charters), letters (private and official), narratives (chronicles, memoires), sources of economic character (accounts) and sometimes other evidence, such as poems were used. Moreover, contemporary Austrian, Czech and Polish (narrative) sources, with direct reference on flood events that occurred in Hungary, were also applied. This later evidence is an important source of information, including evidence in the form of annals, chronicles and travelogues.

In the present analysis beyond historical interpretation, both on the small and large scales, it is necessary to include some basic information on the geographical and environmental background. This is carried out partly as a large-scale overview of past environmental conditions, and a detailed, small scale in-situ analysis. Clearly, it is not possible to study floods and inundations without a basic interpretation of the landscape and hydrological, hydrographical backgrounds, taking into account landscape transformation and dynamics.

1.2 About the present work: aims, reasons and the background

Floods, flood frequencies and magnitudes are in close, actually, in the closest relationship with climate variabilities and changes. The studied period, namely the 11th-15th centuries, belongs to two periods of main historical climatic anomalies: the Medieval Warm Period (MWP) or as recently called, Medieval Climate Anomaly (MCA), lasting in large parts of Europe roughly from 900 to ca. 1300. This was followed by the Little Ice Age (LIA), approximately until the later 19th century (1860s-1870s).²

¹ This later information was included in such cases when the watercover or mudiness, due to documentary circumstances and geographical background, had a greater importance.

² It seems that by the last decade a consensus developed among natural scientists and historical climatologists, studying the high-resolution changes and variabilities of climate in the last 1000-2000 years. This agreement appears not only in the scientific literature but also in books and publications addressed to the wider public. For brief and simple descriptions about the climatic periods called LIA and the MCA see, for example: Henson 2006, pp. 210-216.

The present work is part of a larger Eu project called 'Millennium', related to the climate changes and variabilities occurred in Europe in the last one thousand years. The aim of the project was not only to detect changes of temperature and precipitation conditions in the medieval and early modern, modern periods, but also other significant questions such as to define main characteristics of turning points (e.g. MCA–LIA transition), to enlarge the knowledge on weather-related extreme events and to some extent also detect their possible impacts on the general environmental conditions.³

In Hungary, similar to other parts of Europe, there is a clear demand for the better understanding of not only early modern-modern, but also of medieval conditions, and the possible direct and indirect impacts of climate variabilities and change on the environment, either we talk about physical or human environment. From the documentary side some investigations, partly in the form of case studies concerning medieval Hungary as well as papers on mainly literature overview, were published. Long-term analyses, based on systematic collection of data, however, were carried out only by natural scientist.⁴

The amount and quality of natural scientific research concerning the last one two thousand years greatly advanced in the recent years.⁵ The above-mentioned questions, however, only partly can be answered by the (growing number of) results in natural sciences. Therefore, the systematic study and analysis of high-resolution (annual, seasonal, monthly level) information preserved in contemporary documentary evidence is of vital importance in the understanding of environmental processes which took place in the Carpathian Basin. Such a systematic work however, up to the present, has not yet been carried out.⁶

Continuing a work started in 1995,⁷ in the framework of the 'Millennium' Eu-project, from 2006 systematic data collection and analysis of medieval evidence were carried out concerning weather-related information. Being primarily a weather-related event, collection of flood-related information was as well included in this work.⁸ With reference to the medieval Carpathian Basin and medieval Hungary, most of the weather-related documentary evidence is available concerning flood events, and therefore, the best and most comprehensive analysis can be done in this topic. Nevertheless, as mentioned above, it has to be emphasised that collection of weather-related data is an ongoing process, and even if most probably the majority of evidence has been already included, it is still a developing database. This also means that the flood-related analyses, carried out in this work, might (and should) as well develop in the future.

Beside flood (and weather/climate) reconstruction issues, who may benefit from this research and might find answers for some of their questions?

Among historical sciences environmental history, history of agriculture (e.g. environmental background of expansion and desertation), history of water management, water history, settlement history, history of travel and transportation, general economic and social

³ A recent overview of results on natural scientific investigations suggests that the MCA had great variations, detected both in space and time, even over the northern hemisphere. See: Xoplaki et al. 2011, 39 p.

⁴ For an overview of documentary-based literature in Hungary, see Kiss 2009a, pp. 315-339. A literature overview concerning the medieval period, with special emphasis on the MCA-LIA transition, see: Vadas-Kiss 2010, pp. 239-252. For a recent overview of natural scientific results and documentary case studies, see: Vadas-Rácz 2011, 18 p.

⁵ A recent collection of millennial results were published in the special issue of the *Időjárás* (Vol. 113/4, 2009: 108 p), the IF quarterly journal of the Hungarian Meteorological Service. In these studies not only recent results, but also detailed overviews are provided about relevant earlier investigations in the topic. For short overview of topics and results presented in the special issue, see: Kiss 2009d, pp. I-II (editorial).

⁶ For the critical overview of available data-compilation (Réthly 1962, 450 p), see Kiss 2009a, pp. 315-339.

⁷ First results were attempts towards building a systematic collection of weather-related medieval source materials, data and analyses of better-documented case studies. See, for example: Kiss 1996, 1997, 1999, 2000, 2003, and partly also in Kiss-Piti 2005.

⁸ Kiss 2008, pp. 163-169. For more information on the project, see: <http://137.44.8.2/>

history, historical demography, history of technology (conditions of mill-utilization, risks of building and maintaining bridges etc.) and history of industry (e.g. changing conditions of mining, environmental risks of salt and metal production) may benefit from the present investigations. Moreover, the social impacts of floods (impact and perception) can provide interesting data to social history, the history of mentalities, and church history; through the examples listed, even environmental ethics, history of legal systems can use the data and the general conclusions provided by flood research.

Concerning natural sciences, hydrology, historical climatology, hydromorphology (partly also hydrogeology), sedimentology (e.g. changes in sedimentation rates), and to some extent meteorology (e.g. synoptic) can benefit from systematic medieval flood research. For the comparison of long-term results, palaeoclimate or palaeoenvironmental/ecological research can also apply results.

1.3 Structuring and main sections

The present work is divided into seven main chapters, in which several sections are included. Sections are divided into three hierachic levels. Due to this fact, the dissertation may seem to be overstructured and broken up too much for the first sight. Taking a deeper look into the whole work might, however, prove that this overstructuring does not only make sense, but it is even necessary in dealing with the various separate and individual pieces of information included in this dissertation.

The main body of the dissertation is the analysis part (chapter 5). However, from the viewpoint of analysis, it has vital importance to structure the case studies of medieval flood events in chapter 9 (Catalogue and analysis of individual flood events) in a way detailed enough to be easily and clearly referred back and applied in the analysis chapter (5). In the Catalogue part (chapter 9) individual mini case studies of each and every flood event were carried out to provide an adequate background to the understanding of source material and basic social and environmental circumstances.

A somewhat similar logic led to the fact that introductory chapters – providing necessary background information on hydrology, environment, the nature of source materials and other, methodological questions – are divided according to basic units. These basic units can be easily checked back and used any time when needed in the better understanding of later chapters.

2 An environmental background: floods, modern hydrology and the medieval environment in Hungary

2.1 Research on medieval floods, long-term water-level fluctuations and the environment

2.1.1 Floods and water-level fluctuations in Europe and Hungary: a short literature overview

In the first section of the chapter, a general overview of international and Hungarian flood research and long-term evidence on lake and river water-level fluctuations in Hungary in a historical perspective, with special emphasis on the Middle Ages, are accounted. In the second section a general environmental background is provided.

2.1.1.1 Medieval floods: investigations in Europe and Central Europe

Floods in a historical perspective are most frequently discussed in connection with climate. The magnitude and frequency of floods are strongly related to climate variability.⁹ In this sense, it is possible to distinguish between long-term palaeoenvironmental research on palaeo-flood events covering several thousands or tens of thousands of years.¹⁰ Another research direction is historical flood research, which concentrates mainly on the basic hydrological information of the last thousand years and/or the impact of floods on societies. This latter branch of investigations is also important from the viewpoint of present-day flood risk management.¹¹ A concise overview of the most relevant recent scientific literature with special emphasis on hydrometeorological research related to European research on historical flood events is available in the paper of R. Brázil and his colleagues on the present state of historical climatology.¹² Moreover, hydromorphological research provides some other significant contributions as well, sometimes not only on the long-term (e.g. Holocene), but also at a historical level, as well for the Middle Ages.¹³

In a historical sense, long-term statistical overviews of the frequency and magnitude of flood events, including medieval floods, were carried out in several parts of Europe including the Netherlands and the Belgian coasts,¹⁴ Switzerland,¹⁵ the German areas¹⁶ and some parts of the Iberian peninsula.¹⁷ Venice storm surges can also be listed, because their effects are quite similar to river floods.¹⁸ Some of the papers on long-term evidence are related to floods from a European perspective: these papers are usually based on already-existing datasets covering certain parts of Europe (e.g. west-central).¹⁹

⁹ Benito et al. 2003, pp. 171-192.

¹⁰ For some examples of European research, see: Macklin et al. 2005, pp. 937-943; Nesje et al. 2001, pp. 329-342. Concerning some promising beginnings of Hungarian investigations on the Danube, see: Nagyváradi 2004, pp. 241-248.

¹¹ See, for example: Brázil et al. 2006b, pp. 739-764.

¹² Brázil et al. 2005, pp. 363-430.

¹³ See, for example, Macklin et al. 2006, pp. 145-154. See also the concise work on the connection between extreme precipitation events, floods and landslides: Bork et al. 1998, 328 p.

¹⁴ Tol-Langen 2000, pp. 357-369; Glaser-Stangl 2003, pp. 605-613; De Kraker 2006, pp. 913-929.

¹⁵ See, for example: Pfister 2006, pp. 265-273.

¹⁶ See, for example: Glaser et al. 2004, pp. 43-49; Glaser 2001, 2008; Glaser-Stangl 2005, pp. 485-510. Mudelsee et al. 2006, pp. 808-833.

¹⁷ Benito et al. 2003, pp. 171-192; Barriendos-Rodrigo 2006, pp. 765-783.

¹⁸ Camuffo 1993, pp. 1-14.

¹⁹ See, for example, Starkel 2000, pp. 55-62; Jacobbeit et al. 2003, 4 p; Wanner et al. 2004, pp. 1-16.

Some joint European flood papers have also had a special methodological influence on further hydrometeorological analyses.²⁰ Even when discussed at a European level, many areas of Europe such as Hungary or the Carpathian Basin, are usually not included in these international papers.

Apart from studying long-term fluctuations, another direction in flood research is related to the complex investigation of single historical flood events. Some of the especially destructive flood events in the past are of special interest and historians, hydrologists and also meteorologists have studied them in great detail.²¹ Hungary and the Carpathian Basin are (already) included in these investigations.²²

There is a general tendency in flood research, at least regarding long-term results, that is either more concentrated on the early modern, modern period or the whole 1000-year interval. Works that just deal with medieval data are relatively rare. Medieval floods are often not studied on their own but together with investigations of other phenomena such as other natural hazards. Similar to the investigations dealing with the early modern and modern periods, the detection, causes and consequences of extreme medieval flood events are the most common topics of research, namely the magnitude, extension, duration, social and economic impact of individual floods.²³

Central European scholarship is in quite a strong position in terms of historical flood research. This is not only true for some west central European areas (e.g. Germany), but also for areas close to the Carpathian Basin. Austrian research has concentrated mainly on historical data (magnitude of floods and the human response)²⁴ while research in the Czech areas tends to be more climatology-based (frequency and magnitude of flooding, etc.) with reconstructions and impact-studies (often comparing floods in the past with present-day flood events of similar causes and magnitude).²⁵ As in western scholarship, only some separate investigations have been carried out particularly on the Middle Ages.²⁶ These investigations are especially important from our present viewpoint due to the fact that Czech and Austrian research makes reference to neighbouring areas including the medieval floods of the Danube in its western catchment area, which is of basic importance in Carpathian Basin flood research. Thus, regarding Austrian and Czech tributaries of the Danube and the Danube itself, rather rich resources are already available for different methodological approaches and further comparison. Such data permits the study of flood-frequency reconstruction, individual flood events of extraordinary magnitude, and the human response to flood catastrophes.²⁷

2.1.1.2 Research on historical floods and long-term water-level changes in Hungary

Up to the present, scientific (either natural scientific or historical) research on historical flood events was concerned mainly with the 18th and 19th centuries. Flood events before this period were only occasionally mentioned. Historical flood events are also important issues in concise local history studies and historical ethnographic investigations. Individual case studies on early modern-modern flood events are available in some articles that concentrate either on

²⁰ Brázil et al. 1999, pp. 239-285; Brázil et al. 2002, pp. 21-23; Glaser-Stangl 2005, pp. 485-510.

²¹ For the early modern period, see, for example, Thorndycraft et al. 2006, pp. 899-912; Jakubwski-Tiessen 2003, pp. 179-200. It has to be commented that some individual flood events also gain great interest in Hungary. For more information, see: Kiss 2009a, pp. 315-339.

²² Brázil et al. 2010, pp. 163-189.

²³ See, for example: Tetzlaff et al. 2002, pp. 41-49; Brázil et al. 2006a, pp. 848-863.

²⁴ See, for example, Strömmér 2003, pp. 101-301; Rohr 2005, pp. 71-86.

²⁵ From the rich literature see, for example: Brázil et al. 2005, 369 p.

²⁶ Brázil-Kotyza 1995, 260 p; Rohr 2007, 640 p.

²⁷ See, for example: Brázil et al. 2006a, pp. 848-863; Rohr 2003, pp. 37-49; Rohr 2006, pp. 834-847.

floods in certain periods or individual flood events in specific locations (usually flash floods). In this latter case, the impact of flash floods on town development is also a relatively common topic of discussion.²⁸

As for long-term overviews including the Middle Ages, the connection amidst hard winters, ice cover and ice floods on the Danube over a thousand year period were discussed by Déry.²⁹ His work was based on data obtained from the Réthly collection³⁰ and the late 19th-century Zawadowski flood-data catalogue.³¹

Only preliminary investigations have been carried out to date on specifically targeted medieval flood events in the Carpathian Basin. There have been basic investigations, for example, on 14th-century flood and weather events,³² and the main sources available for detecting flood events.³³ With the increasing amount of accurately dated 14th-century legal evidence, some great floods and presumed higher flood frequencies may be seen in certain cases, such as in the 1340s.³⁴ Other papers dealt with individual 15th-century high water levels or flood level events on Lake Fertő/Neusiedlersee as these relate to fisheries there, while the hydrological Hungarian term 'fok' were discussed in some other papers.³⁵

As far as documentary evidence is concerned, and in spite of its good research potentials, almost nothing has been published up to now concerning medieval flood events in Hungary. Although Déry's paper refers to some medieval ice-flood events, his entries all originate from the weather compilation by Antal Réthly. This work is almost entirely based on non-contemporary evidence, and thus, the possibility of applying it to any analyses concerning the Middle Ages is rather restricted.³⁶

With reference to long-term changes, in an interesting early case study, primarily based on archaeological evidence from the Visegrád royal palace and settlement, the late medieval-early modern increase of average water level of the Danube is discussed.³⁷ Although archaeological and palaeoenvironmental investigations provide a rich set of hydrological information, these data are more concerned with long-term water-level changes, especially lake water levels.³⁸

Water-level changes of lakes and some stagnant water bodies, on either a hundred-year basis or a millennial scale, were also subject to detailed investigations, already in the late 1960s-early 1970s. Two long-term, mixed archaeology-documentary-geoscience-based, water-level reconstructions on a millennial scale were presented concerning Lake Balaton by Bendefy-V. Nagy (1969) and Sági-Füzes (1973).³⁹ Although (documentary-based) water-level reconstruction was also prepared for the second largest lake of the Carpathian Basin, Lake Fertő, this reconstruction only covers the last 400 years and thus, it does not provide information on medieval times.⁴⁰

Recent, complex palaeoenvironmental investigations of Lake Baláta in Southwest-Hungary (south of Lake Balaton) and Lake Nádas in North-Hungary (Cserhát Mts.,

²⁸ For an overview on Hungarian scientific literature concerning historical flood events, discussed according to main research directions and historical periods, see: Kiss 2009a, pp. 326-328.

²⁹ Déry 1989, pp. 151-158.

³⁰ Réthly 1962, 450 p; Réthly 1970, 622 p; Réthly 1998, 616 p.

³¹ Zawadowski 1891, 450 p.

³² Kiss 1999, pp. 51-64.

³³ Kiss 1996, pp. 61-69; Kiss 1997, pp. 238-241.

³⁴ Kiss 2009c, pp. 37-47; Kiss 2010, pp. 181-193.

³⁵ Kiss- Piti 2005, pp. 164-184.

³⁶ Déry 1989, pp. 151-158.

³⁷ Héjj 1988, pp. 47-62.

³⁸ Concerning settlements and land-use changes around Lake Fertő, see for example: Kiss-Paszternák 2000, pp. 402-419; Kiss 2001, pp. 61-77; Kiss 2005, pp. 39-49.

³⁹ Bendefy-V. Nagy 1969, 215 p; Sági-Füzes 1973, pp. 247-261.

⁴⁰ Kopf 1963, pp. 190-203.

Nagybárkány), on a millennial scale, were carried out by P. Sümegi nad his research group.⁴¹ Long-term, millennial-scale precipitation-temperature reconstruction was recently carried out, based on the stable isotope and trace element contents of a stalagmite record in the Bükk Mountains (North-Hungary), concerning the last 1100 years.⁴²

⁴¹ Sümegi et al. 2009, pp. 265-298; Sümegi et al. 2010, 13 p.

⁴² Siklósy et al. 2009, pp. 245-263.

2.2 Floods, inundations, inland excess waters and the environment

2.2.1 Definitions of hydrological terms discussed

2.2.1.1. Flood and inland excess water

Before giving an overview of the main hydrological characteristics of water bodies subject to flood or inundation, the meaning of such key terms as flood, inundation and inland excess water have to be discussed. Flood or inundation occurs when the water level of a waterflow or a lake exceeds its banks and water overflows onto a piece of land that is normally dry; that is to say, when peak discharge exceeds channel capacity.⁴³

Although floods in the Carpathian Basin generally occur in spring and early summer, as a Mediterranean influence, there is a possible secondary flood maximum in the autumn. Moreover, before water regulation works, in winter, (ice) floods also cause significant damage, especially on the Danube. Long-lasting inundations on floodplains were mainly associated with these flood events and could even last for years in some cases. The most likely periods of the appearance of inland excess waters in the central, low-lying, most endangered areas are winter-spring (December-April), summer (May-August), autumn (September-October) periods, thus covering almost the whole year. The greatest damage usually occurs in the summer when inland excess waters in some areas may destroy the crops before harvest. It should be added, however, that the intensive agricultural use of such low-lying areas became a practice only after the systematic water regulation works when large areas were free of the risk of river flood, and even in this case intensive agriculture appeared in low-lying areas only in prolonged dry periods.

Inland excess water is the surplus of water on the surface (not coming from the flood of a river) which obstructs the development of vegetation and causes damage in the built-up environment. In most cases it may be found in the high inundation area of rivers, after prolonged wet conditions. It is also rather frequent on alluvial fans. The risk of inland excess water increases when approaching the living/active riverbed. Inland excess waters, related to the origin of water, are divided into two main types:

1. accumulative: the water, directly originates from rainfall or snowmelt, is not able to seep down due to existence of any impermeable layer close to the surface. This type of inland excess water most frequently develops after winters rich in precipitation.

2. groundwater-upsurge, which originates from subsurface waters: the surplus water is usually associated with the high water-level conditions of the living water. Nevertheless, this second type should not be confused with the inundation waters that remain after a flood in the inundation area.⁴⁴

2.2.1.2. Flood types and definitions

Due to rapid appearance and release, its extremely high water levels, and the fact that it usually occurs in winter or early spring, ice (jam) flood is one of the most destructive type of flood

⁴³ Mayhew 1997, p. 175. According to the National weather service weather forecast office (NOAA), flood is "an overflow of water onto normally dry land. The inundation of a normally dry area caused by rising water in an existing waterway, such as a river, stream, or drainage ditch. Ponding of water at or near the point where the rain fell. Flooding is a longer term event than flash flooding: it may last days or weeks."

See: <http://www.srh.noaa.gov/mrx/hydro/flooddef.php>.

⁴⁴ Lovász 2000, p. 108. For definitions of inland excess water, see Pálfa 2001, pp. 376-392.

events.⁴⁵ The other, very destructive flood type is flash flood,⁴⁶ which is also associated with very rapid increase of water, even if it can be caused by several reasons.

Most of the flash flood events occur due to prolonged intensive rainfall, breaking of a dam (either ice or an artificial one of a reservoir). The first flash flood type is often connected to torrential rain, and responsible for the flash-flood type called torrential flood.⁴⁷ Nevertheless, torrential rains can be also responsible for other type of inundation resulting, for example, inland excess waters. In medieval documents sometimes only the term 'torrential water' is blamed for flood damages: in these cases the origin of the water is rather clear (rainwater), the fact that a flood occurred is clear, but then often no indication is available on the (type of the) flood event, but there indication on (flood) damages.⁴⁸

2.2.2 Main environmental characteristics of waters in the Carpathian Basin

In this section mainly those rivers and waterflows are discussed that also appear in medieval flood evidence. In its hydrography, the Carpathian Basin is basically divided into two main parts: the Danube and the Tisza catchments.⁴⁹ In the western part of the Carpathian Basin, the Danube catchment covers not only the western Carpathian Basin, but also a much broader area. Before arriving in the Carpathian Basin, the Danube collects the waters of the northeastern and eastern Alps, as well as the waters of the Moravian Basin.

Similar to the Danube, main waterflows of the Transdanubian region in western Hungary and northern Croatia, namely the Rába (Raab-A), Dráva (Drave-Hr), and Sava (Hr, Slo) arrive from the Alps and therefore, their water supply is more or less dependent on alpine weather (and flood) patterns. The northern tributaries of the Danube as well as the complete Tisza catchment in the Carpathian Basin collect waters coming from the Carpathian Mountains. Moreover, the Tisza, as a more continental river, has a catchment area restricted to the eastern parts of the Carpathian Basin.

⁴⁵ Ice jam (causing floods): In hydrologic terms, a stationary accumulation that restricts or blocks streamflow. For a NOAA definition, see: <http://www.nws.noaa.gov/glossary/index.php?letter=i>.

⁴⁶ For practical definition, see NOAA-definition: Flash flood is "a flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through river beds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam." Definition published: <http://www.srh.noaa.gov/mrx/hydro/flooddef.php>.

⁴⁷ Oblack, Rachelle. Torrential rain. Definition: "torrential rain is any amount of rain that is considered especially heavy. There is not a formal definition of torrential rains as recognized by the National Weather Service. The proclamation that rains are *torrential* simply means the amount of rain is abundant, had a fast on-set, or lasts for a long period of time. Hazards associated with torrential rains include flash floods, stream flooding, and landslides." See: http://weather.about.com/od/t/g/torrential_rain.htm

⁴⁸ DL 55253 (14.04.1443), or 1454: Zichy Vol. 9, ch. 337, pp. 461-462.
For the description of types and classification of rains and related (flash-)floods (with morphological consequences), see: Starkel 2000, pp. 55-62; Stankoviansky 2003, pp. 89-107.

⁴⁹ The only exceptions are the uppermost catchment areas of the Dunajec and Poprad rivers in northern Slovakia. These rivers take waters towards the north, to the Vistula (Visła) river in Poland. Another (partial) exception is the upper catchment of the Olt river in southern Transylvania (Romania), which takes the water towards Valachia, even if it also eventually enters the Danube and thus, directly belongs to the Danube catchment.



2. Fig. Potentially flood-endangered areas of the Carpathian Basin before water regulations (overestimated)⁵⁰

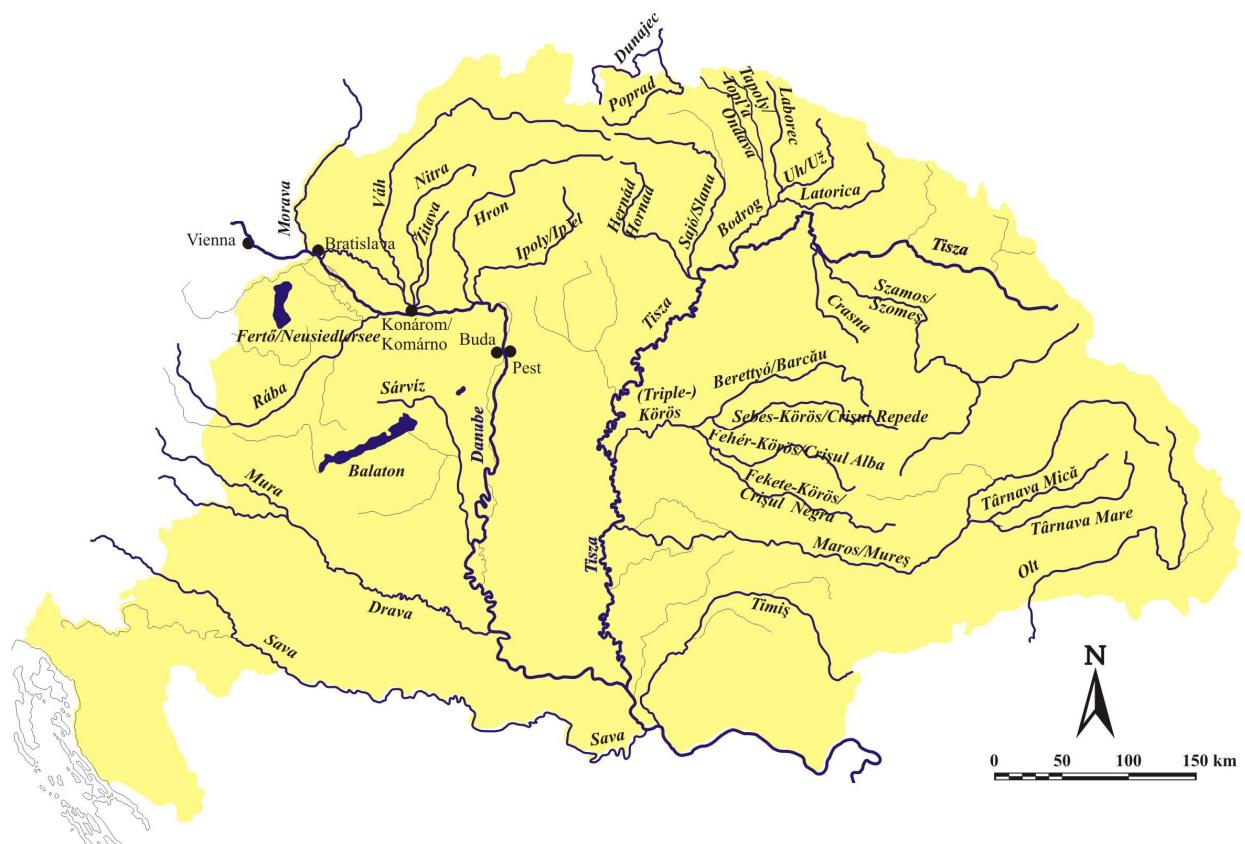
Before the late 19th-century water regulation works, the landscape of the Carpathian Basin, especially in its central parts, seemed rather different since, according to still 'officially-accepted' estimations, around 12-15% of the whole Basin and approximately 20-25% of the areas of present Hungary (thus, most of the low-lying, central parts) were for shorter or longer period of time prone to (the risk of) floods (Fig. 2).⁵¹ Nevertheless, it should be remarked that, according to recent investigations, this map contains exaggerated information based on taxation and water-regulation protocols and documentation, which means that in reality those areas under temporary or constant water cover were (perhaps much) less than what is reconstructed on the map.⁵²

Concerning the distribution of medieval flood events, the two main catchment areas of the Carpathian Basin, namely the Danube and the Tisza catchments play an equally important role and therefore, the general characteristics of the two main rivers as well as their catchments are similarly discussed. Since most of the major tributaries of the two main rivers or their catchment areas were mentioned in flood-related medieval documentation, they are as well discussed separate. For major tributary catchments, mentioned in medieval documentation, see Fig. 3).

⁵⁰ Issued by the Hydrological Institute of the Hungarian Royal Ministry of Agriculture, in 1838.

⁵¹ For the probably most frequently applied handbook-reference, see for example: Frisnyák 1992, p. 8. For a conclusion of geographical research on long-term consequences of water regulation see, for example: Somogyi 2000, 302 p.

⁵² Pinke-Szabó 2010, pp. 194-203; also: http://www.hidrologia.hu/vandorgyules/28/dolgozatok/pinke_zsolt.html.



3. Fig. Main river and river catchments mentioned in medieval flood reports in the Carpathian Basin

Water management practices already had a great impact at the local level by diverting rivers and streams, creating fishponds, mill-canals, building dykes and dams for watermills and for protection in the Middle Ages and in the early modern period.⁵³ Nevertheless, systematic water regulations – affecting several counties and long river sections – were mainly carried out in the 19th century, and in some cases were only completed in the 20th century.⁵⁴ Thus, in several cases present conditions, especially concerning hydrology, are fundamentally different from the situation that prevailed in the Middle Ages or in the 18th century. Hydromorphological processes, for example, could be slower and gradual before the 19th century, and provided the 18th-century picture of the first and second military surveys with an environment in many cases somewhat comparable to the medieval one (there should be, however, also clear differences, so the level of similarity should not be overestimated).

Great flood events in the Carpathian Basin, except for those that developed as a result of snowmelt or ice barriers, are mainly caused by abundant precipitation, related to convective systems. These abundant precipitation cases are mainly associated with (intensified) cyclonic activity on a regional scale, appearing in almost all cases over the Mediterranean. Moreover, most of the extreme precipitation events and connected flood cases in this category are connected to blocking anticyclones.⁵⁵ In the case of great flood events (except for ice floods on the Danube), cyclones moving from west to east play a somewhat marginal role. Usually the weather and precipitation (as well as flood) conditions of the previous periods (couple of seasons) are also responsible for the occurrence of an extreme flood event on a larger, regional scale (e.g. 1970, 1974 and other great floods of the Tisza). These extreme flood events on

⁵³ See, for example: Jankovich 1996, Andrásfalvy 2007, etc.

⁵⁴ For a concise discussion of these systematic regulations see, for example: Ihrig 1973, 398 p.

⁵⁵ Tóth-Gyuró 2006, 7 p; Gyuró-Tóth 2008, pp. 14-18.

major rivers of the Carpathian Basin are often preceded by other, earlier (smaller) flood waves.⁵⁶

2.2.2.1 Main hydrological characteristics of the Danube and the floods

Floods related to the Danube river appear most frequently in the documentary evidence of medieval Hungary. Thus, its characteristics need to be discussed in more detail not merely because of its basic hydrological importance, but also because of its primary importance in flood-related documentary evidence.

What can cause the flood of the Danube in the Carpathian Basin and where does this water mainly come from? The answer seems to be rather easy: generally, the main source of flood-waters (e.g. melted snow, rainwater) is usually the western, alpine catchment, and thus, main source of Danube floods in medieval Hungary can be found in most cases, outside of the Carpathian Basin.

The most typical reasons for floods on the Danube in the Carpathian Basin are as follows:

1. floods mainly caused by prolonged rainfall (late spring, summer), accompanied by snowmelt of the higher alpine areas⁵⁷
2. floods mainly caused by snowmelt (spring), often accompanied by rains⁵⁸
3. ice (jam) floods (winter, early spring) caused by cold winter with a sharp, mild interruption, often with rain and snow-melting in the lower-elevation parts of the catchment.⁵⁹

Historical Danube flood investigations, west of the Carpathian Basin, were carried out for its uppermost, German (Svevian-Bavarian) sections,⁶⁰ while for the Austrian section investigations are available for the medieval times and 16th-century, as well as for the 18th and early 19th centuries.⁶¹

In the floods of the Upper Danube the upper catchment (west of the Carpathian Basin), but especially the floods of the Inn, and partly, other northern alpine rivers, are of great importance. In the western Danube catchment (west of the Carpathian Basin), generally two flood waves develop: spring floods due to snowmelt, which usually appear in several smaller waves, and summer floods which are mainly caused by rainfall. This latter flood wave develops at the upper sections in July, August, and rarely in June or September.⁶² Low water levels prevail in the late summer, autumn and winter time. The Danube's discharge is greatest in June, but in this case floods of the tributaries usually do not coincide with that of the Danube.⁶³

The annual course of the Danube shows, downstream, to the inflow of the Drava river, somewhat similar characteristics in the Carpathian Basin as in its upper, western catchment. Except for the case of ice (jam) floods, spring floods usually produce lower water levels than summer floods. In the Carpathian Basin the summer flood waves coming from the west often change their character, and the larger western floods become less and less threatening in the Carpathian Basin. This is caused by the fact that the Danube west of the Carpathian Basin has its precipitation maximum at a time different from that of the Carpathian Basin tributaries of the Danube. While mainly northwestern air masses cause the floods in the western catchment,

⁵⁶ Bodolainé Jakus 1983, pp. 11-15.

⁵⁷ 1402: Zichy Vol. 5, ch. 256, p. 299; 1402: MGH SS Vol. 9, p. 736 (*Continuatio Claustroneoburgensis V*).

⁵⁸ For example: 1342: AO Vol. 4, ch. 138, pp. 219-223.

⁵⁹ For example: 1412: DF 227795; 1454: DL 44718.

⁶⁰ See, for example: Glaser et al. 2010, pp. 235-256.

⁶¹ For example, Strömmér 2003, 325 p; Rohr 2007 a, 647 p.

⁶² Bogdánfy 1925, p. 11.

⁶³ Pécsi-Sárfalvi 1964, pp. 45-46.

predominantly southwestern air masses cause the summer floods of the Morava, Rába, Váh, Hron and Ipoly rivers (with a relatively small discharge).⁶⁴

Of all flood types, ice floods are the most destructive flood events on the Danube, due to sudden great rise of the water level (and the destructive ice pieces in winter). Up to the mid-20th century, in winter, some kind of ice cover developed over the Danube in Budapest every second year. Firm ice cover (sometimes causing an ice flood) developed during prolonged hard frosts.⁶⁵ Before water regulation works, the occurrence of ice (jam) flood events on the Danube was rather likely during or at the end of a hard winter. Areas with a larger number of islands downstream were always at greatest risk: ice (jam) floods in the early modern or modern period were most frequently reported around Pozsony (Bratislava-Sk), Győr, Komárom (Komarno-Sk), Vác, the Pest-Buda area and Baja.⁶⁶ However, no ice flood can develop on the Danube on its section south of the Drava inflow.⁶⁷

As a result of a great Danube flood or years of higher flood frequency, in large areas of the Danube floodplain water could sometimes remain on the land (of agricultural use) for years.⁶⁸ Such information is quite useful, because it might tell us about an event parallel to some medieval ones roughly in the same areas.⁶⁹ The great Danube flood, especially on the lower sections of the Danube in the Carpathian Basin, north of the Drava inflow may occur if the Carpathian Basin catchment is in flood (with a good chance of a flood in Austria, too).

The areas of the Danube, emphasised in medieval documents due to their flood events, are as follows: Žitný ostrov island area and Bratislava at the northwestern part of the Carpathian Basin (West-Slovakia), the Sárköz (Kalocsa-Bátmonostor) area and the lower-middle and lower sections along the Danube downstream to northern Serbia. Although according to the international classification, the middle section of the Danube means practically the whole Carpathian Basin, in the present investigation, the Hungarian classification is applied for dividing Danube sections in the Carpathian Basin. Thus, the upper section of the river means the Danube between the Devín Gate (where the river enters the Carpathian Basin) up to the Danube Bend, while the southern flood-endangered area (Sárköz and more northerly and southerly sections), documented in medieval sources, belongs to the lower-middle and lower sections of the Danube.

2.2.2.2 Tributaries and key sections of the Danube: the Carpathian Basin catchment

The Danube discharge in the Carpathian Basin mainly arises from the flow of the Danube west of the Basin. There is a 15-fold difference difference between the discharge of the lowest and the highest water levels in the Hungarian sections of the Danube.⁷⁰ However, the

⁶⁴ Bogdánfy 1925, p. 12.

⁶⁵ Pécsi-Sárfalvi 1962, p. 46.

⁶⁶ Probably the most destructive reported ice flood event on the Danube occurred in 1838 (see e.g. the special issue of the journal *Hidrológiai Közlöny* in 1988/1). For earlier ice floods of the Danube, see e.g. Déri 1989, pp. 152-155. Kiss 2007, pp. 271-282. Although the number of ice floods, due to 19th-century regulation works, largely decreased, some rather destructive ice flood events even occurred in the 20th century: for example, a major ice flood of the Danube which damaged the bridge and endangered the town of Baja in 1956. See: Ihrig 1956, pp. 400-418. Szászhelyi 1956, pp. 161-165.

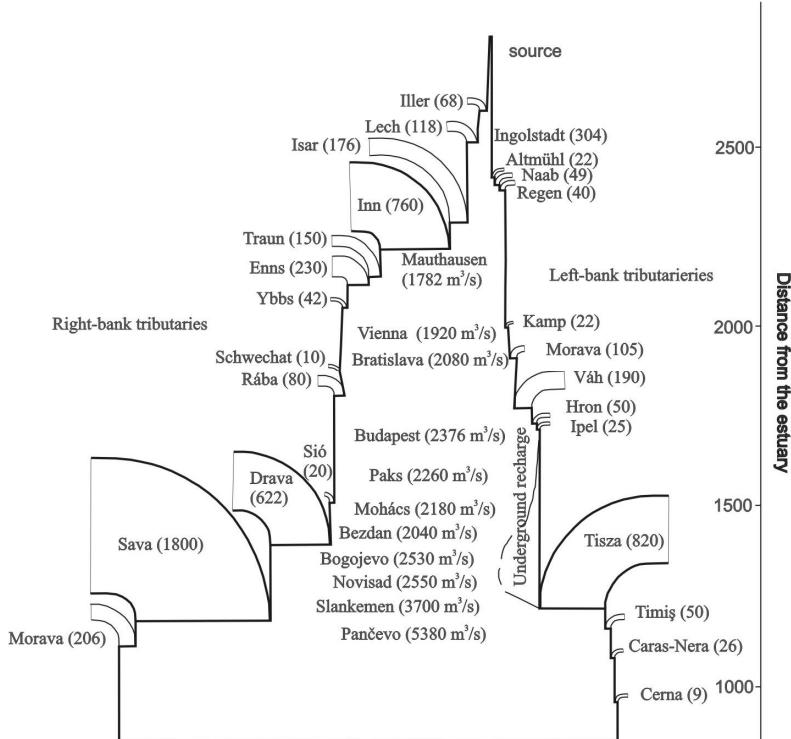
⁶⁷ Bogdánfy 1925, p.12.

⁶⁸ Reported in the noble congregation protocols of Pest-Pilis-Solt county (No. 246: PML IV. 1-c/2. 1712. No. 7), for example, in February 1712, after the unusually great flood event ('*exundatio aquarum*') of the Danube (the largest in 18 years), the water stayed on the agricultural lands for 2-3 years; what is more, reeds started to grow on (former) arable lands. Somewhat similar condition could be reported at the Danube, for example in 1436 (Zichy Vol. 8, ch. 397, pp. 570-571; DL 80573).

⁶⁹ 1344: Bossányi 1916, pp. 82-84.

⁷⁰ Pécsi-Sárfalvi 1962, p. 46.

alpine tributaries play crucial role, not the Danube itself; among these tributaries the Inn has the most importance (see Fig. 4). Between the Inn and the Drava rivers (thus the Austrian section and the majority of the Carpathian Basin), there is no really significant tributary which could mainly influence the water level of the Danube alone. In fact, along its (present-day) Hungarian section there is no great inflow at all.



4. Fig. Annual discharge of the Danube and its tributaries (m^3/s)⁷¹

As we have seen, and also see in Fig. 4, the waters arriving at the Carpathian Basin are mainly dependent on the northern alpine tributaries, and in particular on the water inflow of the Inn river. While the channel width of the Danube is still 175 m at the Isar inflow, the width almost doubles (300 m) after the Inn inflow.⁷² Thus, on the upper Danube section in the Carpathian Basin, it is quite an important question of whether or not the flood on the Danube – mainly coming from the Bavarian and Austrian areas – is strengthened or not by the flood of the Inn river which enters the Danube at Passau.

As we shall see in the later chapters, most of the known medieval flood evidence in the upper Carpathian Basin catchment is associated with the Danube itself, and only in some individual cases the floods of any of the Danube-tributaries appear. Among the main rivers, flowing into the Danube in the Carpathian Basin, the waters of the Morava (in Slovakia and the Czech Republic), the Rába (Raab in Austria), Váh, Hron, Nitra, Žitava in Slovakia, the Drava and Sava in Croatia should be mentioned.

The northwestern tributaries

The Morava river (length: 354 km, catchment: 26,658 km²) is the longest mid-mountainous river flowing into the Danube, collecting the waters of the Bohemian-Moravian Uplands.⁷³ The Váh⁷⁴ is the longest river of Slovakia and has a length of about 378 km length,

⁷¹ Pécsi-Sárfalvi 1962, p. 44; Tockner et al. 2009, p. 65.

⁷² Stančík-Jovanovič 1988, p. 86.

⁷³ Tockner et al. 2009, pp. 86-89. For medieval flood evidence discussed in this work, see for example: 1260: MHG SS Vol. 9, p. 183 (*Annales Otakariani*). For more historical floods, see Brázdiel et al. 2005. For a very

with a catchment area of 19,660 km² (more than one-third of Slovakia). The Váh collects its waters in western-northwestern and partly central Slovakia. The main discharge occurs in March and April due to snowmelt, while low waters occur at the end of the summer, in the autumn and the winter. It has a 'flash flow regime' with a maximum discharge 62 times greater than that of the lowest water levels.⁷⁵ Its most important inflow (at the Váh-Danube) is the Nitra river, which has a length of 160 km.⁷⁶

The Hron is 289 km long, with a catchment area of 5,465 km², displaying characteristics rather similar to that of the Váh river.⁷⁷ Coming from the Lower-Tatra mountains and the Slovak Ore mountains, the river enters the Danube opposite Esztergom, at Šturovo. The upper and middle sections of the Váh and Hron rivers have a strong mountainous character with high discharge rates.⁷⁸ The Žitava river⁷⁹ (99.3 km long, with 1,244 km² catchment) originates from the Lesser-Fatra mountains and flows into the Hron river.

The Rába-Rábca system and Lake Fertő/Neusiedlersee

The Rába (Raab-A)⁸⁰ originates from the eastern part of the Styrian Alps. Its full length is 322 km and catchment area is 10,720 km². In the annual discharge of the Rába river, both on the Austrian and Hungarian sides there is a March, June-July and a weak November maximum discharge.⁸¹ This is basically dependent on snowmelt and precipitation conditions: the precipitation minimum in the catchment occurs in January and February while the maximum rainfall is typical in June and July. The weak secondary maximum in November is the result of increased precipitation in the southern part of the catchment area (in Hungary), and reflects a Mediterranean climatic influence. Though the water deficit does not develop at all in the western catchment, droughts may appear once every 5-10 years on its (present) Hungarian section. In the catchment area, from west to east, a clear decrease in precipitation can be observed in the summer half year.⁸²

Connected to the Rábca (Rabnitz-A) water system, Lake Fertő (Neusiedlersee-A) should also be mentioned due to its medieval flood importance. Being a shallow alkaline steppe lake (average present-day depth: 0.5 m), the originally 320 km² Lake Fertő (today ca. 180 km²), before water regulation works, had extremely variable water levels. Due to its water-level changes and shallowness, together with the extensive wetland area of the Hanság (Wasen-A) and indirectly connected to the Rába-Rábca system, Lake Fertő is an especially good indicator of short and long-term hydrological variabilities and changes.⁸³

The Sió-Sárvíz and the Drava-Mura system

In its Carpathian Basin middle section, apart from the small Sió (earlier: Sárvíz) river,⁸⁴ the Danube has practically no tributary downstream to the Drava inflow. The Sió/Sárvíz is one of the rivers which looks completely different today from that in the Middle Ages.⁸⁵ At present,

interesting, recent survey on the floodplain development of the Morava river over the last thousand years, see: Kadlec et al. 2009, pp. 499-509.

⁷⁴ 1421: DL 98381.

⁷⁵ Tockner et al. 2009, pp. 89-91.

⁷⁶ For a medieval flood-example of the Nitra river, see 1432: DL 12454.

⁷⁷ 1309: CD Vol. 8/1, ch. 151, p. 351.

⁷⁸ Stančík-Jovanovič 1988, p. 108.

⁷⁹ See, for example, 1342: AO Vol. 4, ch. 174, pp. 287-291.

⁸⁰ 1402: DL 49584. 1426: SvO Vol. 2, pp. 105-106

⁸¹ Goda-Vasvári 1997, pp. 518-538.

⁸² Ambrózy 1997, pp. 498-517.

⁸³ See, for example: Károlyi 1966, pp. 170-187; Kiss 1999b, pp. 215-221, Kiss 2001, pp. 61-77, Kiss 2006, pp. 141-152.

⁸⁴ Medieval flood-reference: 1399: Zichy Vol. 5, pp. 105-108; 1410: DL 9622.

⁸⁵ For the medieval reference of this river section, see: Lukács 1952, pp. 255-266. Kiss 2009, pp. 49-63.

the whole river is canalised and its swampy floodplain dried. The waters of the Sárvíz arrive from the Sárrét wetland area (around Székesfehérvár), from Lake Balaton and some smaller waterflows of the southern Transdanubia (e.g. Koppány).

The Drava is one of the most important inflows of the Danube with its 39,082 km² catchment area and 749 km length, originating from South Tirol.⁸⁶ In the annual watercourse, minimum values occur in January-March, while maximum discharge takes place in June-July. A secondary maximum (especially in the southern catchment) occurs mainly in October and November.⁸⁷ While in the eastern foothills of the Alps the greatest discharge may be observed in April, in the high mountain areas of the inner, western catchment this is postponed to July.⁸⁸ Therefore, while the greatest discharge on the Drava river normally develops in June-July, the greatest amount of water flows down on the Mura river in May.⁸⁹ The highest water levels on the Drava river may occur most between April and July. Thus, floods may develop in late spring and summer, but a secondary autumn flood maximum can also occur on the Drava river.⁹⁰ All this information may be of special importance for us, since a flooded piece of land in the immediate vicinity of the Drava river, observed in mid-September in 1342, is probably of summer origin.⁹¹

2.2.2.3 The Tisza floodplain before water regulation works

Before water regulation works, the Tisza floodplain, covering a two-million hectare area, was not flooded in each year. It is, of course, partly due to the fact that floods did not occur in the same way every year. Moreover, floods were not obstructed by dams as they are today and thus, the heights of flood levels (and flood peaks) were much lower than today due to the fact that water could cover its extensive floodplains (this is especially true if we also account with traditional floodplain management issues).⁹² Although today floods can recede more swiftly, before the late 19th century flood waters usually stayed longer in the inundation areas, where shallow open surface of waters were often used as natural or (partly-)managed fishponds and fisheries.⁹³ Without any doubt, the area most affected by flood events was the Upper Tisza, the (lowland) section over Tokaj. A similar problematic area was the floodplain between the Körös and Berettyó rivers, while the middle and lower sections of the Tisza became mainly problematic only after winters with heavy precipitation.⁹⁴

The Tisza, entering its floodplain at Királyháza (Королево-Уа), forced the Túr river to a riverbed parallel to the Tisza, and thus before water regulation works, the Túr flowed into the Szamos. Due to these circumstances, the Szamos-Tisza Interfluve suffered from the floods of two rivers. On the right bank of the Tisza, the floodwaters of the Borsa river prevailed, also supplying the Szernye-swamp with water.⁹⁵ The Kraszna river, flowing today directly into the Tisza, originally first entered the Szamos river. Between the Kraszna and Szamos rivers the extensive wetland area of the Ecsedi-láp could be found. North to the inflow of the Szamos

⁸⁶ For some of the famous historical floods of the Drava river, see: Petrić 2007, pp. 136-147.

⁸⁷ Lovász 1972, p. 67.

⁸⁸ Lovász 1972, p. 100.

⁸⁹ Lovász 1972, p. 127, 142.

⁹⁰ Lovász 1972, pp. 133-138.

⁹¹ Lovász 1972, p. 126. The other event in 1346 occurring before 3 May, might be either a long-term inundation or the result of an April spring flood event. For more information on the hydrological background, see Lovász 1972, p. 144.

⁹² Lászlóffy 1982, p. 177.

⁹³ See, for example: Ortvay 1882, 464 p; Belényes 1953, pp. 148-162; Farkas-Kiss 2008, pp. 62-67. etc.

⁹⁴ Lászlóffy 1982, p. 179.

⁹⁵ Lászlóffy 1982, p. 171.

river, the Tisza during flood events supplied several river-branches which led the surplus waters of the river towards the Szernye and the Latorca (Latorica-Ua) rivers. Since the Latorca approaches the Tisza at Csap (Čop-Ua) for 2 km, and its riverbed is deeper than that of the Tisza, Tisza floods frequently overflowed into the Latorca and flooded the Bodrogköz area, which was criss-crossed by several waterflows, such as the Karcsa, Török- and Füzes brooks. In this part of the Bodrogköz area, therefore, before the late 19th-century water regulation works only small, higher terrains and islands were suitable for grain production. The Tisza was especially slow between the inflows of the Bodrog and Sajó rivers: in this area before water regulation works almost no settlements existed, due to the great flood risk.⁹⁶

The waters leaving the Tisza between Tiszadob and Tiszafüred (left banks) through waterflows and swamps reached the extensive Nagy-Sárrét swamps of the Berettyó river. Before water regulation works, this 45,000 hectar swamp formed one part of the extensive wetlands which were supplied not only by the Tisza but also by the Körös rivers. Wetland areas, with some interruptions, occupied lowland areas of the eastern Great Plain almost up to the mountains. On the right bank of the Tisza, around the Sajó inflow at Tiszafüred, the waterflow of the Kis-Tisza (a large branch of the Tisza river) formed an island which extended to the plain of the Kánya, Laskó and Eger waterflows. Similar wetlands could be found in the area between the Tisza and the lower section of the Zagyva river.

At the Great- or Triple-Körös inflow the wetland area was not extensive, while the section south of the Körös inflow down to the inflow of the Kurca river, in the area where the Tisza and the Kurca ran parallel, was characterised by swampy islands. A great wetland area could be found around the Maros inflow from Hódmezővásárhely down to Szeged, with the Hód Lake at the centre. South of the Maros down to the Senta inflow swampy meadows ran next to the Tisza in a 6-7 km broad area. At its lowest section, from around the Bega inflow, the water level of the Tisza river was already under the direct influence of the Danube where again extensive wetland areas and swamps (e.g. Belo blato/Fehér tó) could be found.⁹⁷

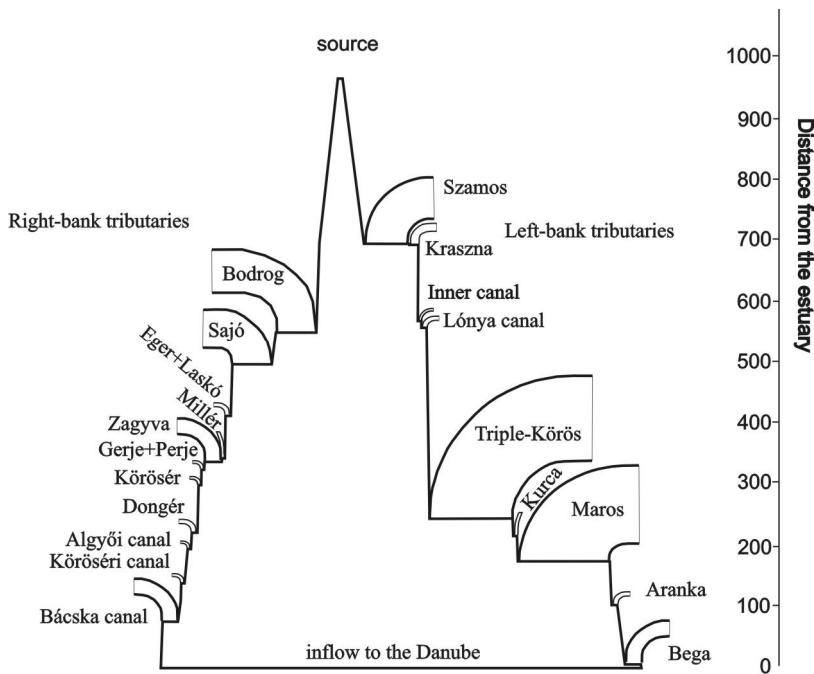
2.2.2.4 Main hydrological characteristics of the Tisza river and its main tributaries

The Tisza, with its 157,200 km² catchment, is a waterflow with more continental characteristics than those of the Danube.⁹⁸ The Tisza in the Carpathian Basin is divided into three main sections: the Upper-Tisza with mountain characteristics, the Middle-Tisza collecting most of the main rivers coming from Transylvania. The Lower-Tisza means the river section between the Maros-inflow and the Danube (see *Fig. 5*).

⁹⁶ Lászlóffy 1982, p. 174.

⁹⁷ Lászlóffy 1982, pp. 174-177.

⁹⁸ For some of the famous historical (early modern, modern) Tisza floods, see: P. Károlyi 1970, pp. 150-152, 191-192.



5. Fig. The Tisza river and its tributaries⁹⁹

The Tisza is a typical flatland river; up to the regulation works of the late 19th century it frequently changed its riverbed within its almost 2 million-hectar floodplain or inundation area. Consequently, it is a very slow river which, except for its uppermost, mountain-influenced section (source), has a meandering character, often surrounded by oxbows and temporary or constant wetland areas.

Two main flood waves appear on the Tisza: one is in early spring mainly originating from snowmelt in the Carpathians and Transylvania. The other, greater one is caused by rainfall occurring in early summer.¹⁰⁰ Due to its hydromorphological and geographic conditions, the occurrence of an ice (jam) flood is relatively unlikely on the Tisza river.¹⁰¹

Although the spring floods of the main Tisza tributaries occur roughly at the same time, these flood waves usually arrive at different Tisza-sections one after the other, and do not coincide with each other. Nevertheless, other problems can occur due to the fact that the spring flood of the Danube often arrives at its lower sections around the same time as that of the Tisza. Thus, the flood water of the Tisza cannot discharge properly into the Danube, and this influence can be followed on the Tisza up to Szeged or even beyond.¹⁰²

The richest water supply of the Tisza is typical in spring months with snowmelt and rainfall. On the lowland areas, most precipitation in the year falls in June and the least in January-February, but the October precipitation (secondary maximum) is usually only 20% less than in June. This Mediterranean influence (autumn) is almost entirely absent in Transylvania, but rather strong in autumn and winter in the higher mountains with a western, southwestern exposure in the Upper Tisza catchment.¹⁰³ While sudden, destructive flood events caused by rainfall are usually more concentrated in smaller areas, winter or early spring flood events caused by rapid snowmelt can be more threatening due to the fact that usually it occurs in the entire Transylvanian catchment at once.¹⁰⁴

⁹⁹ After Lászlóffy 1982, p. 46.

¹⁰⁰ Pécsi-Sárfalvi 1962, pp. 47-48.

¹⁰¹ Lászlóffy 1982, p. 105.

¹⁰² Pécsi-Sárfalvi 1962, p. 48.

¹⁰³ Lászlóffy 1982, pp. 59, 62, 102.

¹⁰⁴ Lászlóffy 1982, p. 65.

The early summer flood arrives earlier on the Tisza than on the Danube, and causes the greatest inundations at the upper sections; flood levels usually decrease towards the south. At the Upper-Tisza a secondary, autumn (and winter) precipitation maximum can also be seen, which might cause a third flood wave there. Since most of the Tisza-related known medieval flood events occurred at the upper and upper middle (lowland) sections of the Tisza and its catchment, the extreme regime of the river is of great importance: while at Szolnok (the middle section) the river transports 53 times more water in a flood event than at low water-level conditions, flood water discharge is 87 times more than at low water-level conditions at the Vásárosnamény (upper) section.¹⁰⁵

Although the flood of the Tisza river appears in medieval documents fewer in number than that of the Danube, it is still clearly the second most frequently referred-to river in flood-related medieval evidence. Moreover, together with its catchment area, more medieval floods are known from the Tisza-system than that of the Danube. This may be due to at least three reasons. On the one hand the Tisza and its catchment was usually ignored by western narratives in which only the flood of the Danube or just 'rivers or waters of Hungary' appear in general. On the other hand, the central and southern parts of the Great Hungarian Plain east of the Danube is in general very underrepresented concerning medieval source medieval, while most of the Tisza-related flood events were reported at the upper and upper-central catchment of the river, whose area (especially Szatmár, Szabolcs, Bereg counties) is otherwise the richest in available medieval source evidence. The Tisza catchment, eventually leading the waters to the Danube, is around twice the size of that of the Danube in the Carpathian Basin.

In the Tisza-system, spring (March-April) is the most important flood season in general. While in most of the Tisza catchment due to snowmelt March is already a flood-month, in the Upper-Tisza catchment where snowmelt occurs later in the mountains, most of the floods take place in April,¹⁰⁶ or sometimes even in May (e.g. the Tisza at Tiszabecs). Nevertheless, the greatest amount of precipitation occurs in summer.¹⁰⁷ At the upper part of the Middle-Tisza section March flood-maxima are also very frequent, due to the fact that the Szamos-Bodrog catchments are predominantly at lower elevation terrains and snowmelt mainly occurs in March. Examining the entire Tisza catchment, we see that the areas located above 1600 m only comprise 1%, while lowland areas under 200 m sea level cover 46% of the whole catchment area.¹⁰⁸

In the case of larger river-catchments meltwaters merge later and thus, the floodwaters may peak in April (e.g. the middle sections at Szolnok and Szeged).¹⁰⁹ Apart from April, in the area under Szolnok (middle and lower sections), May floods may also be significant because here the Tisza is very slow and flood waves often reach each other. This may result in a significant prolongation of the flood event. Compared to their extensive catchment areas, relatively little amount of water is transported by the Zagyva, Kraszna and Körös rivers.

At the Upper Tisza and the Körös rivers there is a typical late autumn flood event which reaches its maximum in November-December. This late autumn flood, however, has little

¹⁰⁵ Pécsi-Sárfalvi 1962, p. 49.

¹⁰⁶ Lászlóffy 1982, p. 104.

¹⁰⁷ Hajósy 1954, pp. 20-21.

¹⁰⁸ Lászlóffy 1982, pp. 47-50.

¹⁰⁹ Lászlóffy 1982, p. 102. The main flood events over the last century or so mainly occurred in April (e.g. 1877, 1881, 1888, 1889, 1895, 1915, 1919, 1924, 1932, 1940, 1962, 1964), and sometimes began in March (e.g. 1876, 1879, 1912, 1941, 1942, 1967), and very rarely earlier (e.g. 1966, 1977, 1979). Nevertheless, apart from the fact that May is usually included if a flood started in March or April, it is not unusual that a flood level remains even for months afterwards (with only a gradual decrease: e.g. 1876, 1877, 1879). Sometimes there is a second increase in the flood level from early June (e.g. 1876, 1877, 1912, 1940). Really exceptional cases are when a mid-, late summer flood level prevails compared to the spring one (e.g. 1913, 1933, 1965, 1970, 1974 – in this latter case there was no spring flood, 1980). For more details, see: Vágás 1982, 283 p.

influence on the Tisza sections under Tokaj (Middle-Tisza). As for the present study it is important because, similar to the Upper Tisza area, a high water level in January can also appear relatively frequently along this section. The very rare February floods are usually related more to the early start of spring snowmelt. At the Upper Tisza, the June-July summer floods may occur quite often. This flood wave usually does not cause a flood at the middle section, but June-July flood waves may appear as well under Csongrád, around the Körös and Maros inflows. Even if at the Upper Tisza and around the Körös inflow some high water levels were also seen in the period between August and October, this period is usually characterised by low water levels.¹¹⁰

The Upper Tisza and the Szamos-Crasna catchment

The catchment area of the Upper-Tisza, over the Szamos inflow, is the richest in annual precipitation in the whole Tisza catchment, in a rather extensive area. In half of the upper catchment the sum of annual precipitation is over 1000 mm, with a summer maximum and a secondary maximum in October.¹¹¹ Still, winter is relatively rich in precipitation. In this respect, the northern parts of the Maramureş Basin has special importance, where winter months are relatively rich while summer ones relatively poor in precipitation, and autumn secondary maximum is rather pronounced. Thus, the Borsova and Túr rivers transport a significant amount of water, the difference between summer and winter is relatively little, although summer appears with the highest rates of discharge. Following prevailing precipitation conditions, the October and partly November a secondary maximum is rather pronounced.¹¹²

The Szamos (Someş-Ro) river partly originates in the Munții Rodnei and partly in the Munții Apușeni, whose two rivers combine at Dej in Transylvania. The Szamos (catchment: 15,217 km²), among others, collects the waters of the Crasna and the Almaș rivers.¹¹³ As for the main reasons and timing of flood events, 40% of all precipitation falls in summer, and the winter is dry and thus, the Szamos catchment has a catchment of a more continental character than that of the Upper Tisza.¹¹⁴ The early spring (from snowmelt) and (late spring)-early summer flood waves of the Szamos usually appear at the same time as those of the Tisza, but usually no autumn flood wave develops in the drier catchment of the Szamos river. While the floods of the Szamos, caused by prolonged rainfall, arrive 1-2 days later than that of the Tisza, the Szamos-floods caused by snowmelt arrive earlier. Summer floods are usually more severe and swifter.¹¹⁵

The annual course of the Crasna river (catchment: 3,142 km²) looks rather similar to that of the Szamos. Nevertheless, its catchment area is drier, especially in summer, and its average discharge (3 m³/s) is somewhat marginal compared to that of the Szamos (120 m³/s). Similarly to the Szamos, the Crasna has a flood discharge almost 20 times larger than the average discharge. Up to the end of the last century the Crasna was a tributary of the Szamos river. Unlike the Szamos with its large Transylvanian catchment, the Crasna river has a narrow catchment, but – apart from the summer flood period – autumn floods can be also detected

¹¹⁰ Lászlóffy 1982, p. 105.

¹¹¹ Hajós 1954, p. 21. For floods developed during the (secondary,) autumn maximum in the whole upper Tisza catchment and even beyond, see: the special issue of *Vízügyi Közlemények*, Vol. 1: 1998. Szlávák 2003, 216 p.

¹¹² Hajós 1954, p. 21. Konecsny 1999, pp. 314-315.

¹¹³ For medieval flood of the Szamos and Almás, see: 1496: DL 65441. (for more evidence on Szamos floods, see, e.g. 1325: DL 96117).

¹¹⁴ Lászlóffy 1982, p. 57.

¹¹⁵ Andó 2002, pp. 37, 63.

there.¹¹⁶ Before water regulation works, the waters of the Crasna, and the floods of the Szamos river also supplied the swamps and wetland area of the Ecsedi-láp.¹¹⁷

Bodrog-Sajó catchment

Collecting waters of the northeastern Carpathians, with its 13,579 km² catchment area, the Bodrog is one of the most important tributaries of the Upper Tisza. The Bodrog is a fusion of five rivers, flowing into the Tisza at Tokaj, displaying the same meandering flatland characteristics with extensive wetlands as the Tisza in most of its sections.¹¹⁸ Among the right-bank tributaries, the Bodrog has the most extensive catchment area and transports the largest amount of water to the Tisza. From the viewpoint of medieval charters, the floodplain area of the Bodrogköz (located between the Bodrog and the Upper-Tisza, criss-crossed by waterflows, branches) is of special importance.¹¹⁹ Floods of the landed possessions of settlements, like the 1381 flood event at Cigánd (partly located on higher terrains) in this area were clearly related to the floods of the Tisza and the Bodrog rivers.¹²⁰

The most important tributaries of the Bodrog river are the Ronyva, Tapol (Topl'a-Sk), Ondava, Laborc (Laborec-Sk), Ung (Uh-Sk, Už-Ua) and the Latorca (Latorica-Ua), of which only in the catchment areas of the Latorca, Ung and the Tapol can one find mountain areas higher than 1000 m. These mountain areas frequently obstruct the flow of air masses coming from the southwest and thus, especially the areas in the Latorica and Už catchments are rich in precipitation. In these areas, even if the precipitation maximum is still in the summer, there is rather high amount of precipitation in autumn and winter. In general, the annual distribution of precipitation in the Bodrog catchment is practically the same as in the Upper-Tisza catchment.¹²¹

Another important tributary of the Tisza, also mentioned in medieval flood-charters, is the Sajó (Slaná-Sk) river, which originates from the Szepes-Gömöri-érchegység (Slovenské Rudohorie-Sk). The other important inflow is the Hernád (Hornád-Sk), originates from the Lower Tatras (Nízke Tatry-Sk) mountains, and leads the water of the Spiš Basin towards the Sajó river. Some parts of the catchment, such as the area of the Laborc and Ondava rivers as well as the Spiš Basin, are drier: in these valleys both autumn and summer months are drier. Compared to other tributaries of the Tisza, the catchment of the Sajó river is relatively poor in precipitation; this is especially true for the autumn and winter months, and thus, autumn secondary maximum is not typical.¹²²

The Körös catchment and its waterworld

In between the Bodrog and Körös inflows, as a right-bank tributary, the Zagyva river arrives in the middle section of the Tisza. Nevertheless, no medieval floods related to the catchment area of this small river are known, and its importance as a water source for the Tisza is relatively marginal (see Fig. 5).

¹¹⁶ Hajós 1954, pp. 22-23; Andó 1999, p. 45. For more information, see also: Lászlóffy 1982, p. 31. Pécsi-Sárfalvi 1962, p. 50. Andó 2002, p. 62. For medieval flood(s) see, for example, 1417: DL 96927.

¹¹⁷ The depression and the wetland area of the Ecsedi-láp developed in the last glaciation period, along the Crasna river (Konecsny 1999, p. 318). This wetland area, also surrounding the high-medieval fortress of Sárvár, was already referred in the *Gesta Hungarorum* (late 12th century), together with clear additional reference on early human impact around the time when the earthworks of the fortress were made. See: SRH Vol. 1, p. 63.

¹¹⁸ Pécsi-Sárfalvi 1962, p. 49.

¹¹⁹ Up to the 1830s no significant regulation or drainage works took place here, and floods of the two rivers primarily influenced (and still influence) the area. See: Dóka 1997, 345 p.

¹²⁰ For medieval evidence, see: DL 96560.

¹²¹ Lászlóffy 1982, p. 58. Hajós 1954, pp. 23-24.

¹²² Lászlóffy 1982, p. 34. Hajós 1954, pp. 23-25. For the flood in the catchment of the Rima river, tributary of Sajó see, for example, 1341: DH Vol. 1, pp. 160-171. For a Sajó flood in 1342: DL 75835.

Apart from the Szamos and the Maros rivers, the most important left-bank tributary of the Tisza is the Körös. The Körös (Criş-Ro) catchment covers a 27,537 km² area in western Transylvania as well as the Great Plain. The combined, lowest section of the Körös river collects the waters of the Berettyó (Barcău-Ro) and the Triple-Körös (Hármás-Körös). The Tiple-Körös is the fusion of the Sebes- (Crişul Repede-Ro), Fehér- (Crişul Alb-Ro) and Fekete-Körös (Crişul Negru-Ro) rivers, which originate in the Munții Apuseni.¹²³

Usually June is the month richest in precipitation in the Körös catchment.¹²⁴ Floods usually develop as a result of direct precipitation (rainfall), or sudden snowmelt.¹²⁵ There are no areas with summer snowcover in the catchment which could provide any additional summer water-supply to the three Körös and the Berettyó rivers and thus, summer water-level conditions are entirely dependent on rainfall. Flood-downflow can be very rapid, since after the beginning of the rainfall or snowmelt, the floodwave may arrive within 24-60 hours in the lowland areas (present eastern Hungary). Sudden (flash-)floods are rather frequently occur on the Körös rivers, and low water levels and drought events are also rather frequent: the river displays clear signs of continental characteristics.

In general, the rivers (Sebes-Körös, Fehér-Körös, Fekete-Körös and the Berettyó)¹²⁶ have strong influence on each-other's water level in the area of inflow. The effect of the Tisza floods or high water levels can be detected on the water level of the Sebes- and Kettős-Körös (Fehér- and Fekete-Körös), more than 90 km from the point where the Körös flows into the Tisza river. It does influence not only the hydrological conditions of the Triple-Körös but also those of the Hortobágy and Berettyó rivers.¹²⁷

Due to the available two medieval flood and one probably inland excess water records, but especially because of the visible scarcity of any medieval flood evidence, the past hydrological conditions of the extensive lowland catchment area of the Körös river(s), need to be discussed in more detail. 19th-century and earlier landscapes of the area fundamentally differ from our present day picture. Before water regulation works, the Körösköz (area between the Körös rivers) area was criss-crossed by smaller and larger waterflows of the three Körös and the Berettyó rivers, and the extensive wetlands of the Nagysár (Kis- and Nagy-Sárrét) area. The extensive wetlands were supplied by the waters of the Sebes-Körös and Berettyó, connected to several other, smaller wetlands, wet meadows, small lakes, and were often used as fishponds in the Middle Ages and afterwards.¹²⁸ More important periodic waterflows were the Ér and the Hortobágy, being dry in late summer and autumn.

Interestingly enough, this 'Körös waterworld', although seemingly not particularly underrepresented (at least around settlements) in medieval charter materials in general – at least concerning the number of charters per settlement – with a descriptive character, provides us with very few flood records. This fact can only partly be explained by the possible destruction in the Ottoman period or in some other periods. More likely reasons are the presence of semi-nomadic Cuman population from the mid-13th century onwards, and the scarce (and to some extent instabile) medieval (and early modern, modern) settlement system, combined with low population density in the area, partly due to the presence of extensive wetlands. Beside the two extensive wetlands (Sárrét), there were several smaller wetlands, lakes and branches of waterflows, often accompanied by various forms of water management frequently appeared.

¹²³ Lászlóffy 1982, p. 40.

¹²⁴ Hajós 1954, p. 26.

¹²⁵ Lászlóffy 1982, p. 37.

¹²⁶ For a medieval flood of the Fehér-Körös, see 1495: DL 37693. For medieval floods and (wetland) landscape conditions of the Körös-Berettyó area see, 1466: Hahn 1870, pp. 92-94. For a medieval Berettyó flood, see 1338: DL 62697.

¹²⁷ Andó 2002, p. 86.

¹²⁸ See, for example, Andó 2002, p. 78; Jankovich 1996, pp. 305-349; for a flood-charter concerning the area see, for example, 1466: Hahn 1870, pp. 92-94.

For example, in one of the medieval flood-affected areas, Dévaványa was also surrounded by several small lakes, often mentioned as fishing places in medieval documents.¹²⁹

The Maros, Timiș and Bega river catchments

The Maros is one of the most important affluents of the Tisza. The Maros river, with its extensive catchment area of 30,332 km², originates from in the mountains of the eastern Carpathians. The river then collects most of the waters in the Transylvanian Basin (where the summer is rainier than in the Great Hungarian Plain),¹³⁰ the Muntii Giurgeului, the southern part of the Muntii Apuseni, and then continues through the lowland areas of the Great Plain when finally arrives at the Tisza river in Szeged.

The main wet period in its catchment area is May-August, whereas the late autumn and winter months are the poorest in precipitation, except for its western mountain catchment where, west of Deva, an autumn secondary maximum appears. The river has two main flood periods, namely spring and summer, and the flood of the Maros also has an influence on the water levels at the lower sections of the Tisza river. On the lower Tisza (below the Maros inflow) spring floods are more pronounced, while summer floods – due to the fact that Maros-floods recede earlier than that of the Tisza – tail off.¹³¹

The most important tributary of the Maros (Mureş-Ro) is the Küküllő (Târnava-Ro) and the two main rivers, namely the Kis- (Târnava Mica-Ro)¹³² and Nagy-Küküllő (Târnava Mare-Ro) which merge at Balázsfalva (Blaj-Ro).¹³³ With its high-elevation catchment area in the southern Carpathians, another important tributary is the Sebes (Sebeş-Ro) river.¹³⁴ Two flood waves, one in spring and another in early summer, appear on the Maros, while an autumn flood wave is entirely absent. A flood usually recedes by rather swiftly, say within 10-15 days.¹³⁵

Both the Temes (Timiș-Ro) and Bega (Begej-Srb) rivers are originated in the mountain areas of the southern Carpathians, but most of their catchment area is situated at the lowlands. For both rivers the amount of water transported varies significantly, often with extremes.¹³⁶ From our present viewpoint, the lower, lowland catchment of the two rivers and their tributaries (e.g. tributaries of the Berzava) are of the greatest importance, where an early 15th-century flood or inundation event was reported.¹³⁷

2.2.2.5 Inland excess waters

In the Carpathian Basin, but especially in its central parts, other sources of temporary water-cover can cause problems: inland excess waters. As we saw earlier, by definition it is a kind of temporary lake, receiving its water supply either from precipitation (rain or snowmelt) or ground water. Inland excess water definitely cannot receive its supply from floodwater. While in years drier than average this form of water-cover appears much less in quantity, in wet years not only flood water, transported by rivers, but also the ground water-table rise or precipitation, falling on the surface, may and might cause long-lasting inundations. This problem can be examined before and after the water regulation works, and extended to large

¹²⁹ Dóka 1997, pp. 16-20; Jankovich 1996, pp. 305-349.

¹³⁰ Hajós 1954, pp. 26-28.

¹³¹ Hamar-Sárkány-Kiss 1995, p. 21.

¹³² For the flood of the Kis-Küküllő, reported in October 1348, see DL 30383.

¹³³ See, for example, the flood event of the Nagy-Küküllő river in the area of Balázsfalva, reported in November 1416: DL 30773.

¹³⁴ Lászlóffy 1982, p. 42.

¹³⁵ Andó 2002, p. 94.

¹³⁶ Lászlóffy 1982, p. 58.

¹³⁷ 1409: TO Vol. 1, p. 420.

areas in the Carpathian Basin. The areas most in danger of inland excess waters are the Danube floodplain(s), including the northern island area of the Žitný ostrov, the floodplain(s) of the Tisza and its whole lower catchment.

Inland excess waters became a real headache after the water regulation works when former low-lying inundation areas, frequently applied as pastures, started to be used for constant, intensive agricultural production (e.g. arable lands). Real problems occurred, for example, after the dry decades of the 1980s and 1990s (after the great flood year of 1998) in 1999 and 2000 when floods (again) occurred on the Great Hungarian Plain and inland excess waters also covered large areas.¹³⁸

Well-known cases, however, were documented, in the 18th century as well. The danger caused by inland excess waters was a topic of discussion, for example, at the noble congregation of Pest-Pilis-Solt county in April 1737 concerning the Baja-Kiskunhalas-Kalocsa area along the Danube,¹³⁹ when rainfall was sufficient for having mud everywhere in the Solt district. In these areas dams were built to assist travel and accessible roads the whole year round.¹⁴⁰ Same was the case in many areas in the low-lying parts of the Great Plain. In most cases these areas, occupied by inland excess waters mainly of rainwater origin, were used as pastures in the 18th-19th centuries, and probably also before,¹⁴¹ in other low-lying areas of the Great Plain often with extreme alkaline soils.¹⁴² In many cases inland excess waters were the second source of inundation after river flood events, and they accompanied each other.¹⁴³ The inland excess water high-risk areas, used as pastures in traditional agriculture, were usually left in whole, and land divisions were only made in prolonged dry periods.¹⁴⁴

Inland excess waters might also appear in medieval charters in those cases when a 'flood of waters' is reported.¹⁴⁵ Compared to floods, it is typical for inland excess waters that their inundation lasts for long time.¹⁴⁶ In fact, often the groundwater-table increased the effects (size of area under water) of a (river) flood event, and prolonged the length of the inundation. Nevertheless, the existence and active maintenance of possible channels, canals, ditches etc. would significantly decrease the danger of any prolonged inundations of inland excess waters.

¹³⁸ See, for example: Pálfa 2004, pp. 37-84. In the past century or so, great amounts of inland excess water caused significant damage to agriculture, for example, in 1871-1872, 1879, 1881, 1915-1917, 1919-1920, 1922, 1925-1296, 1932, 1940-1942, 1953, 1956-1957, 1963-1967, 1969, 1977, 1980 etc. The last waterlogging cases occurred in 1998-2000, 2006 and 2010-2011 (greatest of the last 50 years or so).

¹³⁹ See, for example, the county congregation protocol Pest-Pilis-Solt county (in Pest) on 6 April 1737 (No. 4735, Vol., pp. 135-141): there were concerns that inland excess waters might break in from the direction of Baja towards the road of *oppidum* (Kiskun)Halas. Thus, in this case a possible general, and thus usual problem is mentioned, which might have occurred rather frequently. Actually, it is mentioned right after raising the potential destruction that could be caused by Danube flood events. Continuous inundations of the Danube are mentioned in mid-February (No. 4624, Vol. 17, p. 17).

¹⁴⁰ County congregation protocols: Pest-Pilis-Solt county on 17-18 October in 1737 (No. 4884, XVII. pp. 299-303).

¹⁴¹ See, for example: Szenti 1983, p. 287.

¹⁴² See, for example, Bodrogközy 1980, p. 43.

¹⁴³ For example, Bodó 1975, p. 8; Dóka 1997, 345 p.

¹⁴⁴ This is not only true of the Great Hungarian Plain, but also in more western, inundation-endangered areas: (e.g. at Lake Fertő/Neusiedlersee). For example, after the dry period of the 1710s and 1720s, in the late 1720s a series of perambulation processes (in many cases depicted on maps) began. See, for example, in the secondary basin or inundation area of Lake Fertő: Kiss 2005a, pp. 39-49.

¹⁴⁵ A recent example when floods and inland excess waters occurred in the same time is 2006. In this year a great inland excess water inundation event happened in February, and a great Danube (and Tisza) flood event took place in April. Out of the six interactive satellite image of the areas, those most affected by the 2006 floods, three were regions best documented for medieval flood events: <http://nimbus.elte.hu/kutatas/sat/cs/2006/floods2006.html#>

2.2.2.6 A conclusion of general characteristics: prevailing flood (and inland excess water) occurrences and their chief causes

1. Winter floods

Main reasons: snowmelt; combined by rainfall, sometimes the accumulation of ice.

Danube: it is mainly associated with an ice (jam) flood and the arrival of western air masses, makes it less likely that there will be a 'normal' flood. It presumes preceding hard winter conditions with or without (better with) a firm amount of snow. Mild western air masses are often accompanied with heavy rainfall.

Winter floods were typical of the Upper-Tisza catchment and that of the upper middle section: predominantly caused by warm wet air masses coming from the south, southwest – from the Mediterranean.

2. Spring floods

Main reasons: snowmelt, rainfall, sometimes the accumulation of ice.

Ice (jam) flood may also occur after hard winter conditions. Ice floods were typical for the Danube, less likely to occur on the Tisza.

3. Summer floods

Main reasons: rainfall (snow/icemelt).

In the Danube catchment it may be partly due to snow and icemelt in the higher parts of the Alps: this is typical only for the Danube catchment, while in the Tisza catchment it is only and exclusively related to rainfall (due to the lower elevation of the catchment).

Western-northwestern winds carry air masses rich in precipitation; both in the Danube and Tisza catchments.

4. Autumn floods

Main reason: rainfall.

Mediterranean influence: southern, southwestern air masses carrying humid air, especially in October. A typical area of autumn floods is, for example, the Upper-Tisza catchment. This flood course is entirely absent on the Danube and in the Transylvanian catchment of the Tisza, except for its southwesternmost parts.

2.3 Medieval environment and its changes: the human and physical background

In the study of floods (with special emphasis on frequency, magnitude, flux and consequences) and long-term water-level changes the variability and change of climate is the most important driving force. However, while discussing the floods and long-term water-level changes observed and/or reconstructed in the Carpathian Basin, it is also important to study the environmental background and changes, especially those caused by human impact, occurred throughout the study period. It is due to the fact that human-induced landscape and environmental changes influenced water regimes and thus, it had to have effects on both the long-term water-level changes and the main flood characteristics (e.g. magnitude, consequence etc), too.

These physical changes cannot be studied without understanding the human environment and human impact behind. To the better understanding of the broader circumstances and the environmental background of flood events, in this chapter a short overview is provided about the human-processes taking place in the environment in the Carpathian Basin through the 11th-15th centuries. Thus, in the course of discussion, a special emphasis is given to human issues and the possible rate of human impact on the physical environment.

2.3.1 Demography and the changes of settlement system in medieval Hungary

2.3.1.1 Population growth and density as factors for landscape and environmental change

Growth of population: an overall picture with no major interruptions?

In high medieval Europe, demographic pressure was one of the most important factors resulting the expansion of lands under more intensive human impact (e.g. forest clearance, wetland reclamation).¹⁴⁷ Concerning population density, the medieval Hungarian kingdom was, without any doubt, not amongst the highly populated areas. Nevertheless, except for some episodic 'breaks', its population was almost continuously growing throughout the high and late Middle Ages – which was clearly not the case in large parts of (West-)Central and Western Europe where a clear and sharp decline occurred in the 14th century.

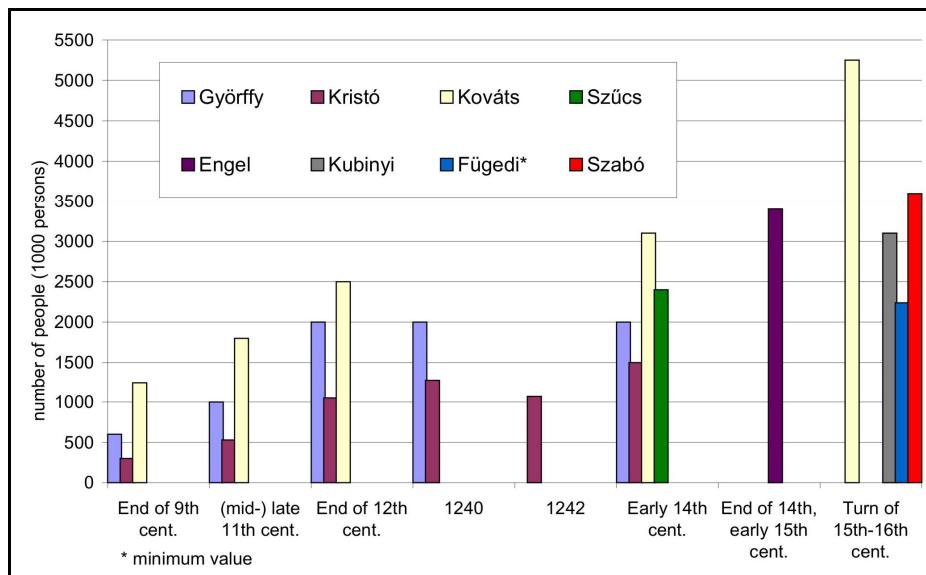
Although there are differences in estimations, as shown on Fig. 6, in the 10th and 11th centuries around half or one million people lived in the inhabited parts of the Carpathian Basin. Territorial expansion of population towards mountain areas was detected latest from the late 12th-early 13th centuries, and in parallel the number of people presumably reached 1-1.5 million (or perhaps two millions) by the mid-13th century.

The great Mongol invasion in 1241-1242 might cause a 10-20% decrease in population,¹⁴⁸ but the spatial distribution of population loss was quite uneven. While it was almost undetectable in the western and northern parts of the country, it caused great devastation in the majority of the Great Hungarian Plain, and also in Transylvania. In some areas population decrease, caused by this short but severe invasion, had direct consequences on landscape change. For example, in the sandy area of the Danube-Tisza Interfluve (Great Plain),

¹⁴⁷ For example, in the neighbouring Austria, forest clearance is said to be taken place due to an increased need for food (need for new territories for food production), caused by rapid population growth. See: Zöllner 1998, pp. 74-78.

¹⁴⁸ For recent collection of studies and sources of the first or great Mongol invasion, see: Nagy 2003, 638 p.

formerly with predominantly settled crop-producing population, were re-inhabited by Cumans, which meant a revival of semi-nomadic grazing practices of a non-settled population.



6. Fig. Population of medieval Hungary (with Slavonia): some estimates¹⁴⁹

Although recent investigations suggest larger numbers for the late Middle Ages,¹⁵⁰ it is clear that a slow growth of population can be detected in the 14th and 15th centuries from 1.5-2 million up to 3.5-4 million people by the end of the 15th century. In the mid-15th century a period of stagnation was also detected. A somewhat more intensive growth of population occurred in the 14th century, while (according to present estimations) a slower rise can be detected in the 15th century (see Fig. 6).

The mid-13th-century devastation and population decrease (estimated to 15-20% minimum loss of population),¹⁵¹ which was severe in some of the areas, acted as a catalyst of socio-economic development in the whole of Hungary in general. This is true, even if most areas of the country were probably not severely affected by the Mongol invasion itself. Similar to other parts of Europe, the Black Death also appeared in Hungary, but it did not really cause detectable decrease of population.¹⁵² Thus, in late medieval Hungary, compared to the high medieval period, population pressure was clearly not less but even more.

Population density and its main territorial differences

According to all known estimations, the population density of Hungary in the 11th-13th centuries, even if with a slow growth, was well under 5 persons/km² in the inhabited areas.

¹⁴⁹ Based on the most well-known, still relatively recent, estimations: Györffy 1963, p. 48; Györffy 1997, p. 32; Kristó 1997, p. 62; Szabó 1963, p. 97; Kubinyi 1997, p. 106; Engel 1997, p. 116; Fügedi 1992, p. 41; Szűcs 1993, p. 167. Kristó et al. 1994, pp. 684-685 (Zoltán Kováts). Yet in manuscript form, a detailed comparison and critics over their methods are available in: Vajda (2011), 235 p.

¹⁵⁰ See, for example Neumann 2003, pp. 849-884.

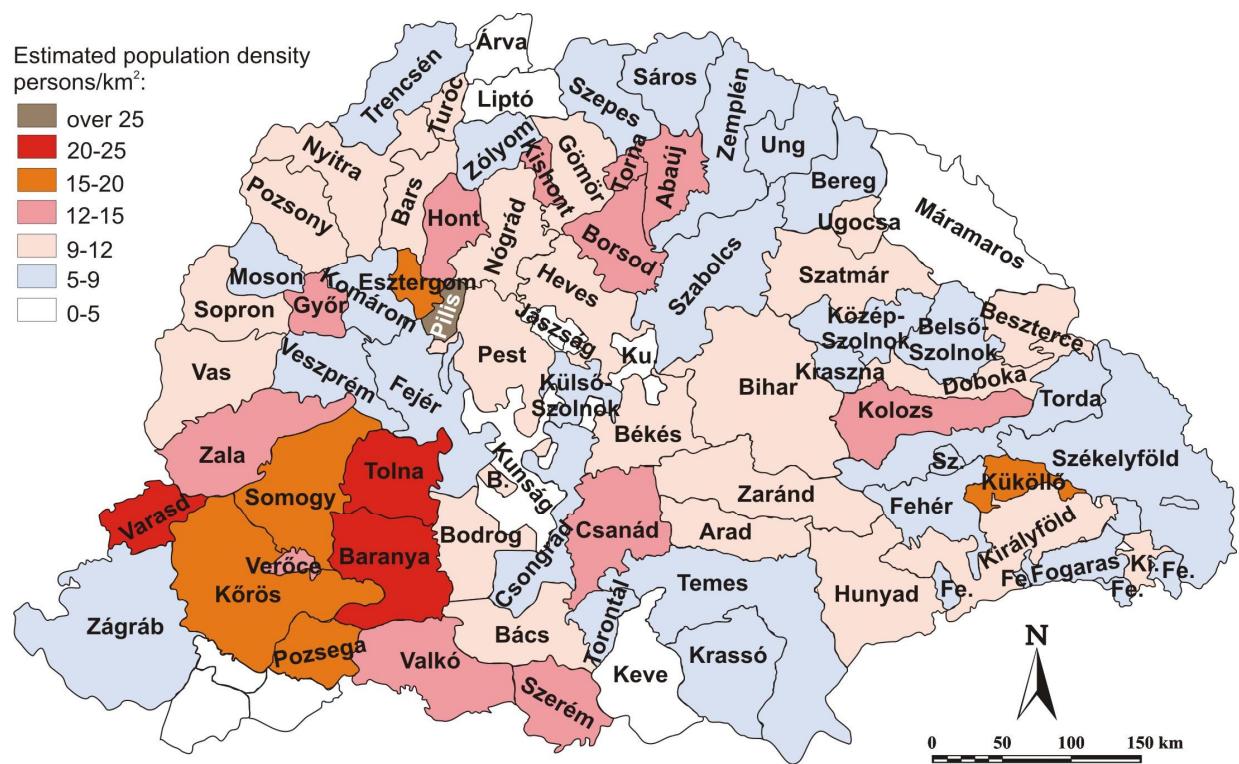
¹⁵¹ For example: Almási 2000, pp. 96-100. In the years after the Mongol invasion planned settling process, organised by the king, started towards the areas which became almost uninhabited during the invasion. Only a small number of western immigrants came; most of the arrivals were coming from the neighbouring areas. The largest block was, however, clearly of eastern origin: Cumans and Iasonians, who meant to be an important eastern, nomadic-style military support for the kingdom in the following decades.

¹⁵² For a relatively recent survey of international comparisons and estimations (of death rates) see: Benedictow 2004, 433 p. For Hungarian conditions of this period, see for example: Szabó 1963, pp. 63-65; Fügedi 1992, pp. 28-31.

Even in the first half of the 14th century – when the population density of, for example, France, Italy or the Netherlands was around or even over 30 persons/km², that of Britain and perhaps also in the German areas around 15 persons/km² – population density of whole Hungary (inhabited and uninhabited parts) was around 5-6 persons/km² and around 8 persons/km² in the inhabited parts.¹⁵³

At the end of the 15th century the average population density of Hungary was around 9.9-10.6 persons/km². Slavonia was more densely populated: estimated population density was around 14.3 persons/km². However, there were great differences in the country.

Based on the scarce charter evidence, in the 11th century some of the most densely populated parts of the country were situated, for example, along the line of the Danube (e.g. Kisalföld/Little Hungarian Plain), around Lake Balaton and the lowland areas of present southwest Slovakia.¹⁵⁴ In the first decades of the 13th century the most densely populated areas of the country were in the Transdanubia, southern parts of the Great (Hungarian) Plain (perhaps also in the Danube-Tisza Interfluve), the Little (Hungarian) Plain and in some of the hilly areas of lower elevation (e.g. the settlement lines between hilly and lowland areas). In general, the population density of the Little Plain, thus the broader area of the Upper Danube floodplain, throughout most of the Middle Ages was estimated to be close to the western standards.¹⁵⁵ This also meant a much greater probability of intensive transformation of landscape than, for example, in Árva, Liptó or Máramaros counties in the northeast with very low population pressure and extensive hilly forested areas, where even in the late Middle Ages (see *Fig. 7*) only main river valleys were inhabited.



7. Fig. Population densities of Hungary at the end of the 15th century on county level (estimated by A. Kubinyi)¹⁵⁶

¹⁵³ Kristó 1997, p. 60.

¹⁵⁴ Györfy 1997, pp. 48-49.

¹⁵⁵ Maksay 1971, p. 44.

¹⁵⁶ Kubinyi 1996, pp. 135-161, and Kubinyi 1997, pp. 93-110.

This information, however, is not in full agreement with the late 15th-century county-based population density estimations, provided by Kubinyi (*Fig. 7*).

In the 15th century, the most densely populated area was, without doubt, the agglomeration of Buda-Pest; and as for county, the Pilis. Other, relatively densely-populated counties were in the southern Transdanubia and the Drava-Sava Interfluve, but probably even more people lived there in the early than in the late 15th century.¹⁵⁷ In the densely populated parts of the Saxon lands in South-Transylvania the average density of population was around 15 persons/km², while some other areas were hardly inhabited at all.¹⁵⁸ Besides, areas along the Danube, main trade routes and mining areas were as well more densely populated.

Population density in the newly transformed mountain areas, occupied by forest clearance and planned settling, mainly in the 14th-15th centuries, usually remained far behind that of the lowland areas with similarly growing population.¹⁵⁹ In spite of a relatively scarce population some landscapes, however, could be more intensively transformed due to, for example, mining activites (e.g. Fehér, Torda, Zólyom).

As we could see, despite the almost uninterrupted (slow) increase, even in the 15th century in most parts of the country population density did not reach 10 persons/km². Thus, main reason for territorial expansion towards forested mountain areas was clearly not the overall population pressure of the inhabited areas. Still, to some extent population pressure induced internal migration from more densely populated areas (especially from the western parts of the country) towards areas with more freedom, lands, and probable better living circumstances. This movement was greatly eased by the free move of serfs, a process started from the second half of the 13th century, and showed its positive effects especially in the 14th and 15th centuries.¹⁶⁰

Immigration and its presumable consequences on the (intensity of) land use and environment

Spatial difference in population density could be influenced by both natural and human factors. Changes in population density in the different areas over time could be caused by several reasons such as wars, major diseases or changing economic importance. However, as mentioned above, clearly a very important social factor was from the second half of the 13th century that more and more serfs had the right for a free move, in which development the arrival of immigrant groups (and their rights received) played a very important, catalyst role. Moreover, with taking their management and cultivation practices, immigrants (also with special emphasis on monastic orders) in many cases acted as an important factor of landscape transformation, mostly towards an intensive, but sometimes also to extensive direction of land

¹⁵⁷ Kubinyi 1997, pp. 106-107. Relatively densely populated before the early-mid 15th century, great depopulation occurred in the mid and late 15th century in the southern parts of the country due to frequent Turkish attacks, where in the second half of the 15th century southern Slavic population (mainly Serbians) was settled. See: Blazovich 1997, pp. 117-123; Draskóczy 1997, p. 129.

¹⁵⁸ Draskóczy 1997, p. 128.

¹⁵⁹ Based on the late 14th-century conscription of Ung county (1398), for example, Erik Fügedi concluded that the villages of magnates were much more populated in the earlier settled areas (mainly lowlands) than in the areas of new settlements (hilly and mountain areas). This means that while in the lowland areas the density of population reached 18.5 person/km², in the occupied hilly-forested areas it was around 4.5 person/km². This statement he generalised for other counties of Hungary with the same territorial characteristics. See: Fügedi 1992, p. 43. See also Kristó et al. 1994, pp. 490-491 (Erik Fügedi).

Nevertheless, due to worse soil properties, more extensive lands – on average – were needed to maintain the same amount of population than those of the lowland areas.

¹⁶⁰ There were other reasons for the territorial expansion, such as the increase of incomes by having more lands suitable for agriculture (and population who works on these lands). An important reason was also the rise and great importance of salt and ore mining and related industry in the hilly and mountain areas latest from the 13th, but especially from the early-mid 14th centuries.

use. Thus, it is also important to discuss, very briefly, the role and possible impact of characteristic immigrant groups, arrived to Hungary throughout the Middle Ages (see *Table 1*).

Ethnic groups	Where from	When	Number	Where to (mainly)	Intensity/type of land use (economic activity)	
Western	Germans	Saxon	early 13th cent.	some ten thousands?	privileged areas (highland basins): Spiš, S-Transylvania	
		'Teutonici' (mainly Bavarian, partly Austrian and other)	from 11th cent.	some thousands?	(royal) towns, western bordertowns	
	Latins	Walloon (Flanders, N-France, Lorraine)	(11th-) 12th cent.	some thousands?	(royal) towns	
		Italian (Lombardy)	from (11th-) 12th cent.	some thousands?	towns+small privileged areas	
	Slavs	Czech+Moravian	from early 14th cent.	some ten thousands?	N-Carpathian Mts. (present Slovakia)	
		Polish(+Russian) +others	from early 14th cent.	some ten thousands?	N-Carpathian Mts. (present Slovakia)	
	Steppe people	Pechenegs+others (e.g. Alans)	11th-12th cent.	some thousands?	wet lowland areas: E-Transdanubia, E-Fertő	
Eastern, southeastern		Cumans (+others: e.g. Tatars?)	13th cent.	ca. fourty thousand	privileged areas Great Plain: Sand Ridge area, Maros-Körös Interfluve, W-Transtisia	
		Iasonians	13th cent.	some thousands?	mainly in privileged areas North-Great Plain (Heves county)	
Others	Romanians	from early 13th cent.	some ten thousands?	E-, S-Carpathian Mts., Maramureş		
	'muslims' (e.g. Hvorezm, Magreb)	10th cent.	some thousands?	spreaded (towns?)		

1. Table *Most significant immigrant groups, their predominant traditional occupation and land-use types*¹⁶¹

Immigration as a source of population growth was probably the most important in the high medieval period. Its general importance became less pronounced in the (landscape transformation of the) formerly inhabited areas from the 14th century onwards. From this time the landscape-changing role of immigrants became the most important in the occupation of the formerly uninhabited, mountain areas of the Carpathians (with immigrant population predominantly from the neighbouring countries).¹⁶² While most of the eastern groups can be characterised by extensive land use (grazing: lowland steppe areas, mountains), the occupation of western population settled in Hungary is mainly connected to intensive land use and mining (arable, viticulture, industrial and urban activities).

Concerning landscape processes, three main categories can be distinguished:

- Groups playing catalyst role in the 'plantation' of intensive land-use cultures: e.g. urban development, territorial increase and introducing new techniques in vine cultivation (e.g. Latins). In this sense, there role could be somewhat similar to Benedictine and then Cistercian monasteries (11th-12th centuries).

¹⁶¹ Kristó et al. 1994, pp. 709-710 (Imre Szabics), 505 (Zsuzsa Teke), 485 (András Kubinyi); Kristó 2003, 313 p; Pálóczi Horváth 142 p; Engel 2003, pp. 217-218; Blazovich 2009, pp. 213-215. See also: Kristó et al. 1994, pp. 432-433: map: 'Non-Hungarian ethnic groups in Hungary in the 11th-14th centuries.; and Kristó 2003, 313 p.

¹⁶² Engel 2003, p. 217.

2. Their land-use traditions/characteristics dominate the area where they were settled: for example, extensive grazing of Cumans (in grassland areas with low population density), intensive land use and intensive urbanisation of Saxons in their privileged areas (12th-13th centuries).
3. Clearances and occupation of densely forested and alpine pasture mountain areas in the Carpathians, where (German,) Slavic (Polish, Moravian, Russian) and Romanian population had great importance (14th-15th centuries).

2.3.1.2 Social, economic changes and transformations of the settlement system

Social, economic factors and the high-medieval characteristics of settlement system

Hungary in the period between the 11th and mid-13th centuries is characterised by the dense network of (very) small (often with more of a hamlet size and outlook) and some larger 'villages'. Size of usual settlements were (1-)5-10 (rarely more) households. Population is predominantly self-sustaining, the economy is mainly based on and organised in and around the manorial/domain system. In this system the *praedium* is the basic economic unit and centre of economy (of landlords) with serving population, existing parallel and as an integrate part of the settlement network.¹⁶³ Administrative and political life is mainly organised on county level, where (key) fortresses act as administrative-political centres (called *urbs* or *civitas*) of counties (*várispánság*) with the *comes* (*ispán*) in lead, delegated by the king. The decline of (some of) these centres already started in the 12th century. Approximately up to the turn of the 12th-13th centuries land ownership with political-administrative power is predominantly in the king's hand; larger areas are donated from the first decades of the 13th century, which resulted the great decrease of lands in royal ownership, and in parallel the greatly growing wealth and increased importance of lay landowners (nobles, and barons).¹⁶⁴

In its western sense, practically no real towns existed in the high medieval period, perhaps except for the royal centres of Székesfehérvár and Esztergom with their foreign quarters and royal households. Besides, perhaps some of the episcopal centres showed certain elements of urban features. These were the stations of international trade, main market places, and – together with some of the county centres – became later the first centres in the development of real towns.¹⁶⁵

Society is characterised by the groups of free and dependent population. Although dependent population – according to the level of freedom possessed – is also divided into several groups (in which situation a significant development occurred until the mid-13th century), usually has no right in person for a free move. This situation, however, gradually changed from the second half of the 13th century. In this development *hospes* population (mainly western immigrants, but also others, even Hungarians) with their extensive rights – received from the king (especially in the late 12th-early 13th centuries) upon arrival – played an important, catalyst role in spreading of new agricultural (and other) techniques, and acted as a root of a more market (and money)-based economy.¹⁶⁶

The outlook of a typical high-medieval village in the 11th-12th centuries is mainly characterised by a non-organised group of houses and economic buildings, located half-way underground, each surrounded by a system of ditches in the landscape belonging to the territory of the village.¹⁶⁷ From the 12th century more and more houses are located entirely over the

¹⁶³ See, for example: Maksay 1971, pp. 41-42; Almási 2000, pp. 75-76.

¹⁶⁴ For example: Almási 2000, pp. 34-35.

¹⁶⁵ Gerevich 1973, pp. 235-236, 238.

¹⁶⁶ Almási 2000, pp. 76-77.

¹⁶⁷ Maksay 1971, p. 41.

ground, and from the 13th century onwards – with the emergence of more villages (parallel to population growth) in the same area – the shape/outline of the village was also in change towards a more dense, defined and sometimes more organised form in which houses were located closer to each other.¹⁶⁸

Main social-economic changes (including the transformation of settlement system) occurred in the period of the 13th and early 14th centuries. Changes became especially rapid after the first Mongol invasion (1241-1242), which clearly made a turning point in the king's politics and acted as a catalyst in socio-economic changes with the beginning of, for example, intensive inner migration.¹⁶⁹ By the early 14th century, these changes resulted the development of a more or less unified serf society with free move, a more and more market-oriented agricultural (and industrial) production, which altogether caused the great decline of the *praedium*-system. All these facts had great impact and resulted such fundamental changes in the settlement system as urbanisation and settlement desertion process, mainly taking place in the period of 1200-1350.

It has rather great importance that the exact borderlines of areas belonging to a defined settlement started to be fixed and unchangeable in the period of the 12th-14th centuries, but especially in the (second half of the) 13th century. It happened, together with fixing the serf's land as a unit (with its inner and outer parts), during the 'village-boom', namely when all over the country several new settlements emerged in the areas of preceding single settlements.¹⁷⁰

Why all these information can be important from the better understanding of flood-related medieval evidence? It is because lacking flood events and flood-related evidence in the 11th-12th, and mainly still in the 13th centuries might be potentially caused by several factors such as the ('positive') influence of the climatic period called Medieval Climate Anomaly, or the scarcity of documentary evidence available (and perhaps many more). But also by the fact that socio-economic conditions, attitudes (including religious),¹⁷¹ land and settlement division, and the management of landscape and environment were rather different in the high medieval than in the late medieval period. Thus, late medieval society reacted more sensitively (and perhaps more rapidly) on variabilities and changes in its environment.

Late medieval settlement system: the emergence of towns and boroughs

The 13th and the first half of the 14th century is the period of the emergence of villages in the former royal possessions, donated to landowners. Although villages completely spontaneously also appeared, usually the (new) landlord planned and organised the emergence of a new village.¹⁷² The clear changes started after the first Mongol invasion, when – due to the shortage of labour caused by sudden population decrease – a significant inner migration, agricultural reforms (including the inheritance of serf's landed property), an intensive building process of stone castles, fortresses and the emergence of (fortified, royal) towns started.¹⁷³ All these changes had clear impact on land use and the landscape.

In general, probably the most important change in the settlement system, occurred in the 13th-early 15th centuries, is the emergence of self-organising socio-economic centres (market places and towns with central functions) with extensive rights and freedom for their inhabitants. The emergence of market places, boroughs (*oppida*) and that of the (royal) towns

¹⁶⁸ Almási 2000, pp. 114-116.

¹⁶⁹ For example, Almási 2000, pp. 100-101.

¹⁷⁰ Maksay 1971, pp. 114-115, 133.

¹⁷¹ This attitude also reflected in the religious view of the world of the high medieval period, which fact should be also considered. In this sense, a rather 'modern attitude' is reflected in the late 13th-century canonization trial of princess Margit, in which case the Dominican nun, Margit ('the symbol', the 'ideal person' of her age) herself raises the attention for the flood as a risk caused by natural conditions of the island of the Danube where they lived.

¹⁷² Maksay 1971, pp. 60-61.

¹⁷³ Almási 2000, pp. 104-106, 118-120.

(*civitates*) in which category also the mining towns were included, in a more market-(and money-)based society led towards a more complex settlement hierarchy and the reorganisation and relocation of population.¹⁷⁴

This process occurred parallel and as a result of the serfs' right for a free move (after fulfilling their feudal obligations), and the fact that the king and landowners (both lay and secular) also changed (and had to change) their priorities towards a more interest- and monetary-based system. In this system income basically meant more the money and/or (by-)products they could gain after the possession of rights (over the lands, mines, roads etc) and less after the direct utilisation of lands and possession/utilisation of (uninterested) people. Moreover, from the late 13th century serfs' lands could be inherited and thus, a fixed ownership and utilisation developed, in the hand of the same serf family.¹⁷⁵

Urbanisation turned into a rapid development in the second half of the 13th century: the king himself chose towns¹⁷⁶ which – usually during the 14th century – received more and more rights by the first decades of the 15th century when they reached their final form.¹⁷⁷ These (later royal) towns (*civitates*) were usually located or placed in the vicinity of an existing castle, mining area or along main international trade routes, with a population mainly German by origin.¹⁷⁸ On the other hand, boroughs (*oppida*) developed from villages with central (market) functions in the territory of a landlord (other than the king), and became clearly different from other settlement types by the end of the 14th century. Their number rose up to 800 by the end of the Middle Ages, and with an average population of 500 people (causing population decrease in villages).¹⁷⁹

By the end of the Middle Ages around 16-20% of the country lived in these towns.¹⁸⁰ The ratio in the number of people between *civitas*- and *oppidum*-population was around 1:3. Royal towns were far weaker concerning the number of population than boroughs, but they had a greater importance in international trade (mining) and country politics than the other group.

In general, landscape-, water-management and human impact were more significant in the close vicinity of (larger) towns; this is especially true for royal towns, mining towns and the largest boroughs (also many of them gained the royal town title by the end of the 15th century). As we could see earlier, the greatest medieval urban agglomeration of the Carpathian Basin was the Buda-Pest(-Óbuda) agglomeration where the two most populous towns of the Carpathian Basin (end of 15th century Buda: 12-15,000, Pest: 10-12,000 people) were located.¹⁸¹

The outlook of a medieval royal town was not very different from those west and north to the Carpathian Basin. Human impact on the environment was also rather similar (e.g. wall, moat, fishponds, watermills, bridges, regulation of smaller waterflows), and so as the problems (e.g. hygienic situation, frequent fires etc.).¹⁸² Nevertheless, these problems were probably less striking in Hungarian towns than in many parts of western Europe. It could be, amongst others,

¹⁷⁴ See, for example, Györffy 1963, p. 57.

¹⁷⁵ Almási 2000, pp. 74-78, 118-119.

¹⁷⁶ For example: Almási 2000, pp. 118-125.

¹⁷⁷ Engel 2003, pp. 218-219.

¹⁷⁸ Gerevich 1973, pp. 242-243. Stone wall as a clear sign and right of a royal town (together with its environmental consequences) became part of the urban privileges in the first half of the 14th century.

¹⁷⁹ Maksay 1971, p. 73.

¹⁸⁰ Szabó 1969, pp. 238-239.

¹⁸¹ Gerevich-Kosáry 1973 Vol. 2, p. 76.

¹⁸² For example, Ortvay Vol. 2/1, pp. 1-172, Vol. 2/2, p. 49, Vol. 2/3, pp. 189-202, etc; Mollay 1956, pp. 31-42; Ruhmann 1988, pp. 46-48; Mollay 1989, pp. 18-40, 126-148, 205-224; Mollay 1992, pp. 150-162. etc. Usually the moat (especially if accompanied by a market area) was an especially problematic point of a town. Hygienic problems (and smells) related to this ditch system clearly caused rather great problems in the early 15th century when, for example, in case of Sopron King Sigismund had to warn the town for an urgent cleaning. See, for example: 1426: SVT Vol. 2/1, p. 166.

due to the usually smaller size and population, and also because of the fact that town citizens rather often lived in suburbs where lacking of space was less of a problem. Lacking the stone fortification, a medieval borough, market town in outlook meant to be a transitional settlement type between a village and a royal town: most of them showed the typical features of a larger village, but some of them had 'real' urban outlook.

Settlement desertion

In medieval Hungary, two main groups and periods of desertion are distinguished:

1. ca. 1200-ca. 1350 predominantly characterised by the desertion of settlements,
2. after ca. 1350, mainly characterised by land desertion and less by settlement desertion.¹⁸³

The classic period of settlement desertion in Hungary took place in the 13th and in the first half of the 14th centuries.¹⁸⁴ Although settlement desertion continued, the second desertion phase was less dominated by settlement- and more by land-desertion (discussed in the next section).

Throughout most of the high and late medieval study period, more and more divisions and fragmentation of lands, and also the great amount of very small-sized settlements are typical in the country.¹⁸⁵ The very small-sized settlements were easily and frequently the subject of desertion from the 13th century onwards, especially with the decay of the *praedium*-system.¹⁸⁶ In many cases, the little high-medieval villages were deserted because of their inability for development (e.g. fishing villages, lack of lands for arable cultivation etc.).¹⁸⁷ As we could see earlier, free movement of serfs resulted a rather active inner migration from the second half of the 13th century onwards: people moved to areas and/or settlements providing more chances for a better life.

In Hungary, connected to economic and social changes, major reason for settlement desertation was the changes occurred in the 'optimal' settlement size; its most important element was the process of urbanization (less but larger settlements, population movement towards central places).¹⁸⁸ A well-examined and rather complex example for this is the desertation process taken place in the Buda-Pest agglomeration throughout the Middle Ages.¹⁸⁹ In this case, a special emphasis has to be made on the transformation of settlement system and land cultivation of the late Middle Ages, characterised by intensive, market-oriented agriculture and industrial activities (see Fig. 8).¹⁹⁰

¹⁸³ Maksay 1971, pp. 84-86. This settlement desertion was preceded by another process which is not called as desertion: up to ca. 1200 the decline of many economic centres (*praedia*), and also the disappearance of small hamlets can be detected.

¹⁸⁴ Maksay 1971, pp. 82-85.

¹⁸⁵ Szabó 1966, p. 149.

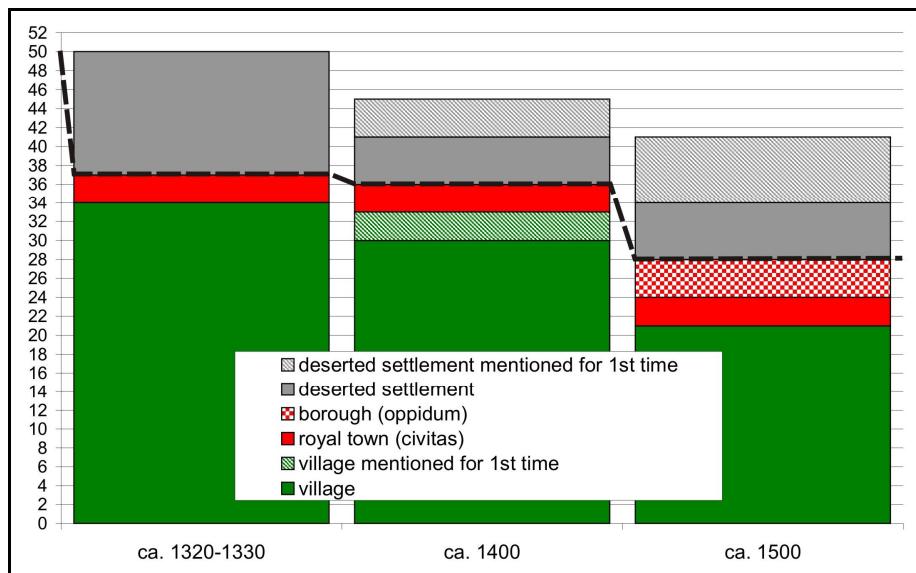
¹⁸⁶ Szabó 1966, p. 150. Not only in Hungary, but also in other parts of Europe it is a general phenomenon that small-sized villages were most frequently subject to desertion (Szabó 1966, p. 186). In fact, by the 15th century the word 'praedium' became equivalent to the meaning of 'deserted village' in the Hungarian latin (charter) terminology. See, for example: Szabó 1966, p. 142.

¹⁸⁷ Szabó 1966, p. 151. For example, in case of small high medieval villages, the lack of arable lands in itself could cause the decrease and complete desertion of a settlement. See: Maksay 1971, pp. 52, 75.

¹⁸⁸ See, for example, Maksay 1971, p. 73.

¹⁸⁹ Naturally, similar process can be detected in case of other towns, especially in areas with relatively high density of population. For a short overview of the Sopron and Fertő area see, for example: Kiss 1999, pp. 372-373-

¹⁹⁰ In this case, a clear early specialisation of agriculture can be followed: this meant the almost complete disappearance of arable lands, the great importance (sometimes on monocultural level) of vineyards all over the hillslopes, the vegetable gardens and orchards, together with the late 14th- and 15th-century significant increase of (extensive) animal husbandry. Grain was almost entirely transported from other, mainly western areas such as the Little Plain. Gerevich-Kosáry 1973 Vol. 2, pp. 14-76.



8. Fig. A complex example of intensive settlement desertion: the changing number and type of settlements in the Buda-Pest agglomeration in the late Middle Ages¹⁹¹

Even if socio-economic changes were clearly the chief reason for this process both in Hungary and most parts of Europe, in many other parts of western Europe one important reason and period of settlement desertion was also connected to the disastrous population decrease, caused by the devastation of the Black Death in the mid-14th century.¹⁹² Wars (e.g. 15th Turkish attacks), invasions (e.g. Mongol invasion) and violent attacks (e.g. neighbouring landowner) could cause depopulation of settlements or areas.¹⁹³

In some other cases environmental changes,¹⁹⁴ occurred in the region, made a place or area of a settlement or settlements unsuitable for continuous dwelling, and inhabitants partly or entirely left the area.¹⁹⁵ The number of directly reported cases is, however, rather low. All cases, which are possible to be directly connected to this group, up to now are partly or entirely connected to water/flood problems, but usually combined with other reasons (e.g. military campaign, human mismanagement etc.).¹⁹⁶ It is important to emphasise that, although we cannot neglect the importance of direct flood events and direct effects of climate variabilities as a primary reason for desertion in some cases, the number of such cases was most probably not

¹⁹¹ Based on the data available in: Gerevich-Kosáry 1973 Vol. 2, pp. 23, 27, 36. Although more than 40% of the high medieval settlements, many of small in size and population, disappeared by or during the late medieval period (from high-medieval 50 to 28 by 1500), clearly a great increase of population can be detected in the Buda-Pest agglomeration as a whole. The two largest royal towns (*civitas*) of the country (Buda and Pest), a third royal town (Óbuda), other four towns (*oppidum*) accompanied by more than two dozen villages, usually quite large in size and population, could be found in the (inner) circle (ca. 17 km) of the country's largest agglomeration. A rather similar process could be followed, for example, in Austria in the Vienna basin: Zöllner 1998, pp. 130-131.

¹⁹² In many areas of Western Europe this population decrease might have started much earlier, already in the late 13th century or with the great famine (and cost-of-living crisis) in the 1310s. See, for example, Jordan 1998, 317 p. Plague disease came back every 10th or 15th years also in the second half of the 14th and throughout the 15th centuries (and later), but the effects were not so disastrous any more. Nevertheless, it is clear that settlement desertion started earlier, due to other dominant economic and social processes such as urbanisation.

¹⁹³ See, for example: Szabó 1969, pp. 34-35, 174-183. Maksay 1971, p. 64.

¹⁹⁴ Concerning northern and western Europe, especially in climate sensitive areas (temperature-precipitation 'peripheries'), variabilities and changes of climate were also blamed for population decrease. Classic example is the, (bit deterministic) approach of Hubert Horace Lamb. See, for example: Lamb 1995, 400 p.

¹⁹⁵ For example, Maksay 1971, p. 74.

¹⁹⁶ For example, the destroyed village which has been rebuilt in another, more suitable place: 1395: DL 50193.

high and therefore, leading settlement experts warned the attention for not to overestimate its impact.¹⁹⁷

Thus, in Hungary main reasons of settlement desertion, as in other parts of Europe, were on the first place general socio-economic changes such as urbanisation, agricultural crisis, migration of serfs, unfavourable location of settlements (i.e. environmental conditions), natural calamities (e.g. diseases, fires, floods etc.), wars and violent actions (private feudal wars), too high taxes and feudal obligations in general.¹⁹⁸

Apart from mass desertion due to wars (i.e. mid 13h century: Great Plain, 15th century: South-Hungary), on average, medieval settlement desertion took a larger extent in lowland areas, especially at the eastern, northeastern parts of the Great Plain (but also the highly-populated South-Transdanubia and some northern areas of early occupation), where it reached 17-20%, but sometimes around 22-36% by the end of the Middle Ages. The extent of settlement desertion was much lower in the later occupied mountain areas, inhabited from the late 13th century onwards: here in most cases the maximum rate of settlement desertion only exceptionally reached 10%, but usually remained under 5%.¹⁹⁹

What happened to the lands of deserted settlements? The lands of completely deserted villages became usually part of the lands of neighbouring settlements,²⁰⁰ but especially in lowland areas of the Great Plain, inner Transylvania, and partly also in the Little Plain and the Transdanubia these lands became subject to grazing, connected to the great increase of cattle export towards Italy and the south-German areas.²⁰¹ Nevertheless, the territorial integrity of deserted villages were usually kept intact for a long time.²⁰²

2.3.2 Agriculture, land use and forest clearance

2.3.2.1 Changes in land use and agriculture – high to late medieval transition

In the 11th-early 13th centuries predominantly the inner 200-220,000 km² of the Carpathian Basin was inhabited, while the rest (Carpathian mountains) remained almost completely uninhabited. During this period self-sustaining agriculture was predominant; production of goods for market (except for some isolated cases) had minor importance.²⁰³

Great transition occurred especially from the 13th century when animal husbandry was combined with systematic cultivation of arable lands. Rotation systems (two or three) together with soil fertilization were introduced on a large scale (in this process some monastic orders e.g. Benedictines and Cistercians, and western *hospes*-population also played an important

¹⁹⁷ In practice, for example Szabó (1966, pp. 170-171) raised attention those one or two medieval examples which are known from charter evidence, while others usually pay even less attention to the subject in general. Talking about larger numbers, perhaps more importance of changing environmental conditions can be detected in case of land (and not complete settlement) desertion.

¹⁹⁸ For example: Szabó, 1966, pp. 147, 153-183; Maksay 1971, p. 86.

¹⁹⁹ See, for example: Szabó 1966, p. 143.

²⁰⁰ Szabó 1966, p. 152.

²⁰¹ Maksay 1971, pp. 138, 146.

²⁰² See Maksay 1971, p. 80. The same happened to, for example, the areas south of Pest in the late Middle Ages (Gerevich-Kosáry 1973, p. 33).

²⁰³ Concerning the counties of medieval Hungary, easily available general descriptions about the high and partly the late medieval landscape and environment can be found in the introductory chapter of each county. And even if these descriptions of the high and late medieval environmental (e.g. medieval hydrography and basic vegetation and land-cover patterns) are not without any mistake, they provide a good overview about the environmental conditions in a county level. Unfortunately, up to date only 4 volumes were published, which means that the description and catalogue of settlements and areas concerning the medieval historical geography of counties of Hungary are available only letter 'P'. See Györffy 1987-1998, 4 Vols.

role). This process was supported and fastened by the introduction of several technical innovations.²⁰⁴

In the high medieval period the Danube acted as a division line between east and west in the Carpathian Basin. While west to the Danube crop (wheat, rye etc) production was the most important agricultural activity, according to the results of some archaeobotanical investigations, east to the Danube animal husbandry was still generally more dominant up to the 11th-12th centuries.²⁰⁵ Nevertheless, by the 12th and especially the 13th centuries, crop production and settled lifestyle also prevailed east to the Danube, even in the (mainly) sandy Danube-Tisza Interfluve.²⁰⁶ At least concerning the Sand Ridge area of the Danube-Tisza Interfluve, this situation fundamentally changed after the Mongol invasion, with the emergence of the Cuman and Iasonian privileged areas. Main occupation of Iasonians, but especially Cumans was animal husbandry; in case of Cumans this activity was clearly characterised by the survival of semi-nomadic traditions, and instable settlement network until the late 14th century.²⁰⁷

During the high medieval period, lands suitable for agriculture – either as an arable land, meadow, hayland or pasture (meadow and woodland), managed woodland – were, extensively or intensively, used and exploited in the inner, hilly and lowland parts of the Carpathian Basin.²⁰⁸ In general, the intensity of exploitation clearly increased by the 14th and 15th centuries: in most areas, concerning arable lands, two and three rotation systems were applied. However, cultivated lands without a rotation system also could be found, sometimes even in the same village.²⁰⁹ Two-rotation systems were generally more widespread in areas with drier climatic conditions or in areas where, compared to the importance of animal husbandry, there was not enough pasture available.²¹⁰

This relatively intensive and uninterrupted (high and late medieval) human impact of agriculture on the environment, in some locations, can be already detected prior to the 10th century. However, human impact intensified from the 10th-11th, but especially from around the turn of the 13th-14th centuries in the inner areas of the Carpathian Basin.²¹¹

From the late 13th century, changes in land use can be summarised in three main points:

1. intensification of agricultural activities in the formerly inhabited areas and territorial expansion in the formerly uninhabited areas,
2. increased specialisation, and increased exchange of goods,
3. more market-oriented production, on both national and international level.

²⁰⁴ Maksay 1971, pp. 51-53. See also: Almási 2000, pp. 114-115.

²⁰⁵ Gyulai 2000, pp. 45-69.

²⁰⁶ Related to economic development, some territorial changes, a shift from east towards the west occurred in the country from the 13th century. The importance of East-Hungary declined together with the fall of the flourishing eastern centres such as Kiev or Constantinople. Moreover, the Mongol invasion affected much more the eastern parts than the western parts of the country. See, for example: Engel 1994, pp. 13-20; Engel 2003, pp. 433-450. Blazovich 2009, p. 214.

²⁰⁷ Maksay 1971, pp. 57-59. For a recent overview on scientific literature concerning medieval land use of the Sand Ridge area, see: Tóber 2011, 14 p.

²⁰⁸ Concerning agricultural consequences and procedures of forest clearance and exploitation of formerly forested areas, see: Belényesy 1954, pp. 387-415; for arable lands and intensive land use related: Belényesy 1955a, pp. 57-98, Belényesy 1956a, pp. 183-188, Belényesy 1956c, pp. 517-555, Belényesy 1958, pp. 117-128; for fishery and utilization/exploitation of waters, see: Belényesy 1953, pp. 148-164; concerning animal husbandry (e.g. meadows, pastures, haylands): Belényesy 1956b, pp. 23-57; vine and fruit cultivation: Belényesy 1955b, pp. 11-28. For intensive and extensive land use on deserted lands, see: Belényesy 1964, pp. 321-349. Although all these studies were published under her name, as she herself mentioned in her studies (see e.g. 1956c, p. 517), Belényesy had access to huge 'agrarian' databases of 14th- and 15th-century charters, elaborated by several of the most well-known medievalists.

²⁰⁹ Szabó 1969, pp. 62-63.

²¹⁰ Maksay 1971, p. 173.

²¹¹ See, for example: Sümegi 2000, pp. 9-26.

Latest by the 14th century, more market-oriented agriculture as well as the possibility and need for a more intensive use resulted (and caused) more and more specialisation. This meant, for example, the great expansion of vine cultivation on southern hillslopes all over the country. Wine production greatly increased; in many cases wine export played crucial part of economy (e.g. Kőszeg, Sopron, South-Central Transylvania etc.),²¹² and cultivation reached sometimes almost monocultural level (e.g. Pest-Buda agglomeration).²¹³ Since vine cultivation is related to very intensive earthworks and transformation of soil properties,²¹⁴ human impact in hillslopes with southern exposure (together with erosion issues) could be rather intensive, especially in the late Middle Ages.

Another direction of changes was the intensification of land use in the more populated, early inhabitation areas. As part of this process, deserted lands were also in many cases reoccupied by clearance.²¹⁵

Whereas one main direction of specialisation led towards the more intensive use of lands, another major direction, extensive grazing (mainly of cattle export), greatly increased the extension of pastures in the late medieval period, especially in the Great Plain. In large extent, overgrazing of sandy pastures, however, (especially together with intensified wind activities) could probably cause important changes, such as the mobilisation of sand dunes, (re)occurred from the 13th-14th centuries in the Sand Ridge area, in the Danube-Tisza Interfluve.²¹⁶

2.3.2.2 Serf's land and its desertion

Developed towards a fixed system from the 13th century, the central part of the serf's land (*sessio=telek*) was the serf's house (and buildings) with the inner grounds (altogether called: *locus sessionalis*). Apart from this, arable land, meadow, some water-surface (e.g. lake, waterflow) and a forest/woodland belonged to the average unit of a serf's land. The *locus sessionalis*, if not standing alone (like a farmstead), was usually located in the village. In fact, a village meant to be a 'set' or 'collection' of *loca sessionalia*. Even after desertion, the serf's land as an integrate unit (with all parts and rights) was preserved.²¹⁷

Concerning land desertion, we can distinguish between two types:

1. 'real': after deserted, the land remained unused for a longer while;
2. 'pseudo': land desertion indeed occurred, but the land was immediately given out for rent.

In this way the landlord gained much more (1/4) income from the tenant (who might be his own serf or the serf of any other landowner, with or without a serf's land) than from a serf's land, and state taxation could be as well avoided in this way.

As we could see earlier, before the mid-14th century mainly settlement desertion occurred, while in the late medieval period mainly land desertion is typical. In most cases the later one meant that only the serf's lands in a village or parts of a village and rarely complete settlements were left by their inhabitants. As a main reason, high rates of taxation are blamed for migration towards other areas or towns and boroughs. Other general, chief reasons could be that inhabitants left the lands with worse soil conditions or the family died out (in disease etc). Moreover, in the second half of the 14th and throughout the 15th centuries much more

²¹² See, for example: Bariska 2001, 48 p; Kiss 1999, pp. 374-375; Kücsán 1999, pp. 5-20; Frisnyák 1992, pp. 34-35.

²¹³ Gerevich-Kosáry 1973 Vol. 2, p. 27.

²¹⁴ See, for example: Kiss et al. 2005, pp. 111-124.

²¹⁵ Wine cultivation was taken out of the traditional frame of the serf's land unit; could be sold or bought, also by outsiders. The same rules implied on deserted/reclaimed lands, out of use at least for decades.

²¹⁶ Nyári-Kiss 2009, pp. 15-23.

²¹⁷ Szabó 1969, p. 18. Almási 2000, pp. 115-116.

information is available about land property and land use details on the level of individual lands than in the previous periods when their forms were not yet fixed.²¹⁸

In the more developed and urbanised Transdanubian and Upper Hungarian areas the rate of land desertation was higher than in other areas.²¹⁹ According to some estimations, in the late medieval period, by the end of the 15th century, out of the approximately 21,000 settlements around 2,000 were (officially) entirely left by their inhabitants. Nevertheless, as many as around 50-60% of the serf's lands in inhabited villages stood (officially) deserted.²²⁰

Thus, on the one hand we can meet up with an increasing and great number of deserted lands which are often given out to serfs for rent (*arenda*). From the late 15th century these lands became more and more often an integrate part of the landlord's manor.²²¹

However, more intensive use of already-inhabited areas can be witnessed, parallel to the fragmentation of serfs' lands. This was due to the reason that while several serf's lands were left by their inhabitants, in case of other serf families the land had to be divided among the male family members. As a result of this process (and also of other reasons such as higher productivity of agriculture), by the 15th century in most cases either half or a quarter of a land meant one unit of a serf's landed possession.

2.3.2.3 Territorial expansion and forest clearance

The processes of urban development and forest clearances occurred in the countries of East Central Europe roughly in the same time, parallel to each other.²²² The relocation of population (by inner migration), mentioned above, was one of the chief reasons resulted the well-known movement of settlement desertion. Another parallel process was territorial expansion (towards forested hilly/mountain areas of the Carpathians), started the latest in the first half of the 13th century, increased from the second half of the 13th century onwards.

Until the early 13th century the population of Hungary is predominantly concentrated to a 200,000 km² area covering the central, lowland and low hilly parts of the Carpathian Basin (including the Transylvanian Basin). Extensive hilly-mountanous, densely forested areas of the Carpathians (including the Apușeni mountains)²²³ were practically uninhabited.²²⁴ Due to clearances and planned settling process in the formerly forested hilly areas, by 1300 the inhabited areas of the Carpathian Basin most probably reached 250,000 km², and this territorial expansion continued throughout the 14th centuries. By the end of the 15th century, in their calculations demographers count with a 290,000 km² inhabited territory.²²⁵

In the northern, hilly and mountain territories (present Slovakia), except for some smaller areas where territorial expansion began in the 12th century (e.g. Szepes county) or early 13th century (e.g. Gömör county), most of the extensive forest clearance started from the mid- and late 13th centuries, and became intensive from the early-mid 14th centuries onwards.²²⁶ While in the 13th century territorial expansion is still mainly related to Hungarian population, the great 14th-15th-century clearances in the Carpathian mountains were mainly

²¹⁸ Maksay 1971, pp. 71, 88.

²¹⁹ Maksay 1971, p. 138.

²²⁰ Maksay 1971, p. 72

²²¹ Szabó 1969, pp. 52-54.

²²² See Gerevich 1973, p. 65; Körnendy 1995, 274 p.

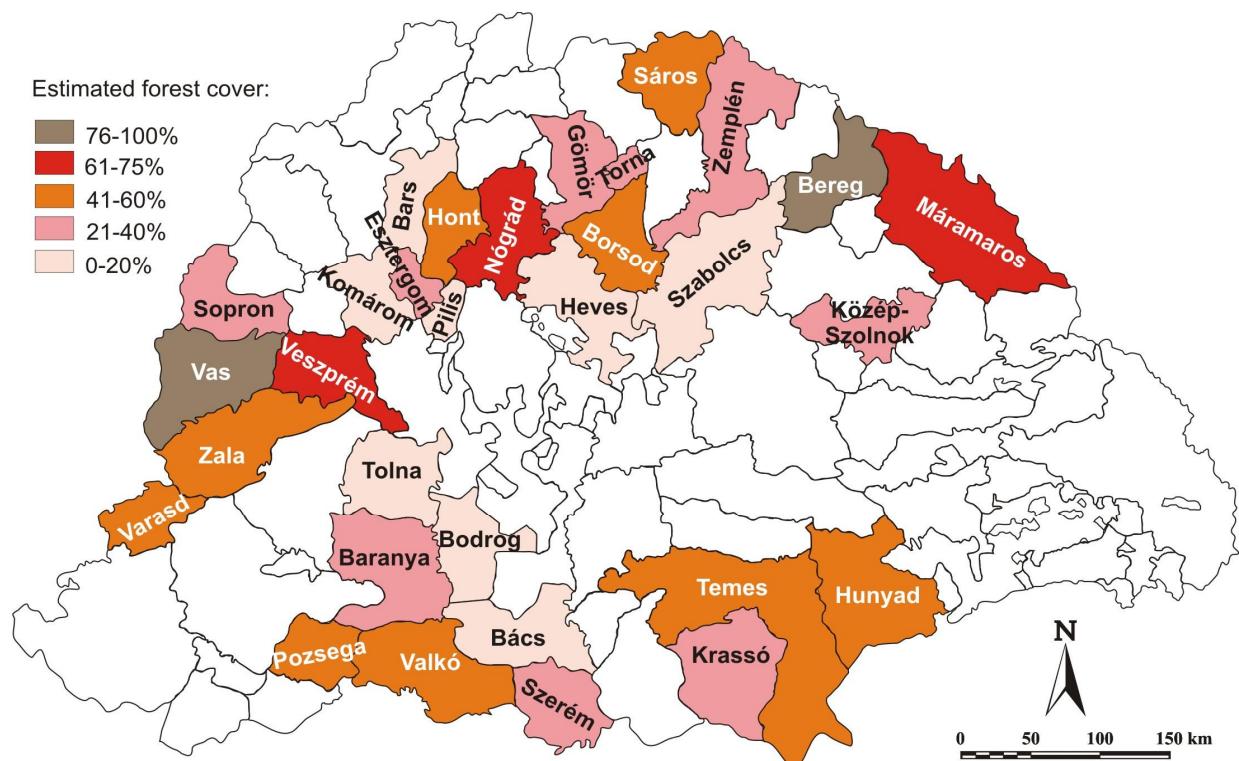
²²³ Mountain range dividing the central parts of the Carpathian Basin from the Transylvanian Basin.

²²⁴ Kristó et al. 1994, p. 491 (Erik Fügedi).

²²⁵ For example: Kristó 1997, p. 62.

²²⁶ Körmendy 1995, pp. 44-73; see also Stankoviansky 2003, pp. 89-107.

carried out by a population predominantly coming from the neighbouring (western Slavic, Romanian and German-speaking) areas.²²⁷



9. Fig. Estimated ratio of forest cover in the 15th century (estimations are available for 33, out of 75 counties)
compiled and edited by P. Szabó²²⁸

As a result, by the late 15th century (for what time some estimations are available: see Fig. 9), in several counties with extensive hilly-mountaneous areas the rate of forest cover decreased (sometimes well) under 50% (see e.g. Bars, Zemplén, Gömör). In mountain areas deforestation was the most intensive in valleys which, of course, had impacts on the (flood) discharge in the upper catchment areas of most rivers. This could have an impact on, for example, the speed and magnitude of floods in the affected areas together with increased soil erosion.

²²⁷ Maksay 1971, p. 37; Engel 2003, pp. 217-218.

²²⁸ Szabó 2009, pp. 140-141. Estimations were carried out when data was available for the lands of at least one settlement in a county. For a more detailed investigation of the topic in English, see: Szabó 2005. Relying on typical datasets which can be generalised for the county, such type of estimations might be useful for general overview. Nevertheless, in some cases they might result some over or underestimations. For example, it is rather difficult to believe that in the late 15th century Vas county (with towns, extensive vine-growing areas for export – for great spatial extensions of vineyards, comparable to that of the 18th century, see e.g. Bariska 2001, pp. 8-9; comparable to the 18th century: see Kiss et al. 2010, 17 p; and – at least along the Rába river – well-populated village and some town areas) would be covered by forests in such a great extent (i.e. 75-100%), even if it is clear that its most western, hilly border areas could be scarcely populated and highly forested. This is, however, was far not true for the whole county. It is especially striking when compared to medieval Máramaros, a mountain county in the northeast with its clearly very scarce settlement system and lowest population densities of the country, which – according to the present estimation – would be less forested as the above-mentioned Vas county.

2.3.3. Human impact on the water regime

2.3.3.1 Medieval hydrology and its natural changes: a general overview

Modern water regulation works, especially taking place in the second half of the 19th century, caused fundamental changes in the hydrological behaviour and hydromorphological conditions of rivers: extensive floodplains became dry, while rivers were forced to stay over the damming system. Nevertheless, rivers and waterflows of the Carpathian Basin were also the subject of hydrological, hydromorphological changes (either of predominantly 'natural' or 'artificial' changes) in the Middle Ages and the early modern period.

To some extent, we can follow medieval changes of mainly natural origin in case of the better-documented (or excavated) areas (e.g. in case of the Danube). For example, the presumable hydromorphological changes concerning the island area of the Žitný ostrov (Csallóköz-H), one of the most important medieval flood-risk areas, were recently described by Pišút and Timár. According to earlier investigations, collected and further developed by the authors, in the 13th-14th centuries the Žitný ostrov island area, east to Bratislava, was significantly smaller and its hydrographical conditions looked rather different than today. The medieval Csalló-branch, for example, did not enter the Vág river, but directly entered the Danube much more to the west than it is today. With the expansion of the Csalló-branch towards the Váh river, most probably some time in the 15th century, the medieval Vágköz area became part of Žitný ostrov.²²⁹ Although main reasons are likely to be natural, as a possible reason of these changes, we cannot completely exclude human impact either.

The Danube has changed its riverbed not only at the upper, but also at the lower sections, which changes sometimes caused the disappearance of human 'objects', too. An example of alteration or change of the riverbed of the Danube can be followed in the late 11th-century description of monk *Bernoldus*, possibly caused by a landslide.²³⁰ Moreover, clearly natural causes led, for example, to the complete disappearance of the medieval town of Tolna at the (lower) middle section of the Danube: due to the slow shift of the riverbed, even the last (already ruined) medieval church of this medieval ecclesiastical centre disappeared during the 1705-flood event of the Danube.²³¹ Such predominantly natural changes, however, can be followed not only on the Danube, but also on other medieval waterflows.²³² Nevertheless, without doubt the greatest changes detectable in hydrology/hydrography occurred due to human impact.

2.3.3.2 Water management in medieval Hungary: types and intensity of human impact

Main types of human impact on medieval hydrology

Concerning water management and human impact on the water regime, one can distinguish among some typical main groups:

1. ditches, canals
2. 'fok' and floodplain management
3. watermills and related water management
4. fishponds and fisheries
 - a. intensive: artificial fishponds (with damming)

²²⁹ Pišút-Timár 2009, pp. 57-61.

²³⁰ 1092: MGH SS Vol. 5, p. 454 (*Bernoldi Chronicon*).

²³¹ Fedeles-K. Németh 2006, pp. 397-433.

²³² For the Váh river, see: 1421: DL 98381.

- b. 'semi-intensive' – existing stagnant water bodies cleaned for further utilisation
(for fishery, or transformed into open water surface used for other purposes)
- c. 'extensive': simple use of permanent water bodies or waters in inundation areas

5. water management related to mining/processing activities.

A rather large scale human impact can be presumed, mainly in lowland areas, already in the high medieval (Arpadian) period.²³³ On the one hand, information on water management is available in foreign reports, in the scarce domestic narratives,²³⁴ but mainly in charters that remained to us from the 11th-13th centuries. On the other hand, the vast amount of archaeological evidence suggest that water management had rather great importance and impact in the high (and late) medieval period.

Canals and ditches around buildings, villages,²³⁵ or leading the rain/floodwater away towards rivers or fishponds,²³⁶ but also those of regional significance have overwhelming importance in the high medieval period. In 13th-century documentary evidence, ditches (e.g. *fossata*) are one of the most frequent landmarks during perambulation process. Some researchers even suggest that these canals and ditches formed an integrate system (of multifunctional use) in floodplain areas.²³⁷

It is interesting to mention that the signs (and temporary decline) of (integrated?) water-and land-management can be detected in one of the possibly flood-related charter from 1344, in which due to the lack of people and the decline of land (and water) management, the lands of the archbishop's town, Kalocsa, became uncultivated, and thus, the town was surrounded and occupied by smelly swamps.²³⁸ In the Sárköz area (around Kalocsa), in which area some of the important medieval Danube flood events were documented, the integrated floodplain management with water management of dug canals and managed waterflows (Danube branches) provided a highly organised and well-developed agriculture already in the high medieval period.²³⁹ Following the testimony of numerous charter and archaeological evidence, this well could be the case in other areas, too.

While a simple, extensive utilisation of wetlands and open water surfaces was clearly wide-spread in the high medieval period, already at this time, especially in more populated areas, utilisation with semi-intensive and sometimes intensive transformation of water bodies can be detected. For example, many of the 'fok' mentionings (a chanel/canal, leading the freshwater from the river to the floodplain lakes and wetlands during floods), predominantly related to fishing activities, also appeared in high medieval charters. At this time their appearance in documentary evidence is mainly connected to fishing. However, already in the high medieval period (i.e. 11th-13th century) their multifunctional use can be assumed. The spatial extension of the hydrological management term 'fok' can be widely detected all over the lowland areas in the Carpathian Basin: various sections of the Danube, the Tisza and their

²³³ In the Hungarian kingdom and Slavonia roughly similar water management practices can be detected.

²³⁴ For example, Oefele 1891, p. 33 (*Annales Altahenses Maiores*): named as '*opus*' (mid-11th century), while in the 14th-century chronicle composition the same object is called as '*obstaculum*' (SRH Vol. 1, p. 329).

²³⁵ For a prototype, see: Dúdar et al 1991, p. 109.

²³⁶ Ditches led away flood or rainwater: 1296: ÁÚO Vol. 10, ch. 156, pp. 240-241; 1300: ÁÚO Vol. 10, ch. 254, pp. 385-387.

²³⁷ See, for example: Takács 2001, pp. 297-314; Takács 2000, pp. 27-61; Takács-Füleky 2001, pp. 177-180 etc. In his research on (documented) medieval ditches (and canals), Takács claims that in floodplain areas an integrated canal/ditch-system existed, whose remains can be detected in the very high number of documented and archaeological evidence. He detected and studied high-medieval canal/ditch systems in three sample areas: the Rábaköz area, the medieval area of Székács village at the Répce and Cserő waterflows in the Danube floodplain, not far from the Sárköz at Kalocsa town (the Sárköz area appeared in some medieval flood-charters).

²³⁸ Bossányi 1916, ch. 159, pp. 82-84.

²³⁹ See, for example: Andrásfalvy 2007, pp. 13-19. A classic example is the Danube-branch called Vajas, and several other canals, in direct connection with the Danube: even if the natural origin of some of them can be presumed, already in the high medieval period they were clearly artificially maintained.

larger tributaries such as the Nitra, Drava, the Maros, Hernd and the Krs rivers and in their lowland catchments.²⁴⁰ Moreover, occasional findings proved that even in those areas where otherwise no reports on direct intervention are widely available, and merely from the environmental conditions the presence of water-management is not obvious, people did intensively used and influenced/changed wetland environment according to their economic needs (e.g. 'fok'-application at Fert).²⁴¹

Suggesting an intensive transformation of hydrological regime, some documentary evidence suggests that we have to account with the presence of watermills already in the (early) 11th century.²⁴² By the 13th century, watermills and water management related to watermills also play a significant role in the landscape, in the form of river diversion, artificial river branches and damming (with pond). Their importance is rather pronounced and should be emphasised already concerning the 13th century, due to the fact that the milling of wheat in lowland areas, in case of watermills, was exclusively carried out in mills with undershot wheel(s), in which case damming, artificial ponds (water reservoirs) and, alternatively, mill canals were necessary parts of the mill management system. Larger watermills for industrial (textile) use were mentioned in the western (West-Transdanubia) and northwestern parts of the country (e.g. on the Hron river) already in the early 13th century.²⁴³

Late medieval development in an intensively transformed landscape

Due to the rapidly growing number of charters and other written evidence, a much better-documented, and thus well-defined, picture can be presented concerning the late Middle Ages. In general, we can meet up with the same categories/types of water management in the late Middle Ages as listed above concerning the high medieval period. As such, practically all management types, detectable in high medieval times, also appear in late medieval documentation. Still, there are clear changes in their scale, importance and spatial distribution.

Whereas ditches and canals, in general, probably played a somewhat less crucial role in charters of the late medieval period,²⁴⁴ the hydrological term 'fok' and information on related management received similar or perhaps a bit more attention. This is also true for the changes leading towards an even more intensive utilisation of waterflows. Apart from floodplain management, a great increase of fishponds, prepared on waterflows by damming with considerable investment, can be detected in the available 14th, but especially 15th-century charter evidence. Similar to the documentation related to watermills, their importance and serious (environmental) consequences of mismanagement can be clearly followed in the high number of complains of damages (mainly caused by flooding) referring to fishponds and damming systems related.

Watermills and water management connected, clearly became much more relevant in late medieval documentation all over the country. So as related mismanagement and water regulation. Making new, artificial branches or changing the main bed of smaller or larger rivers (e.g. Rba, Zala) clearly meant a significant human transformation of waters; this topic was a subject of huge amount legal debates, preserved in charter evidence.²⁴⁵ As we could see, the same is true for fishponds and fisheries in general, either we talk about intensively or less intensively managed water surfaces. Nevertheless, intensive water management connected to fishery (in the form of artificially-created fishponds) seems to play a much more important role

²⁴⁰ Kiss-Piti 2005, pp. 166-167.

²⁴¹ Kiss-Piti 2005, pp. 164-184; Kiss 2006, pp. 141-152.

²⁴² Vajda 2005, pp. 193-197.

²⁴³ Vajda 2005, pp. 193-220; Vajda 2007, pp. 211-245.

²⁴⁴ An important reason for this decrease could be the great social (and economic) structural changes occurred in and from the 13th century (see previous sections). See, for example: Takcs 2001, p. 309.

²⁴⁵ Vajda 2003, pp. 193-213.

in the late Middle Ages. Due to the intensification of mining and related industries, the intensive utilisation of waterflows (watermills, damming, fishponds, canals and ditches etc) can be as well detected.

Ditches and moats (with damming) play great importance in the late Middle Ages, in such specific cases as towns and fortresses. In case of the local level of individual buildings or houses in the countryside, this fact can be explained by various things (e.g. change in building practices: house floor is not under the surface any more). These changes can be somewhat less easily explained on a regional scale (e.g. changing terminology and/or management practices), and are probably more related to general, social and economic changes. As an additional factor, the impact of environmental change (e.g. in the form of higher groundwater table) might also play some part in the above-mentioned processes.²⁴⁶ To some (at the moment unknown) extent, utilisation and transformation of water regime could also affect flood levels.

2.3.4 Industrial activities, mining and their possible impacts

Stone, clay and also sand mining had, where available, a significant impact on the medieval landscape all over the country. However, there are certain types of mining activities and related industries, which had overwhelming importance not only in the economy of the country but also in land use, vegetation cover (increased need for wood and food), landscape, environment and environmental pollution of specific areas. Among these activities salt and ore mining of specific metals such as gold, silver, copper and iron had the most impact (*Fig. 10*).



10. Fig. Mining areas and their relations to main rivers and river catchments in the Middle Ages (with medieval and present-day country borders)

²⁴⁶ Even if this or any opposite hypotheses cannot be directly and undoubtably supported by documentary or at the moment even by archaeological evidence.

This impact is not only important in general sense, but also concerning floods and surplus-water related problems. On the one hand, industrial activities were accompanied by the intensive utilisation, management and a basic influence on watercourses (ditches, canals, watermills, reservoirs, damming etc). To some extent, this influence could change, temporarily or constantly, the general behaviour of a river (e.g. more chance from 'artificial' flood events on the lower section, or changes in flux etc). On the other hand, mines – especially those with deeper sections – were subject to water inbreak problems or constant flooding, which required more investment (in technical equipments) on the long run. Thus, due to their great impact on landscape, river systems and sensitivity on water inbreaks, it is important to provide a brief overview of these dominant mining activities.

2.3.4.1 Salt mining and its relation to hydrology and environment

Documented from the 11th century, due to its fundamental importance in food preservation, salt mining played a crucial role in Hungary. The quantities mined were sufficient enough to be exported, latest from the second half of the 12th century. Main areas of salt production (see *Fig. 10*), predominantly in the form of salt cutting, were located in and around the Transylvanian Basin, South-Transylvania and the Maramureş Basin, with the centres of Dés (Dej-Ro) and Torda (Turda-Ro), and partly in Sóvár (near Prešov-Sk).²⁴⁷

From Transylvania, salt was transported to the inlands of the country on and along two main waterways, namely the Szamos and the Maros rivers (see *Fig. 10*). Thus, in the Middle Ages busy roads, bridges, damming and heavy transportation can be presumed along these two main rivers of Transylvania, due to the primary importance of salt transport in large quantities. In case of more severe flood events (damaging bridges), a more constant period of flooding or low water levels could cause serious problems, even in the general salt supply of the country.²⁴⁸

As for transformation of landscape and environment in historical salt mining, industrial pollution of salt mining in Szék (Sic-Ro), for example, in the form of collapsed (medieval) salt mines, salt cover on the ground around salt-wells (early modern) generally resulted completely bare surfaces without vegetation. Moreover, gathered due to the industrial activity, the high population density of the area meant an increased need for wood and food production. This increased and solvent demand caused the intensive use of environment in the form of deforestation, overgrazing of hillslopes (and thus, intensified soil erosion), and the creation of several fishponds in the landscape, sometimes associated with (high medieval) flood events.²⁴⁹

In salt mines (salt cubes cut) an early and rather threatening problem was water inbreak. With the adit level, located under the soil layers containing groundwater, sometimes miners reached aquifer strata containing (deep) waters.²⁵⁰ Thanks to the fact that salt mining was a royal monopoly in the Middle Ages, problems in salt production and transport are reported and some of these reports remained to us (e.g. related to flood). Presumably such a medieval case was mentioned, for example, in 1440.²⁵¹

²⁴⁷ Frisnyák 1992, pp. 30-33.

²⁴⁸ For a salt-transportation related medieval flood charter, see: DL 65441 (04.07.1496).

²⁴⁹ For environmental impacts and for sources concerning medieval floods related to fishponds, see Farkas-Kiss 2008, pp. 62-67.

²⁵⁰ See, for example: Faller 1997, chapter 10. <http://www.scitech.mtesz.hu/04faller/faller7to10.htm#f10>.

²⁵¹ DL 55213 (19.06.1440).

2.3.4.2 Ore mining and its relation to hydrology and environment

In the 11th-13th centuries, ore mining and metal industry were carried out mainly in valleys of streams, rivers and in the intramontain basins. Main centres of iron production were Vasvár (in Vas county), Vasvár (Ózd) in Borsod county; on the basis of local raw materials in the Rudabánya and Upponyi Mountains. Moreover, there were some local mines in hilly and lowland areas. Changes started with the second half of the 13th century: centres of iron production moved to higher terrains, to the Gömör-Szepes (Slovenské Rudohorie) and Osztrovszki-Vepor (Veporské Vrhy) Mountains (in present Slovakia), and to the area of Vajdahunyad (Hunedoara-Ro) and Torockó (Rimetea-Ro) in Transylvania (see *Fig. 10*).²⁵²

Mining and processing of gold, silver, copper, and to some extent lead and mercury mainly took place in the area of the Gömör-Szepes (Slovenské Rudohorie) and Osztrovszki-Vepor (Veporské Vrhy) Mountains in present Slovakia, and in the area of Munții Metaliferi in Transylvania, in the area of present West-Romania (*Fig. 10*).²⁵³

Ore mining of precious metals had its peak period in the 12th-15th centuries,²⁵⁴ when it played crucial role in the European market from the second half of the 13th century, which meant an amount of 1,000 kg gold per year (80% of whole Europe's gold production), and in silver 10,000 kg/year (25% of Europe's production).²⁵⁵ By the second half of the 14th century, annual production reached 2500 kg in gold and 10,000 kg in silver. The annual amount of mined ore declined by the end of 15th century to 1500 kg in gold and 3000 kg in silver.²⁵⁶ The great development of copper mining (and export) started a bit later than that of precious metals, from the second half of the 13th century onwards, and took place in the same areas as precious metal production.²⁵⁷

This also means that – latest from the second half of the 13th century, but especially after 1327 when King Charles Robert I repealed the royal monopoly on mining²⁵⁸ – one has to account with intensive human impact, landscape (e.g. deforestation) and hydrological changes (e.g. river alterations, mill-canals, damming) along the upper courses of the Nitra, Žitava and Hron rivers and their upper tributaries in present-day West-Central Slovakia, and on the Slaná (Sajó-H) and Hornád (Hernád-H) upper catchments in the areas of present East-Central Slovakia. In these areas, from the 13th century onwards, several royal mining towns (and mining districts: Lower- and Upper-Hungarian, Transylvanian) developed (see *Fig. 10*).

For example, by 1347 in a three-mile area around the mining town of Nagybánya (Baia Mare-Ro), in a formerly heavily forested area, there was no sufficient forest with timber supply for building houses and adits. Thus, miners asked for permission to take timber-wood from the royal forests and those of other landowners. The first known regulations of forestry (in royal forests), dated to 1426, was also organised according to the (timber) needs of mining.²⁵⁹

The example of the high-quality ore reef of Telkibánya well demonstrates how destructive the medieval ore mining could be on the environment: the Telkibánya reefs were

²⁵² Frisnyák 1992, pp. 29-30.

²⁵³ Miners and metal workers were often foreigners from German-speaking areas, and from Silesia, Moravia and Czechia (see *Table 1* above).

²⁵⁴ Importance of precious metal ore mining and the significance of its mining centres can be detected in the Hungarian documentary evidence mainly from the mid-13th century onwards. See: Wenzel 1880, pp. 19-24, 34.

²⁵⁵ These amounts are the minimum values estimated for around 1300. Gold production, for example, was most probably more than this value. See: Benke 2001, p. 20.

²⁵⁶ Frisnyák 1992, p. 33.

²⁵⁷ Frisnyák 1992, pp. 35-36. In this process the settling of miners and metal workers from Tirol and Thüringia played a quite important role. Medieval copper production varied from around 8-1200 to 3000 tons per year.

²⁵⁸ See, for example: Benke 2001, p. 25 (for its importance in mining); Engel et al. 2002, p. 58 (for the importance in socio-economic processes).

²⁵⁹ Tagányi 1896 Vol. 1, ch. 69, 87, pp. 20, 25. See also: Introduction pp. XV-XVIII.

with very high gold and silver content; still, ca. 1 ton of stone had to be mined and processed to gain 20 gr of gold and ca. 240 gr silver. While up to the 15th century mining predominantly meant surface or near-surface mining, from the end of the 15th century it turned more towards deep/undersurface mining with considerably higher investments (both financial, technical and human labour). This was, amongst others, due to constant problems of inbreaking waters (first known mentioning: 1421) or air circulation.²⁶⁰

2.3.5 Human environment and human impact in the Middle Ages: an overview

Even if great regional differences can be detected, the population density of medieval Hungary was under the European average. Despite this fact, practically all main socio-economic and landscape transformation processes also took place and could be followed (even if with different timing) in Hungary, from the high and late medieval expansion and forest clearance, through settlement and land desertion in high and late medieval period, accompanied by inner migration and urbanisation processes. In socio-economic and landscape development, especially in the high medieval period, immigrant groups (both western and eastern) played an important role, either we talk about the intensive transformation or the extensive use of landscape.

Important agricultural and technical changes also occurred in the studied high and late medieval period which, among other reasons, resulted a rather intensively occupied and utilised (and thus, transformed) landscape already at the end of the high medieval period, which landscape transformation – accompanied by intensive forest clearance – intensified in the last centuries of the Middle Ages. It is clear that not only vegetation and the landscape itself went through an intensive transformation, but also a significant impact and management of the hydrological system, including the diversion of smaller and larger rivers, utilisation of inundation areas and creation of fishponds, also took place in this period. Moreover, mining and the concentrated landscape and hydrological management related – intensifying from the 13th, but especially from the 14th centuries – also played a crucial role in the landscape transformation of hilly and mountain areas.

Whereas until late medieval times large areas of the country reamined uninhabited, and even in late medieval times human impact payed only an extensive role landscape transformation, in some other areas transformation of the environment, due to more population or more industrial activities (e.g. Balaton-area, Buda-Pest agglomeration, Zemplén mining areas etc), could be even more intensive in the high and late medieval period than in the early modern (or even modern) times. The intensively or extensively transformed environment, either talking about vegetation cover of catchment areas or direct human impact on the hydrological regime itself, might have influenced flood water-levels, magnitudes and intensities (i.e. destructivity) of flood events. And thus, on the long-term, climate variabilities (i.e. as a sorce of water) most probably played a crucial role in flood frequencies and magnitudes, human-induced changes in the hydrological regime could as well have a changing, but important role, too. Nevertheless, at the moment it is rather difficult to estimate to what extent human impact changed long-term natural processes.

²⁶⁰ Frisnyák 1992, p. 35; Benke, p. 53. From the second half-end of the 15th century, similar to Austria, the Fuggers (through the Thurzó family industry) made considerable investments in the technical improvement of mines. See Wenzel 1880, pp. 164-169. The problem of inbreaking waters is known from an official letter (order), written in 1421 (regulations concerning the reopening of mines inundated by water), and copied or renewed at least twice in the late 15th and early 16th centuries. See: 1421: Csáky Vol. 1/1, pp. 308-310.

3 Long-term changes in the hydrological regime

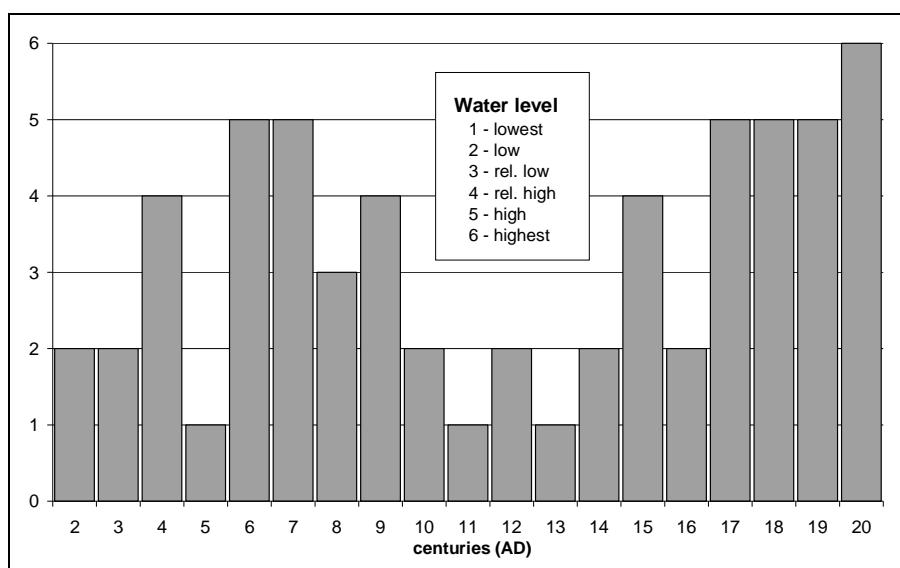
In order to understand patterns in the hydrological regime of the two main catchment areas of the Carpathian Basin, apart from general information on modern hydrological conditions, it is necessary (if possible) to follow long-term, millennial changes and trends in water levels, too. These water-level reconstructions, together with the information derived from some documentary evidence, may provide us with data to better understand long-term changes in the hydrological regime.

3.1 Millennial-scale reconstructions: role of palaeoenvironmental evidence

Some recent palaeoenvironmental investigations can provide us with new results related to the medieval variabilities and water-level variabilities of major lakes, and changes occurred in the hydrological regime of the Carpathian Basin. In our present case this means sedimentary-based water-level evidence, and also wetness/precipitation information, preserved in stalagmite records.

3.1.1 Sedimentary-based long-term, low-frequency evidence: Baláta and Nádas Lakes

Among the natural scientific research on lakes, the reconstruction of Lake Nádas provides us rather important evidence concerning the high and late medieval (generally rising water-level) conditions, with a hundred-year resolution.²⁶¹ The palaeoenvironmental reconstruction of water-level conditions of Lake Nádas in northern Hungary (Nagybárkány, Cserhát Mts), was discussed in the paper of Sümegi and his colleagues. According to their near 2000-year reconstruction (*Fig. 11*), after the predominantly high water-level conditions, prevailed from the 6th to the 9th centuries, low or very low water levels existed between the 10th-14th centuries. After a 15th-century interruption similar conditions were observed again in the 16th-century.



11. *Fig. Prevailing water levels of Lake Nádas in the last 1900 years (source of data: Sümegi et al. 2009)*

²⁶¹ For more information, see chapter 2.1.1.2.

Taking into account factors other than climate, in some periods (in a limited extent) human impact was certainly present in the area.²⁶² Still, the authors claimed that the high water-level conditions of the Migration period (6th-9th centuries) and the prevailing low levels of the 10th-13th centuries clearly show some low-frequency precipitation signal. Interestingly enough, according to the results of the pollen-sequence analysis, the 14th-century – together with the 17th century – still belonged to the periods characterised by low water levels.²⁶³

From the complex (pollen, macrobotanical) palaeoenvironmental investigations of Lake Baláta (located south of Lake Balaton) it can be concluded that a clear desiccation process and low water levels can be traced between about 1000-1300, with a drop in the water level around 1100. The break around 1300 is the end of an old and the starting point of a new period.²⁶⁴ This period, characterised by predominant low water-level conditions, was clearly connected by the authors to the Medieval Warm Epoch (Medieval Climate Anomaly). A clear change around ca. 1300, otherwise, also appeared in the vegetation and environmental history (reconstructions) of the Szigliget- and Keszthely-bays, in Lake Balaton.²⁶⁵

In addition, important is the fact that recent investigations related to the Baláta Lake have proved the existence of a burnt horizon in the turf, dated to the 13th century, which means that rather dry (and warm?) period prevailed at that time. Minimum water level can be detected before the fire, combined with a complete disappearance of some typical aquifer species (*Phragmites*, *Schoenopletus*). It should be also mentioned that human impact (agriculture) in the area was intensive in the high medieval period. This was followed by a rapid water-level rise and an increased spread of reeds (*Phragmites*), an expansion and redevelopment of swampy conditions (paludification), especially in the second half of the 15th century.²⁶⁶

3.1.2 Millennial stalagmite-based precipitation information: Bükk Mountains

Beside temperature and vegetation cover, millennial changes of precipitation regime is discussed by Siklósy et al., based on high-resolution stable isotope and trace-element analyses. According to their decadal-level investigations (Fig. 12), the Medieval Climate Anomaly (MCA) was wet and warm (mainly based $\delta^{18}\text{O}$ - and $\delta^{13}\text{C}$ -related information). The MCA (ca. 1000-ca. 1150) was followed by a transition period (ca. 1150-1550) with dry spells, and then a cooler but humid Little Ice Age (ca. 1550-1670) occurred.²⁶⁷ Stalagmite-based periodisation is rather interesting, because in these investigations a short MCA, a long transition period, and then again a relatively short LIA were recognised.

²⁶² See Sümegei et al. 2009, p. 281.

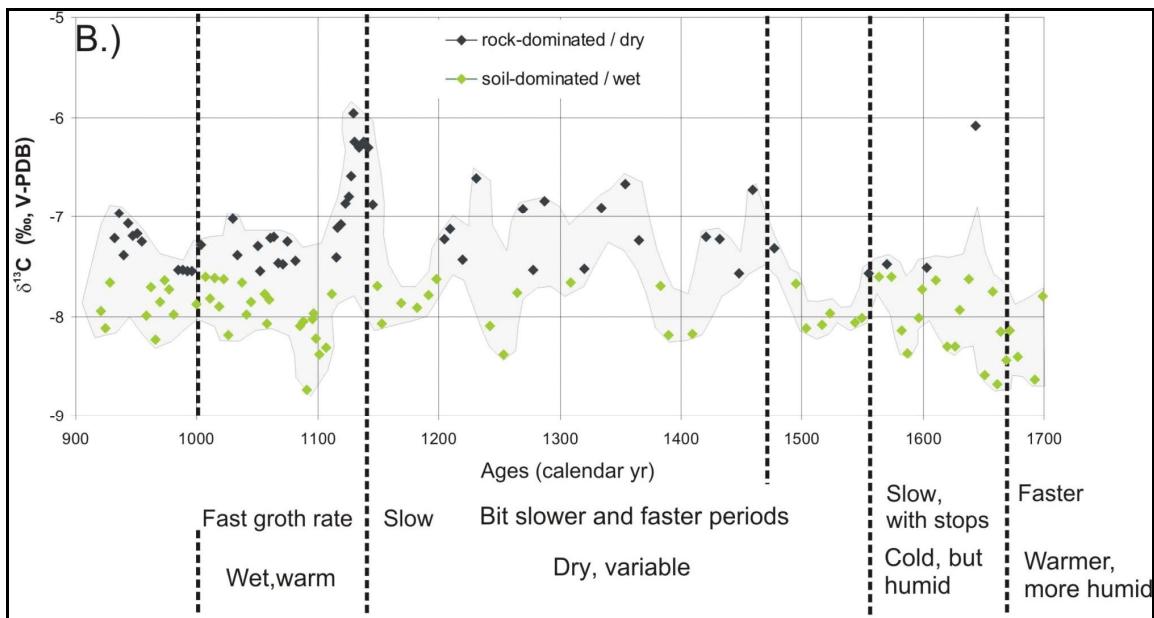
²⁶³ Sümegei et al. 2009, pp. 265-298.

²⁶⁴ Jakab-Sümegei 2007a, p. 249; Juhász 2007, pp. 245-246; Zatykó et al. 2007, pp. 246-247, 249, 251-252. It also should be added that the lake was subject to continuous human activity also in the following, late medieval period, up to the Turkish occupation of the mid-16th century, and this exploitation was even more intensive during the Turkish (Ottoman) period.

²⁶⁵ See phase Fagus 2 in: Nagyné Bodor-Cserny 1998, pp. 360-363.

²⁶⁶ Jakab-Sümegei 2007, pp. 251-252; Sümegei et al. 2010 (accepted).

²⁶⁷ Siklósy et al. 2009, pp. 245-263.



12. Fig. Carbon isotope ($\delta^{13}\text{C}$) based reconstruction of wet-dry and warm-cold phases: 900-1700 (decadal resolution) by Siklósy et al. (2009)²⁶⁸

Supported by low P and $\delta^{13}\text{C}$ (in good correlation with Sr and lamina width) and high $\delta^{18}\text{O}$ concentrations, periods of drier conditions (with either a decrease in the annual mean temperatures or longer winters) were detected between ca. 1150/1200 and 1500/1550 in the cave environment of the studied stalagmite sequence. Nevertheless, altogether "the climate experienced several warmings and coolings and important changes in the precipitation amount over the MCA–LIA transition, both with slower and faster growth rates, compared to the MCA."²⁶⁹

Concerning short-term information, we are in the fortunate position that – compared to the other palaeoenvironmental reconstructions where only data in 100-year resolution is available – stalagmite reconstruction provides evidence in decadal resolution. Thus, even if it is clear that data is a bit relative (e.g. we naturally have to account with some uncertainties), some conclusions can be drawn also on a multi-decadal level. From the viewpoint of the flood-related investigations, especially the wet-dominated short periods of the last, roughly three hundred years of the Middle Ages, thus the so-called 'transitional period', play special importance. It seems that shorter or longer wet phases were detected in the second half of the 12th, mid-13th, beginning of the 14th, turn of the 14th-15th and that of the 15th-16th centuries (see Fig. 12).

3.2 Archaeology- and documentary-based information and reconstructions

Before the introduction of relatively high-resolution (on at least a hundred-year basis) palaeoenvironmental water-level reconstructions, medieval water-level conditions and changes – either of a lake, river or groundwater – were predominantly detected by applying the results of archaeological investigations and some documentary evidence. The reconstructions based on

²⁶⁸ Siklósy et al. 2009, p. 256, Fig 5(B.): "... carbon isotope record plotted against the age-relationship of the studied stalagmite. Vertical dotted line indicate hiatus and/or marked textural changes during the selected growth period Black dots represent carbon isotope values greater and green dots represent lower carbon isotope values than the average of the total section"

²⁶⁹ Siklósy et al. 2009, pp. 259, 261.

these data are rather schematic. Nevertheless, still it provides an (robust) overview of long-term changes and overall water-related environmental conditions which prevailed in the Middle Ages. In this chapter not only the basic findings and reconstruction-results are listed, but also some critical remarks are provided on the problems and pitfalls of some of these widely-accepted reconstructions. Moreover, based on some additional, contemporary written evidence the overall hydrological conditions of the high and late medieval study period are as well presented and examined.

3.2.1 Information on detected groundwater-level changes (archaeology-based)

Although in the early 1990s some medievalists, referring to documentary evidence, already raised attention towards possible long-term hydrological changes (e.g. greater river discharge, high flood frequency), up to the last years no systematic investigations were carried out in this question from the side of medievalists.²⁷⁰ In terms of systematic investigations, more was done by archaeologists (who were in many cases local historians as well) and scientists of related disciplines.

An interesting, early set of examples, reflects the changing average water level and/or increased flood levels of the Danube. A long-term process, affecting settlement and building conditions even in the late medieval period, was observed at the castle and town excavations in the Danube Bend, in Visegrád. In this case, a clear water-level rise of the Danube between the 13th to the 16th centuries was detected by Héjj.²⁷¹ Some recent investigations also seem to support this early theory.²⁷²

Later studies proved that roughly the same process can be detected at other excavated sites and historical buildings (e.g. Esztergom, Vác).²⁷³ The main aim of these studies was to present the evidence on long-term water-level rise. This meant a comparison between a certain part of the Middle Ages and present-day conditions, with special emphasis on the time of the excavation. According to these investigations, the water-level rise from the Middle Ages is around (1.5-)2-2.5 m, depending on locations. Naturally, amongst other reasons, this can as well be the result of increased sedimentation processes, and not necessarily a result of climatic processes. Moreover, already Héjj warned attention to large-scale human impact on the Danube as a potential reason for increased rise of Danube water levels.

Other individual evidence on long-term water-level change, due to groundwater-level rise, was observed in the swamps of the Zala river (not far from the Balaton, close to Zalavár and Zalaszabar). In this case the pavement of the Récéskút basilica, located on a former island, was raised in the 14th century. Although no tan integrate part of the lake, this evidence was also applied in the water-level reconstruction theory of Bendefy and V. Nagy (1969). At the

²⁷⁰ Györffy-Zólyomi 1994, pp. 13-37. Fügedi 1992, pp. 10-60. Györffy mentioned only his general impressions, thus providing actual names and actual documentary evidence, about waterflows with present-day little water-holding and carrying capacity. On these small waterflows mills worked (therefore had to have much more water) in the 14th-15th centuries. Erik Fügedi also raised attention to the possibly increasing flood frequencies, through the example of the general reference on the regulations around the ferry on the Hortobágy river, included in a charter issued in 1342. For scientific/historical literature overview, see: Kiss 2009a, pp. 315-339.

²⁷¹ Miklós Héjj's investigations of settlement development, based on the excavations of the medieval royal centre and civil town of Visegrád, suggested a long-term rise of Danube (high or flood) water levels (in its Danube Bend section) from the 13th century onwards. See Héjj 1988, pp. 63-67.

²⁷² Moreover, the (high or flood) level of the Danube was much lower still in the Middle Ages than it is today. See Mészáros 2008, p. 7; Mészáros 2006, pp. 145-168.

²⁷³ It is also a difficult problem (e.g. for architects), since these (by now problematic, wet) sites are in fact presently inhabited historical buildings in historical towns, such as Esztergom, Szécsény, Vác or Kőszeg etc. See, for example: Vukov 2007.

same Récéskút (Zalavár) island area, in a former church (later manor house area) the well was closed down with a stone sheet, presumably around the turn of the 14th and 15th centuries, due to the increase in groundwater-table.²⁷⁴

In the unpublished PhD dissertation of the dendrochronologist András Grynæus, related to the (13th-century) excavations in Szécsény (Northern Hungary), not only the significantly (about 2 m) lower groundwater-level (compared to 1993) in the high medieval Szécsény-well was described, but the oak wood remains, too. The wood of the well, presumably reflecting past vegetation of the closer area, was detected as *Quercus petrea*, namely the oak type favouring dry environment, which might be an indication of late high medieval conditions in the broader area.²⁷⁵

3.2.2 Water-level reconstructions of Lake Balaton: the Middle Ages and beyond

Concerning Lake Balaton two millennial-scale water-level reconstructions exist (Bendefy-V. Nagy 1969; Sági Füzes 1973). Already in the 1960s and 1970s, perambulation charters were applied to detect actual water-levels of Lake Balaton, in the case of both known reconstructions.

3.2.2.1 Balaton-reconstructions on a millennial scale: an overview

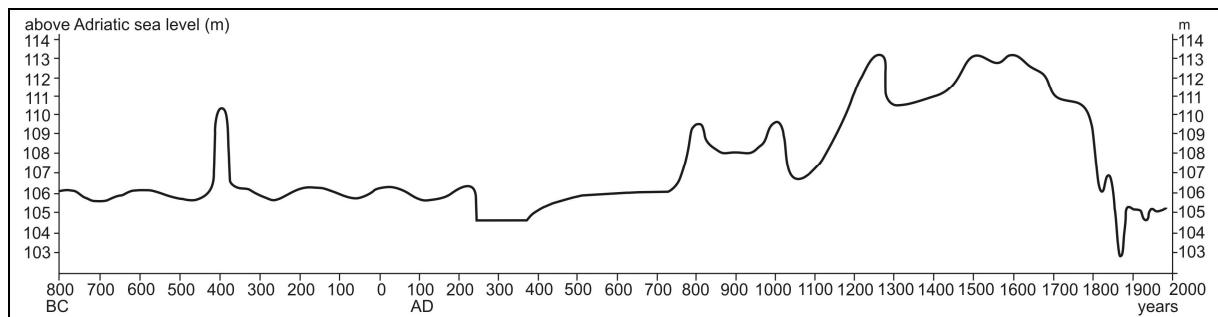
By studying the water-level fluctuations of Lake Balaton, an advantage is its relative shallowness, but especially its small, well-defined catchment area situated in the west-central part of the Transdanubia in Hungary. In a book by Bendefy and V. Nagy on the water-level changes of Lake Balaton (Fig. 13), there is a clear attempt to apply contemporary medieval, early modern and modern documentary evidence.²⁷⁶ Although the book is still widely-accepted and used by natural scientists, the authors' interpretations of historical, cartographic and archaeological evidence are often problematic and conclusions drawn are in many cases conceptual.²⁷⁷ According to the authors, water-level variabilities and changes are mainly related to direct human activity, and much less to any natural reasons.

²⁷⁴ Bakay et al. 1966, p. 185. In this case a *terminus post quem* dating was applied, with the help of coins dated to the mid- and late 14th century (king Lajos I, queen Maria I and king Sigismund). See: Mordovin 2007, pp. 65-76. It also has to be mentioned that the details concerning the excavation and original position as well as (wooden) structure of the well are only known from the much earlier documentation of a previous excavation taken place in the same area. In this sense, the author refers back to a previous publication: Radnóti 1948, pp. 21-30.

²⁷⁵ In Hungary both the *Quercus petrea*, favouring dry conditions, and the *Quercus robur* of wet conditions can be found. Depending on the hydrological conditions of the area (both in space and time) the proportion of these two types can be rather different. In our case *Quercus petrea* in this hilly area means drier conditions. For more details, see: Grynæus 1997.

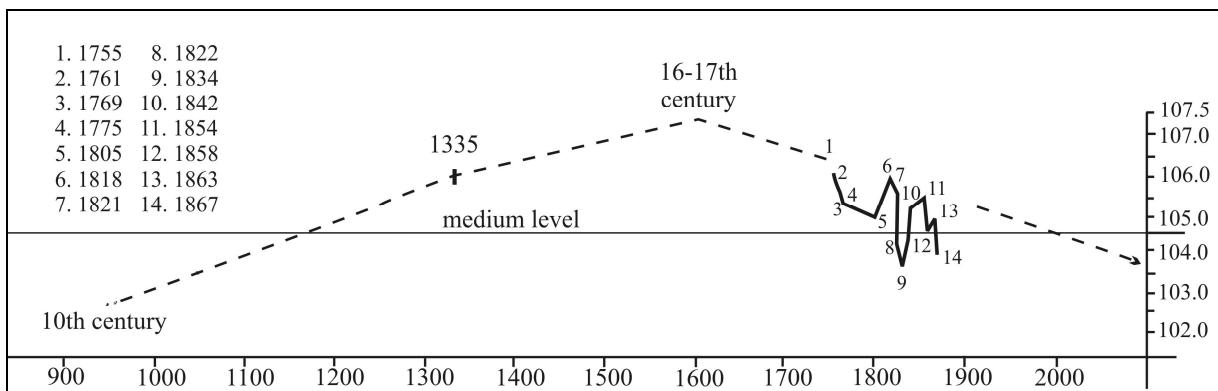
²⁷⁶ Bendefy-V. Nagy 1969, 215 p.

²⁷⁷ See, for example: Gyulai 1986, p. 157.



13. Fig. Water-level fluctuations of Lake Balaton in the last 2800 years according to Bendefy and V. Nagy 1969

This last fact shows one of the clear differences from the other water-level reconstruction of the Balaton (Sági-Füzes 1973). In the later case the authors emphasised the importance of climate-related hydrological changes on the first place, although they did not deny the role of (mainly indirect) human impact (Fig. 14). Since in some cases the results of Bendefy and V. Nagy (1969) clearly contradicted with the other existing reconstruction of Sági and Füzes (1973; better accepted amongst historians and archaeologists) a well-known, long-lasting 'Balaton-debate' developed in the early 1970s, concerning medieval and early modern water levels.²⁷⁸ Another important difference was that, while in the case of the first water-level reconstruction human influence played an important role in the medieval and early-modern periods,²⁷⁹ the other reconstruction viewed climate fluctuation as the factor primarily responsible for the historical water levels of Lake Balaton.²⁸⁰



14. Fig. Water-level changes of Lake Balaton in the past millennium, given by Sági and Füzes (1973)²⁸¹

On the other hand, in both papers there was a clear agreement on the fact that the average water level of the Balaton underwent a slow rise in the high and later Middle Ages. The changing human impact on the only natural outflow (Fok river) of the lake by itself, however, cannot be alone responsible for this significant increase, since in the 14th century up to the early and mid-16th century contemporary sources show a survival of earlier utilisation

²⁷⁸ Sági 1970, pp. 200-207. Bendefy 1972, pp. 335-358; Sági-Füzes 1973, pp. 247-261. For conclusions over problematic points see for example: Gyulai 1986, pp. 135-168. For an early application of the Sági-Füzes reconstruction as a background in interpreting documentary-based climate information see, for example: Kiss 1996, pp. 66-67; Kiss 1997, p. 241.

²⁷⁹ Bendefy-V. Nagy 1969; Bendefy 1973, pp. 113-128.

²⁸⁰ Sági 1968, pp. 441-468; Sági and Füzes 1973, pp. 247-261.

²⁸¹ Sági 1968, pp. 441-468; Sági-Füzes 1973, pp. 247-261.

and management practices (mainly mills) of the Fok river, and thus, the concept of a fundamental change in direct human impact cannot be proved.²⁸²

According to the reconstruction of the archaeologist-local historian Károly Sági and the palaeobotanist Miklós Füzes (*Fig. 14*), after the dry conditions of the Migration Period, when the water level of the Lake decreased to 103.4 m (a.s.l.) or below,²⁸³ a slow rise started from the 10th century which continued throughout the high and late medieval period. Although they (in agreement with Bendefy and V. Nagy 1969) argued that a charter issued in 1335 provided clear evidence on the exact location of the contemporary shoreline,²⁸⁴ this argument was not described in detail, and no evidence is available concerning any testing of the hypothesis in the field. Another case is similarly connected to the western and southwestern shorelines of the Lake: according to both reconstructions, the water-level rise could be clearly followed in the sedimentation in and over the early medieval-medieval church, located on the former island of Máriaasszonysziget, at the village of Vörs.²⁸⁵

Based on the above-mentioned evidence referring to the (first part of the) 14th-century, the water level of the Lake was about 106 m a.s.l.²⁸⁶ Although no direct evidence is available, it was presumed that the rising tendency continued throughout the late Middle Ages, and the water level reached its peak at the turn of the 16-17th centuries. It should be also added that, according to the Sági-Füzes reconstruction, this had been the first time since the Neolithic period when the water level rose above its present level. It is interesting to note that all the existing reconstructions assumed a decrease in the water level from the 17th century onwards.²⁸⁷

Nevertheless, we also have to take into account some further uncertainties of interpretation:

1. With the application of archaeological methods, it is possible to fix the prevailing maximum water level of a certain period, but often no information is available about minimum or medium water-level conditions.²⁸⁸ Moreover, archaeological methods, similar to the known documentary evidence, do not allow us to provide frequently and regularly available data on the water-level change. Thus, we can only talk about tendencies of changes, which is also suggested by Sági and Füzes in their above-mentioned paper (1973).

2. Another problem is that already in the 1960s and 1970s western European water-level and climate reconstructions were directly applied to fill in the great gaps in the Hungarian database. Thus, when no Hungarian evidence of water-level conditions was available (e.g. in the 15th-16th centuries), the water-level reconstruction of Lake Balaton was simply interpreted, fixed according to what happened in Europe west to us, with special attention to the water-level changes of alpine lakes. Sometimes documentary sources, otherwise not really suitable as a water-level evidence, were (mis)interpreted and explained in such way that it 'should' have fit the western-European tendencies.²⁸⁹

²⁸² Kiss 2009b, pp. 49-63.

²⁸³ This information on late early-medieval and early high-medieval low- water-level conditions were greatly supported by the results of the palaeobotanist Ferenc Gyulai.

²⁸⁴ Nagy 1886-1890, pp. 294-307.

²⁸⁵ See, for example: Füzes-Horváth 1971, pp. 491-497. Bendefy 1973b, pp. 143-151.

²⁸⁶ During the water-level debate there was agreement on both sides concerning the 14th-century water-level rise.

²⁸⁷ The water-level fluctuations and changes, described here, are mainly based on the investigations of Károly Sági ad Miklós Füzes (1973). This straight and somewhat abrupt water-level rise (at least in the long-run), presented in the Sági-reconstruction provides only a simplified picture. As we shall see later, other, more detailed paleoenvironmental reconstructions may completely contradict it in some cases. For, example in the life of Lake Nádas the 13th-century, which was also reconstructed as a rising water-level period by Sági (for Lake Balaton), appears to be one of the driest parts of the last millennium (see Sümeg et al. 2009a, Sümegi et al. 2009b). These reconstructions can be as well supported by some results of dendrological investigations (see: Grynæus 1993).

²⁸⁸ Sági 1968, p. 442.

²⁸⁹ As an example, see Kiss 2005b, pp. 325-331. In reality, all the quoted medieval charter evidence, referred to in the book by Bendefy and V. Nagy (1969) could be raised here as examples of this problem. Moreover, similar

3. A third source of uncertainty can be related to geological processes: tectonic movements (a), and the (changing) rate of sedimentation (b):

a. Whereas the sinking process of the Balaton tectonic line/basin has been 1 mm/year in the last few decades, the same but opposite process can be followed in the areas around the Lake, especially in the area of the Balaton Uplands.²⁹⁰ Excluding the 'waste' caused by erosion, and accounting with the present-day magnitude of tectonic movements, in a 1000-year period this means about 2000 mm, thus around 2 m difference between the uplands and the lake basin. This means rather minor difference – but only if we accept the theory that this rate of tectonic movements was not significantly higher at any time of the last 1000 years.

b. A parallel process is sedimentation, in which case the annual rates can vary in different parts of the Lake basin. According to some investigations based on a 40-year dataset (1950s-1990s), this rate was 14 mm/year generally in the Lake basin, whereas at the eastern edge of the Szigliget-bay it was 5 mm/year; however, this could again vary quite much in other parts of the Lake basin (e.g. due to increased human impact on the landscape and changing erosion patterns).²⁹¹

While the Sági-Füzes reconstruction (*Fig. 14*) provides rising water levels up to 1335, and a somewhat slower rise after this time up to the turn of the 16th-17th centuries, the Bendefy-V. Nagy reconstruction gives rising water level up to the mid-13th century, then a rapid decrease which is followed by a slow rise from 1300 up to the second half of the 15th century when this rise fastens up again. Based on this rough comparison we could simply say that they all more or less agree: rising water-levels throughout the late medieval period.

3.2.2.2 The two reconstructions: 'decent' versus 'popular', 'climate' versus 'human'?

The Sági-Füzes reconstruction (1973) provides a very schematic picture, namely an almost constant, slow rise of the water level throughout the whole high- and late-medieval study period. In contrast, just by looking, for the first sight the Bendefy-V. Nagy reconstruction (1969) seems to be a much more elaborated, professional and detailed version (explained, sometimes with self-contradictions, through an entire book) which is, therefore is more tempting for further scientific application, and in fact received and even today receives much more publicity than the Sági-Füzes one.

However, whereas the Bendefy-V. Nagy reconstruction is predominantly based on archaeological data and documentary evidence, exactly archaeologists (also archaeobotanists) and historians are the most against, and refuse this Balaton reconstruction. It is due to the fact that those parts of the Bendefy-V. Nagy reconstruction which differ from the Sági-Füzes reconstruction are based on misunderstanding and misinterpretation of contemporary documents and results of archaeological investigations. Moreover, some false theories, treated and presented as facts, are also included, which theories have never been tested against any facts or other information. For example, the water level of the Lake 'must have been' artificially risen because of the Mongol invasion²⁹² – when in fact no contemporary information (either

problems occur concerning the interpretation of some archaeological and geodetic survey materials. Sági and Füzes in their common paper (1973), and so as Gyulai (1986) raised the problem of the several misinterpretations of Bendefy-V. Nagy, for example, concerning some medieval evidence (e.g. the case of Máriaasszony-sziget).

²⁹⁰ Joó 1996, pp. 6-12.

²⁹¹ Rate was measured with the help of radioactive isotope analysis. See Bodorné Nagy-Cserny 1998, pp. 364-366.

²⁹² Bendefy-V. Nagy 1969, pp. 32-33.

documentary or archaeological) is available proving the existence of major direct human impact on the water level of the Lake in the entire high-medieval period.²⁹³

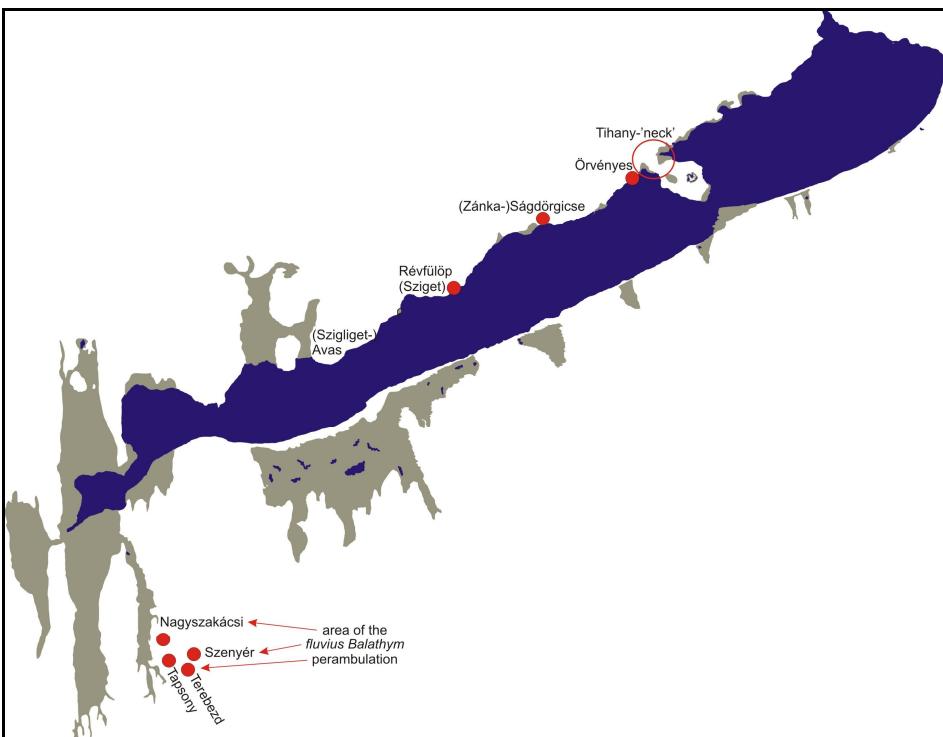
Even if the authors applied a rather large number of documentary evidence partly related to the high, but mainly to the late medieval period, this evidence (if not forged) rarely provides information punctual enough to give such a detailed elevation-based data, how the authors apply them in their reconstruction. Moreover, in some cases in the perambulation evidence the areas described were not even located in the immediate neighbourhood of the Lake. For example, the connection between the name '*fluvius Balathym*' and the mid-14th century water-level of the Lake, provided by Bendefy and V. Nagy,²⁹⁴ can be debated. Some further questions concerning the contemporary documentary evidence available on the mill(s) of the Fok river, the outflow of the Balaton in the Middle Ages were as well studied. Common results were that none of the documentary evidence, concerning *fluvius Balathym* or the Fok outflow, can be so directly connected to the actual water-level conditions of the Lake, and in reality documentary evidence provide a different, more general picture.²⁹⁵ The (over)interpretation of the latin word '*insula*', which was not necessarily equivalent to the meaning of an 'island' in the Middle Ages, resulted in the conclusion that the entrance of Tihany peninsula had to be covered by water and thus, the average water level of the Balaton had to be very high.²⁹⁶

²⁹³ For the information on the only outflow of the Lake, see: Kiss 2009b, pp. 49-63.

²⁹⁴ Bendefy-V. Nagy 1969, pp. 39-40.

²⁹⁵ Kiss 2005b, pp. 325-331; Kiss 2009b, pp. 49-53. Csilla Zatykó in her study, related to the environmental history of Baláta Lake (Zatykó 2007, p. 262), raised attention to the fact that the results of the palaeoenvironmental investigations concerning Lake Baláta agreed with the conclusions Bendefy and V. Nagy suggested on the high water-level conditions of Lake Balaton, based on the swampy or wetland conditions of *fluvius Balathym*, presumably flowing into Lake Balaton. The problem in this case (and with the Bendefy-V. Nagy reconstruction) was not with the conclusions, since it was already in the late 1960s known that in Europe the mid-14th century was a famous wet-cool period, so a parallel situation in the western areas of the Carpathian Basin would not have been surprising. There is a problem rather with the fact that those conclusions could not be based on the raised example. The geographical conditions of the area mentioned in their book (in the perambulated area – Tapsony, Terebezd, Szenyér – we are talking about elevations of 150-170 m a.s.l, while the water level of Lake Balaton is around 104-107 m a.s.l!) and the waterflow (Sár) could be swampy and wet without having any direct connection with the water levels of Lake Balaton. Thus, based on the listed charter evidence those general conclusions, suggested by Bendefy and V. Nagy (1969), could not be drawn concerning the high water-level conditions of Lake Balaton in 1347 (date of charter). Consequently, the authors had to have other reasons while arriving to such significant conclusions, which conclusions, however, are in very good agreement with general European conditions of those times (see the works of H. H. Lamb in the 1960s). Due to the fact that, on the long term, many similarities can be observed between the processes of West(Central) Europe and those of the Carpathian basin, it is not surprising that their general statements showed connections to results of the Baláta Lake investigations (carried out by Sümegi et al. 2007, pp. 237-266).

²⁹⁶ First documented in the foundation charter of its Benedictine abbey (1055: DHA Vol. 1, p. 149) and several times later (e.g. 1211: ÁÚO Vol. 1, ch. 61, pp. 106-126; 1266: ÁÚO Vol. 3, ch. 93, etc). See also Bendefy-V. Nagy 1969, pp. 41-46.



15. Fig. Locations of medieval sites at Lake Balaton, referred in the text (sketch is based on the maps of the First Military Survey, carried out in the area in 1783-1784)

Deciding over the question which reconstruction could be closer to realities, we can shortly confront the two reconstructions with simple elevations of some medieval churches, located close to the Lake or on an island (or peninsula) of the Lake in the Middle Ages:

1. the high medieval church of Avas at Szigliget, built in the 12th century: 108 m a.s.l.,
2. the mid-13th-century church of (Rév)Fölöp located on the 'Island' (at the ferry:) 106 m a.s.l.,
3. the early 13th-century church ruins of the medieval village of Örvényes, deserted in the mid-16th century (due to Turkish attacks): 107 m a.s.l.,
4. (Zánka-)Ságdörgicse: high medieval church close to the shoreline: 110 m a.s.l.²⁹⁷

Even if we have to account with changes of lake basin elevations, and also in groundwater-level conditions, differences are still striking. Applying only these three (or four) simple examples, it is clear that the Bendefy-V. Nagy reconstruction, still recently widely accepted and used in natural scientific investigations, provides impossible numbers. These numbers are not only impossible for the 14th and 15th centuries, when the above-mentioned churches were usually in use, but especially already for the 12th-13th centuries when these churches were built. The other, Sági-Füzes reconstruction seemingly provides more realistic numbers. Even if the elevations of the Révfölöp and the Örvényes churches are still a bit low compared to the reconstructed water-levels of the lake (106-107 m a.s.l.), due to the uncertainties of processes and the relativity of estimations, ca. 1 m (relative) difference does not necessarily mean a contradiction (unlike 4-5 m).

²⁹⁷ For a short description of these churches see, for example: Koppány 1993, pp. 98, 131, 148, 155, (and 206); Horváth-Gondos 2005, pp. 147, 184-185, 202-203. etc. Elevations can be easily checked through, for example, GoogleEarth.

3.2.3 Medieval conditions and water levels of Lake Fertő/Neusiedlersee

3.2.3.1 Long-term water-level changes – only sporadic evidence

Fertő is a lake – due to its great extent, extreme shallowness and very small catchment – even more sensitive for any variabilities and changes occurred in the hydrological regime than Lake Balaton. Before the end of the 19th century, the shallow alkaline Lake Fertő (second largest lake of the Carpathian Basin), especially at its southern and southeastern basin was notably deeper than today, and predominantly covered by open surface of water.²⁹⁸ This was true in the early and mid-19th, and throughout the 18th centuries,²⁹⁹ and before, in the 16th-17th centuries,³⁰⁰ even if in dry periods the extension of the water in the basin could be significantly less than in average or wet periods. The presently available historical water-level reconstruction of Lake Fertő is associated with the name of the Austrian hydrologist, Fritz Kopf. However, his reconstruction covers the last 400 years, and no data is available concerning the sources which the reconstruction is based on.³⁰¹

When documentary evidence is available, concerning major characteristics, somewhat similar environmental conditions and lake (open surface of water) extension can be detected in the Middle Ages than in the early modern period.³⁰² However, problems arise when taking indirect written evidence into account: reconstruction attempts concerning medieval and early modern conditions often have interpretation problems of contemporary terminology (e.g. interpretation of '*fluvius Fertew*' as an indicator of low water levels). In fact, in the case of both major lakes of the Transdanubia, only very sporadic (contemporary) medieval evidence is available at the moment which can be directly related to the fluctuations or possible long-term changes of water level.³⁰³ Some contemporary documents (charters) suggest that not only direct but some indirect landscape and hydrological evidence, for example concerning the water-level conditions of larger lakes such as the Fertő/Neusiedlersee in certain years, can also provide some information.

3.2.3.2 Patchy direct data; extensive water surface versus intensive use of the lake basin?

Since no long-term evidence is yet available concerning the prevailing medieval water-level changes of Lake Fertő, at present only some conclusions, mainly concerning prevailing (general, schematic) environmental conditions of the Lake, can be drawn. Based on this evidence, one can only say that the Lake, in general, seemed to be in a relatively wet phase in the late medieval period, and prevailing conditions were not fundamentally different from those of the better-known 18th century.³⁰⁴

For medieval water levels, only some very sporadic, occasional information is available, either concerning the inundation area of the Lake or the conditions in and around the western

²⁹⁸ See Kopf 1963, pp. 190-203.

²⁹⁹ See, for example: Kiss-Wolf 2009, pp. 203-217; Katona 2008, pp. 391-405; Kiss 2005, pp. 39-49; Kiss 2001b, pp. 76-89.

³⁰⁰ See for example: Kiss 2004, pp. 325-331.

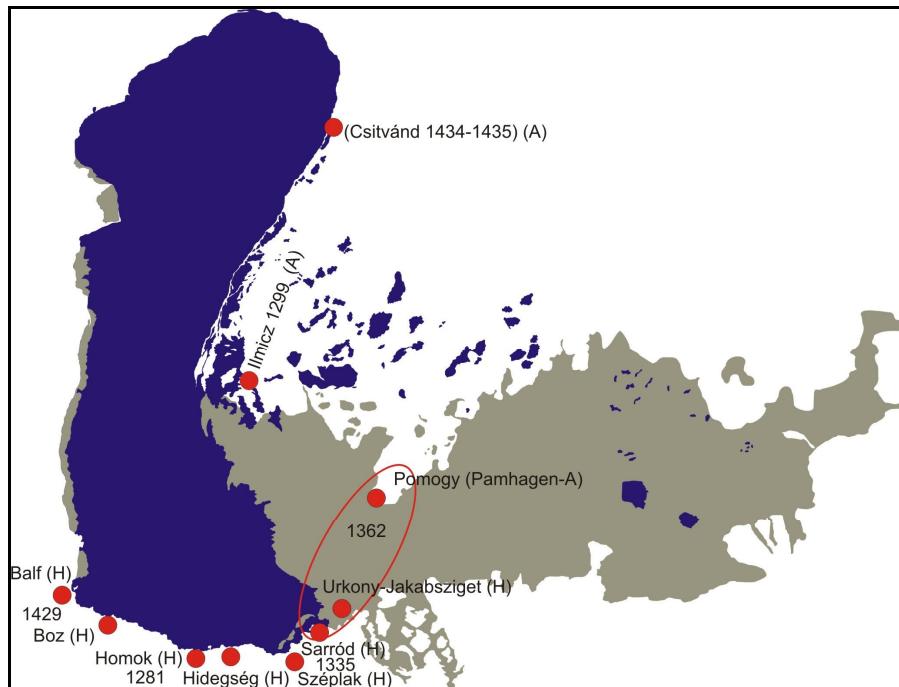
³⁰¹ Kopf 1963, pp. 190-203. For the long-term (Holocene) changes of Lake Fertő: Füköh 1991, pp. 65-67.

³⁰² Kiss 2001, pp. 61-77.

³⁰³ For example: Kiss 2004, pp. 325-331; Kiss 2006, pp. 141-152.

³⁰⁴ For more information, see Kiss 2001b, pp. 61-77; Kiss-Piti 2005, pp. 164-184. It has to be emphasised that this is true even if some data, of course, is available for the Middle Ages concerning Lake Fertő/Neusiedlersee. These data may, however, reflect the conditions of certain short periods (e.g. might be only months, maybe years) of unknown duration, so firm conclusions about the rising water levels in the late Middle Ages cannot be drawn with certainty.

edges of the Hanság wetlands (number of data might still increase). Such examples are the perambulation in spring 1361 partly obstructed by waters, or the active utilization of a temporary fishpond which received its water through a 'fok' watercourse from the flooding/high waters of the Lake in 1434 and maybe also in 1435 suggest at least medium or higher water-level conditions. Patchy information, however, does not help us much in providing conclusions on long-term water-level fluctuations of the Lake. Thus, at the moment only some possible, approximate references on the (normal or wet) conditions of short (max. some months) periods are available. and even these data should be treated with great caution.³⁰⁵



16. Fig. Locations of sites (with years of charter issue) at Lake Fertő and the West-Hanság, mentioned in the text
(sketch is based on the maps of the First Military Survey, carried out in the area in 1783)

As we could see above, related to long-term medieval conditions, on the one hand in references we can meet up with a Lake whose environmental and hydrological conditions seem to be not fundamentally different from those in the (16th-17th,) 18th and early 19th centuries. On the other hand, it is an interesting environmental information that the most intensive utilisation of the Lake basin at its southeastern edges can be dated, according to our present knowledge, to the (late) high and (early) late medieval period, roughly up to the early-mid 15th centuries, when the most traces of human dwellings and cultivation can be detected.

Regarding the inundation area of Lake Fertő and the West-Hanság wetlands, some investigations (archaeological field survey, collection of documentary evidence) were carried

³⁰⁵ Kiss 2001b, pp. 61-77. Kiss-Piti 2005, pp. 164-184; Kiss 2006, pp. 141-152; 1361: McP Vol. 1, ch. 111-114, pp. 123-127. To some extent, general or usual water levels sometimes can be measured. Nevertheless, in such cases care should be taken when drawing long-term conclusions, especially concerning the changes of the prevailing water level of the Lake. In an early paper of mine (Kiss 1998, pp. 241-248) I have provided medieval water-level information in a table based on literature and primary source entries. With studying early modern-modern conditions of the Lake, my present opinion is that, similarly to the charter evidence applied by Bendefy and V. Nagy, in medieval charters more the general conditions, most typical for the area, were described (i.e. in case of the value of a land the average utilisation possibilities, the usual incomes were interesting, and not the conditions of the actual year or month). Moreover, literature entries refer to narrative evidence not available any more and thus, we cannot decide over their reliability. Thus, a careful look on each entries have to be taken before drawing conclusions.

out in the late 1960s.³⁰⁶ Main aim of research was to collect information in the area of deserted medieval sites which appeared in sources in the second half of the 13th century, but were not mentioned any more after the first half of the 15th century. Since these areas/settlements were located close to the Fertő ('iuxta Ferteu'), Péter Mihály proposed the theory that in the Lake basin, due to prevailing dry conditions of the 13th century, extensive dry areas developed where fields/settlements arose. This research was extended later in the form of a complex field (documentary) survey, with somewhat similar conclusions, regarding the medieval settlement and landed possession of Urkony(-Jakabsziget; also *Fig. 16*).³⁰⁷

The overall conclusion of investigations was that the most intensive utilisation of the inundation area most probably occurred in the (late) high medieval and (early) late medieval period. In this period settlements existed in the basin of the inundation area (on higher terrains), which places presumably became temporary dwellings, or entirely deserted places.³⁰⁸ While the known water-level reconstructions of the Balaton concerning the 13th century do not really support this hypothesis, as we could already see, recent palaeoenvironmental lake-investigation also detected notable, prolonged dry conditions in Southwest- and North-Hungary (Lake Balaton, Lake Nádas) in (some parts of) the 13th century (see the previous sections).

Due to the extraordinary shallow and alkaline conditions and relatively great extent of the Lake, the magnitude and incomes of fishing can also be an indirect indicator of the contemporary (general) water-level conditions. The basin of the Lake, especially at its southern, southeastern parts were considerably deeper than today and thus, in case of medium and high water-level conditions, fishing had (much) more potentials than today. Thus, information on the extent and importance of fishing might provide us with very general, but still, on the long-run useful information.

From the Middle Ages only (numerous) data related to good fishing conditions, and the great, regional importance of Fertő-fishing are known,³⁰⁹ and not a single case can be traced when anything (environmental conditions) would have obstructed fishing in the Lake. Nevertheless, the case reported from 1434 and 1435, concerning the fishing in the temporary lakes of the inundation area, suggests that high water-level condition was not a regular, everyday 'gift' in the area. Although fishing of the Balaton as well played an immensely important role in the Middle Ages, due to its considerably deeper basin and greater extension, this fact does not so sensitively show actual changing conditions.

2.1.3.5 Long-term changes in medieval water levels and humidity/wetness: an overview

Based on the temporal resolution of the available reconstructions, one can distinguish among four levels of information:

1. multi-centennial information:

a. on the general hydrological conditions: Based on the general information provided, we can say that large lakes of the Transdanubia such as Balaton and Fertő lived their wet phase

³⁰⁶ Mihály 1971, pp. 17-28, 109-128. See also Kiss 2004, pp. 39-49. Although without a systematic survey, main elements of this concept already appeared earlier. In the second half of the 19th-century, Imre Nagy (Nagy 1869, pp. 690-709) raised the question, while arguing with Frigyes Pesty (Pesty, Frigyes. Elsülyedt falvak a Fertő mentén (Sunk villages along the Fertő). *Vasárnapi Újság* 08.01.1865), that the water level of the lake increased in the late 14th century and beginning of 15th century. The theory was also in agreement with the local tradition, where folk tales mention villages areas inundated by the Lake. For the local tradition, see: Szentmihályi 1974, p. 217.

³⁰⁷ For a complex landscape history and archaeological field survey of one of these deserted villages, partly located on island(s) and in the wetland basin, see: Kiss-Paszternák 2000, pp. 402-419.

³⁰⁸ Kiss 2004, p. 47.

³⁰⁹ Lukács 1953, pp. 282-283; Bárdosi 1993, pp. 8-25; Kiss 1999c, pp. 53-62; Kiss 2001, pp. 61-77.

(comparable to the late 18th-century conditions) in the period when perambulations are available, thus chiefly in the late Middle Ages. However, this is generally also true for the late 13th-century cases – in the presently available cases no fundamental difference can be really detected. This might be connected to the fact that in these perambulations often general information is provided due to the fact that not the actual water level was the interesting point, but how the lake and wetland environment can be utilised, and what it is worth for. Thus, providing information on economic use and general financial value had more importance than the true description of an actual environment (on a given day of the perambulation).

- b. multi-centannual information with long-term tendencies: In this case, primarily based on archaeological and partly documentary evidence, a slow long-term constant water-level rise (roughly 2 m) were detected in case of the high and late medieval Balaton (Sági-Füzes, Bendefy-V. Nagy), and late medieval Danube (e.g. Héjj, Mészáros).

2. reconstructions on hundred-year resolution:

Long-term palaeoenvironmental research on Lakes Nádas and Baláta, carried out on a hundred-year resolution, provided clear evidence on a dry period occurred in 1000-1300, with a peak some time in the 13th century. Since the lakes are located rather far from each other, these data suggests the rather distinctive, supra-regional long-term appearance of the MCA, roughly between 1000 and 1300 in the (inner) Carpathian Basin. The late medieval evidence on Lake Nádas shows interesting results, since 14th century appears with its low prevailing water-level conditions, while the 15th century shows more evidence for the predominantly wet phase of the LIA. These results also agree with the Lake Baláta reconstruction.

3. reconstruction on a decadal resolution:

The stalagmite-based wetness reconstruction concluded a short wet-warm MCA ca. 1000-1150/1200, a long transitional period of mixed dry and wet periods until 1500/1550 which was followed by a short LIA.

Hence, the mainly documentary and archaeology-based reconstructions chiefly show a rather unified, schematic continuous rise of water levels during the medieval, but especially in the late medieval period. More detailed, recent palaeoenvironmental investigations on smaller and thus, probably more sensitive lakes suggests a characteristic division between the early medieval wet, high medieval dry, and a mixed late medieval phase. Stalagmite record provides a high medieval wet, and then a late high-medieval–late-medieval period with mixed conditions.

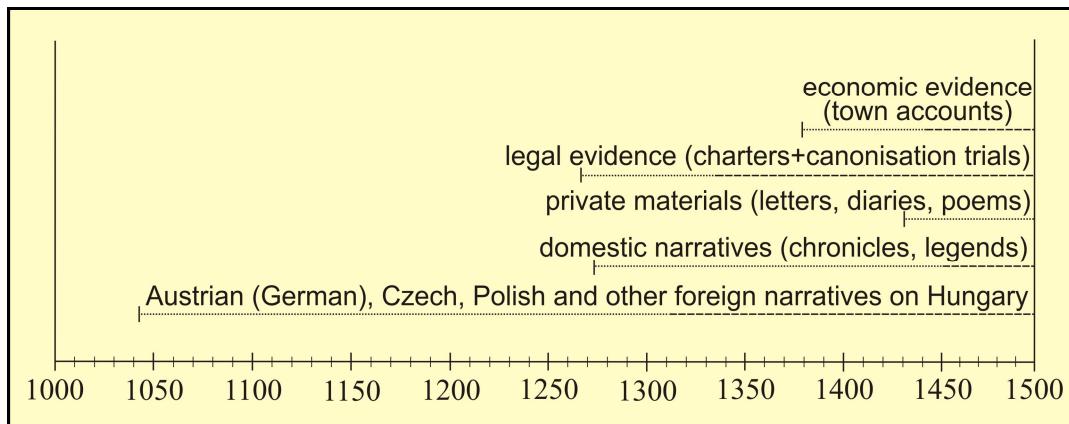
4 Sources and methodology applied

After providing an overview of general conditions, main processes, types of human impact, and their potential consequences on the human and physical environment, in this chapter the types and characteristics of flood-related medieval source evidence, together with key methodological issues, are discussed. The chapter is divided into two main parts. While in the first main section we deal with the types and nature of source evidence, the second section is devoted to terminology questions and as well to the methods applied throughout the dissertation.

4.1 Reporting flood events in medieval Hungary: Sources and main characteristics

With regards to floods in medieval Hungary, at present only written documentation provides high resolution information. While results of other, palaeoenvironmental and

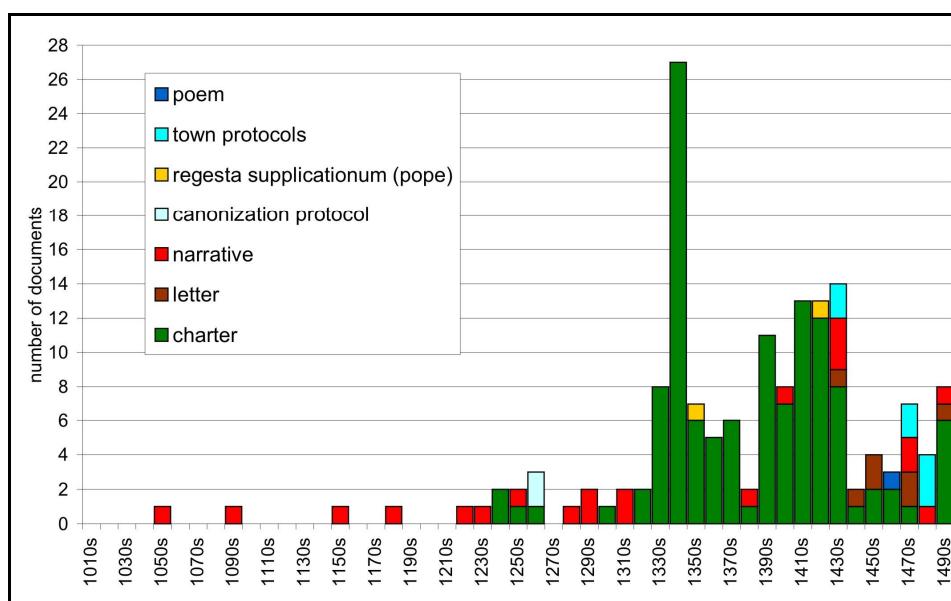
archaeological investigations were already listed in the previous chapter, other potential sources such as medieval epigraphic, pictorial evidence (e.g. floodmarks) of flood events (which can provide precious flood information in other parts of Europe), at least concerning the Middle Ages, are entirely missing in Hungary.



17. Fig. Temporal coverage of flood-related documentary evidence in medieval Hungary

In this section an overview of the main source types and their characteristics are provided. This is especially important due to the unique character of Hungarian medieval documentary evidence, rather different from other, western European flood-related sources. Owing to the relative scarcity of contemporary narratives, information on flood events is predominantly preserved in legal documents, namely in charters.

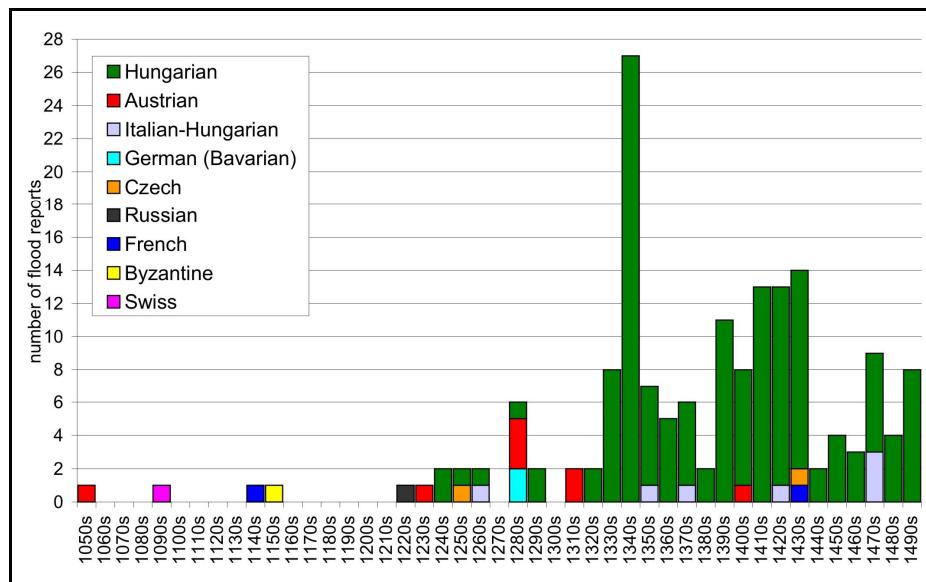
Moreover, in domestic source evidence, apart from some sporadic, individual cases, it is usually possible to locate flood events only from the mid- or late 13th century onwards. In the rest of the high Middle Ages (e.g. the 11th and 12th centuries) there is a better chance for finding Hungary-related flood references in foreign than in domestic sources (see Fig. 17). As a consequence, while in the 11th and 12th centuries, floods can be identified only in very exceptional cases, and 13th century (though with a growing amount of evidence) is still clearly underrepresented, floods are relatively frequently reported in the 14th and 15th centuries, providing around 90% of all known medieval flood records.



18. Fig. Decadal distribution of medieval source types in which floods were mentioned³¹⁰

Among the documents in which the testimony of over a hundred medieval flood events, inundation and high water-level references are preserved for us, around 77% are charters (124 cases); whereas the remaining 23% are narratives (20 cases), town accounts (7 cases), letters (7 cases). 2-2 cases of canonisation protocols and the *regesta supplicationum* (papal protocols), and poems (1 case) (Fig. 18) are also available.

In the high medieval period and at turn of the 13th-14th centuries mainly narratives and partly other documents provide the basis of flood-related information. This also means that, taking the whole medieval period into account, flood-related evidence can be predominantly (ca. 90%) found in domestic evidence. In the very scarcely documented high medieval period, however, foreign sources on Hungary have a rather high importance (see Fig. 19).



19. Fig. Geographical origin of authors and reports, referring to floods occurred in medieval Hungary³¹¹

Except for the very first decades, in the 14th century and up to the 1430s, the overwhelming importance of (domestic) charters in flood research have to be emphasised. From the 1430s the growing importance of other (non-charter) evidence, mainly economic evidence and narratives, can be detected – at the moment on the expense of charters. The main source types are discussed and presented in a more detailed way below, in the following sections, while temporal and spatial coverage are presented in separate, later sections.

³¹⁰ Not equivalent with the number of flood events.

³¹¹ Hungarian-Italian authorship means a group of Italians such as Antonio Bonfini or Ludovico Carbo (narratives) and letter writers such as Florio Roverella (as legate of the pope and bishop of Eger for a while), tax collectors of the pope (writing accounts), who stayed or lived in Hungary for a while, sometimes for years, often collected their information from Hungarian eye-witnesses or they were themselves eye witnesses. However, in their writings their nationality and home logic concerning weather might be also reflected. Usually they provide unuseful information in many cases better and more elaborated than, for example, Hungarian narratives. An unique (and very significant) part of this small group is formed by the entries (petitions) sent from Hungary, and accepted after examination (in Rome or Avignone), included in the *Regesta supplicationum* protocols of the apostolic seat.

³¹² Although in the original texts the Latin word '*reambulatio*' is applied in all cases, which means that the official participants of the legal procedure always renewed the already-existing boundaries (thus, no completely new boundaries were settled), in the English terminology this legal process is named as 'perambulation', and therefore, I apply this term throughout the present study.

4.1.2 Legal evidence I (secular): charters

As we could see, more than three fourth of all known flood-related documentary evidence concerning medieval Hungary can be found in charters. Beyond its overwhelming importance as a source, this fact also means that the character, strength and weaknesses of these legal documents primary affect and dominate the analysis possibilities of medieval floods in Hungary. Out of the charters containing precisely dated information, the importance of field surveys with ongoing flood events, mainly included in perambulation³¹² charters (*litterae reambulatoriae*), should be emphasised.³¹³ This is due to the fact that, for example, the purchase and perambulation of a piece of a land in the countryside, under the direct administration of counties, was a document of primary importance for proving land ownership for centuries. It is not only true in the Hungarian kingdom, but also in the medieval kingdoms of Slavonia and Croatia, as the "Croatian and Hungarian customary law did not differ much from one another – at least in respect of property and family law. The congruence between the two is not surprising given that the social systems of both countries were practically parts of one more or less unified structure."³¹⁴

In everyday life in the (Hungarian) Middle Ages, without the appropriate, reliable legal documentation, namely charter evidence in the background – or having 'stronger' (maybe even forged) charters in the hand of the other – any landowner could easily loose an estate. This was true not only for lay individuals, but also (especially) for ecclesiastical bodies and other communities.³¹⁵ Thus, in the society of medieval landowners charters related to field surveys, estimations and perambulations were probably the most precious and important documents to preserve; not to mention the fact that such important documents usually existed in copies as well, and as such, there was a greater chance for later preservation. Although less in quantity, prorogation charters (postponing procedure) are also a significant set of legal sources for flood events: in most cases these were later included in charters describing the role of a legal debate, sometimes lasting for years or several decades.³¹⁶

With regards to scholarly literature, as a background the practice, methods, beliefs, dates, usual way of perambulation, the process of resettling boundaries of landed possessions, are rather well-studied subjects in Hungary, concerning to the 18th and 19th centuries. This is especially true for historical ethnography and local history research.³¹⁷ Since early modern and modern perambulations in most cases go back to and use the medieval descriptions of boundaries, many of these studies, to some extent, refer to medieval conditions as well. Studies, often carried out by archaeologists, are usually concentrated on identifying medieval

³¹³ Due to its great importance and frequent abuse of the procedure, the role of perambulations and related circumstances were described and fixed in detail in: *Tripartitum Pars 1, Titulus 86*, pp. 166-168. Full Latin text and English translation: Bak et al. 2006, 474 p.

³¹⁴ Karbić 2003, pp. 37-46. Quotation cited from p. 43. In his important paper, the author provides evidence on the small differences between Hungarian and Croatian customary law. These differences, however, do not have any significant effect on legal procedures and flood-related documentary evidence.

³¹⁵ Several, well-known long-lasting legal debates provide clear testimony of such situations: for example, one of the most interesting inundation-related charter series, including the 1342 and 1346 water-cover evidences with regards to the property rights and debates between the nuns of the Margit Island, and the provost of Pécsvárad. See, for example, 1346: DL 3842, 3863.

³¹⁶ As an example, the debate over the changed watercourse of the Halbokapataka stream can be mentioned: the main description of the (flood) event can be found in 1339: AO Vol. 3, ch. 394, pp. 597-598.

³¹⁷ Mainly from the 18th-19th-century practice, comprehensive overviews were provided in: Takács 1987 227; Takács 1974, pp. 389-396. Especially concentrating on the 18th century, the author evaluated perambulations from their historical, ethnographic information content (e.g. servant-population which did not appear in any contemporary population accounts): T. Mérey 1967, pp. 533-546. For a Transylvanian example, see also: Ráduly 1992, pp. 81-89. These descriptions primarily documented ethnographic traditions which might in some cases differ from the official, legal processes. See: Marx 2001, pp. 239-245.

and early modern boundaries or specific points of the boundaries (landmarks) found during field surveys or excavations, or are still visible in the present landscape.³¹⁸ The information content of perambulations are sometimes also used by researchers of other disciplines such as historical cartography and geodesy;³¹⁹ but a medieval perambulation can also be a very important tool for historical ethnographers and/or for those dealing with the history of agriculture.³²⁰

One should also mention that, while from the 18th-19th centuries a great number of perambulations of all kinds of lands (e.g. lands of serfs) remained, medieval charter documentation preserved only the memory of the perambulations of the estates of nobles (or towns or the king). This is also true for almost all of noble and royal landed-property related transactions of the high medieval period, especially for the 11th and 12th centuries.

In general, we may conclude that a charter, in principal, was most likely to be preserved if it had a long-term value and thus, usually in its content it described properties of high economic value. The most valuable medieval property was the land and everything immovable, belonging to the land and its ownership issues. Legal debates, according to Hungarian law, were in the Middle Ages associated with certain legal processes: if these processes were obstructed for any reason, the reason for an unsuccessful legal process had to be reported.

4.1.2.1 When flood reported in charters: legal procedure and documentation

While talking about perambulations and possible legal actions concerning estates, it should be mentioned that throughout the study period legal processes dealt with boundaries that were fixed a long time (decades or more) before the legal action took place. Since over 90% of the charters containing flood events are related to the 14th and 15th centuries, these old, fixed boundaries of landed possessions had to be settled long before these dates.³²¹ In many cases the basis of the legal process, namely the new perambulation, is based on 13th-century charters.³²² Although flood events appear only in exceptional cases, in the 13th-century perambulation charters with flood events also referred back and described the previously-existing boundaries and landmarks, so in many cases these fixed boundaries could be even older.

In medieval charters flood events were mainly reported when such an event obstructed or prolonged a legal process.³²³ The great importance of a flood in land ownership debates appear in the non-official, but extensively-applied, legal collection of late medieval Hungarian customary law, the so-called *Tripartitum*, collected and issued by István Werbőczy (first published in 1508). In the medieval legal practice, it rather frequently occurred that, due to the flood of a river or waterflow acting as a boundary line, a waterflow changed its riverbed. In this case, some land portions became part of another landed possession which caused a debate

³¹⁸ See, for example, Laszlovszky 1986, pp. 5-24. Bede-Szarka 2003, pp. 51-72. Havassy 2002, pp. 459-480; Bertalan 1984, pp. 419-429. Another branch of investigation is related to medieval or early modern (stone) landmarks, found along the boundaries. See, for example: Töröcsik 2004, pp. 55-59. Bendefy 1960, pp. 47-51.

³¹⁹ In situ observations concerning the possible present location of boundaries were, in exceptional cases, also carried out by cartographers, see: Mihály 2000, pp. 27-32. For identifying the location of the first remaining perambulation sketch (with transcription), see: Kiss 2002, pp. 127-141.

³²⁰ For example: Belényesy 1958, pp. 117-126.

³²¹ Despite the low number of charters, already in the 12th century in several cases the old (land) boundaries are mentioned. In fact, from the late 12th century onwards, it became a 'habit' to refer to the boundaries as the old ones during perambulations. See: Szabó 1969, pp. 107-108.

³²² See, for example, 1411: DL 69750.

³²³ Rarely one can even find such an example when the date of a future perambulation (and introduction) procedure was fixed in such way that, in case of a vehement flood event (at Miháld, Sopron county – along the Rába river) would happen and the legal procedure cannot not be carried out in the presence of the provost (on that given future day), a new *terminus* in advance had to be settled: SvO Vol. 2, ch. 290, pp. 465-467 (27.01.1470).

between the landowners: the customary law in this case ordered that the land portion had to be returned to the previous landowner.³²⁴

If legal processes could not be carried out properly or were postponed due to any reasons, the excuses and reasonings had to be reported (this fact was also included in the *Tripartitum*). Apart from human issues which are usually the main cause of problems and obstruction of processes, in the *Tripartitum*, flood (and then weather) clearly appeared as a major reason and acceptable excuse for not having finished a legal process related to landed matters on time.³²⁵ In the late medieval times it was such a common and important reason for postponing a legal process that in some cases already in advance, while writing the order for a perambulation, flood as a possible obstructing event (one of the most important such events) was included, and decisions were made concerning the (timing of the) lawsuit for that case as well.³²⁶

Most of the flood cases in charters concern land divisions and/or perambulations.³²⁷ This type of a legal process was only necessary to carry out in the case of a donation, land purchase or any controversy over the boundaries. One of the most important division types, namely the one inside of the noble family among close family members ('*birtokosztály*'), however, did not need any legal process and thus, usually remained unreported.³²⁸

Although weather-related events, such as floods, might have appeared in several types of medieval Hungarian charters, there are groups of charters in which flood-related evidence is more likely to be found. The most frequent cases and charter types (apart from the fact that these types mostly belong to the group of *litterae relatoriae*) in which flood evidence appears are as follows:

³²⁴ *Tripartitum* Pars 1, Titulus 87, pp. 168-171: "De terris per fluviorum distractis, quid sentiendum sit? / Item, quia plurimarum civitatum, villarum, ac possessionum, multorumque oppidorum, et praediorum metae, ac cursus metales, fluviorum, et aquarum fluvialium distinctione cinguntur, pariter et clauduntur, per hujusmodi autem fluvii inundationem, atque vehementiam, magnae saepenumero terrarum, pratorum, et sylvarum particulae scinduntur, et ad partem alterius vicinae civitatis, aut oppidi, vel possessionis segregantur, et accidunt. Impetus enim, et vehementia fluminis, de suo solito cursu, alveoque, et meatu, in alium novum meatum saepenumero vergi, dilabique solet. Unde nonnuli putaverunt, et opinati sunt; ejuscemodi terras, prata, vel sylvas, quae scilicet ex ipsiusaque cursus, meatusque, seu alvei transmutatione, in partem alterius vicinae civitatis, oppidique, vel possessionis ceciderint, et segregatae fuerint, ad eandem civitatem, aut oppidum, vel possessionem postea spectare, pertinereque debere; allegantes, et adstruentes: metas suas per cursum, meatumque, et alveum fluminis dirigi: Quod tenendum non est."

³²⁵ *Tripartitum* Pars 2, Titulus 59, § 2, p. 329: "Unde rationabilis excusatio est, admittendaque censemur: quando actore, vel in causam attracto, aut ejusdem procuratore, de domo sua ad octavas, aut brevia judicia se movente, pariter et venire satagente; aegritudinem validam post discessum suum idem incurrit; aut aquarum vehemens inundacio ipsum retinuerit: et his, vel similibus casibus praepedientibus, et occurrentibus, ad terminum distributionis literarum judicialibus, aut sententialium in praesentiam sui judicis pertinere, venireque nequirit; merito talis excusatur, et ab onere judiciorum, setentiarumque exoneratur."

³²⁶ 1470: SvO Vol. 2, ch. 290, pp. 467: "...., quod si termino in predicto propter impedimentum inundacionis aquarum idem dominus prepositus ipsas separaciones et distinciones perficere non posset, extunc alium terminum ad id solus dare et deputare valeat atque possit,"

³²⁷ Legal authorities were usually obliged to provide the reason(s) for the prolongation or cancellation of the field survey as part of the legal process. The field surveys were predominantly carried out by local official bodies (members of an actual *locus credibilis*). The king's man, who were often asked to be present at a field survey, was usually a noble from the district and/or the close neighbourhood. Therefore, the official participants of these surveys (so as the landowners and neighbours) had to be aware of the 'usual' conditions, for example timing and magnitude of 'usual flood events'. See, for example, the field surveys carried out in the southeastern Fertő area: Kiss 2005a, pp. 325-331; Kiss 2006, pp. 141-152. As for contemporary (flood) charter evidence, see 1342: DL 75835.

³²⁸ In the case of close family relations (among male family members), no implementation (i.e. *litterae fassionales*) was required. The documentation of only those family divisions remained, in which case there was a controversy what they themselves could not solve inside of the family. See *Tripartitum*, Titulus 43, pp. 112-113; Titulus 63, pp. 136-137.

1. An ongoing flood or inundation during a perambulation process obstructs full perambulation with measurements (mainly appear in *litterae reambulatoriae*); in many cases concerned with a *statutio* process (*litterae statutoria-relatoria*)³²⁹
2. A flood event occurred before, and then the perambulation took place because
 - a. flood took/destroyed landmarks (mainly appear in *litterae reambulatoriae*)³³⁰
 - b. waterflow, acting as a borderline between landed possessions, altered or changed its bed and the other landowner (illegally) started using the land portion of the original owner (usually appears in *litterae prohibitoriae, inquisitoriae, reambulatoriae*)³³¹
3. A legal procedure, meeting (even parliament meeting) or perambulation were obstructed by flood event or one of the parties (or both) was obstructed in attending the legal procedure (e.g. *litterae prorogatoriae*)³³²
4. Other, special cases
 - a. landed possession completely deteriorated by flood event or inundation (when water remained on the land after flood or the riverbed completely took the portion)³³³ (e.g. *litterae inquisitoriae*)
 - b. information on water management conditions provide proof on a (previous) flood event (e.g. 'fok' or mill/fishpond management; *litterae prohibitoriae* and *inquisitoriae*).³³⁴

Although most of the charters containing flood-related information were in *litterae relatoriae, reambulatoriae, prorogatoriae, prohibitoriae* and *inquisitoriae*, practically in any of the other charter types there is a chance for finding flood-related data. Moreover, in many cases the above-mentioned types appear in combination with each other, in the same legal document.

Even if their overall distribution and importance are less pronounced compared to other legal bodies (e.g. royal court, county offices etc. – see Fig. 20), most of the charters containing flood-descriptions were prepared and issued by the '*loca credibilia*', the places of authentication.³³⁵

³²⁹ See, for example: 1335: AO Vol. 3, pp. 159-162; 1341: DH p. 162; 1342: DL 75835; 1414: Zichy Vol 6, ch. 205, pp. 309-311.

³³⁰ 1411-1415: DF 209489; 1413: DL 10105; 1416: DF 273814; 1426: SvO Vol. 2, pp. 105-106.

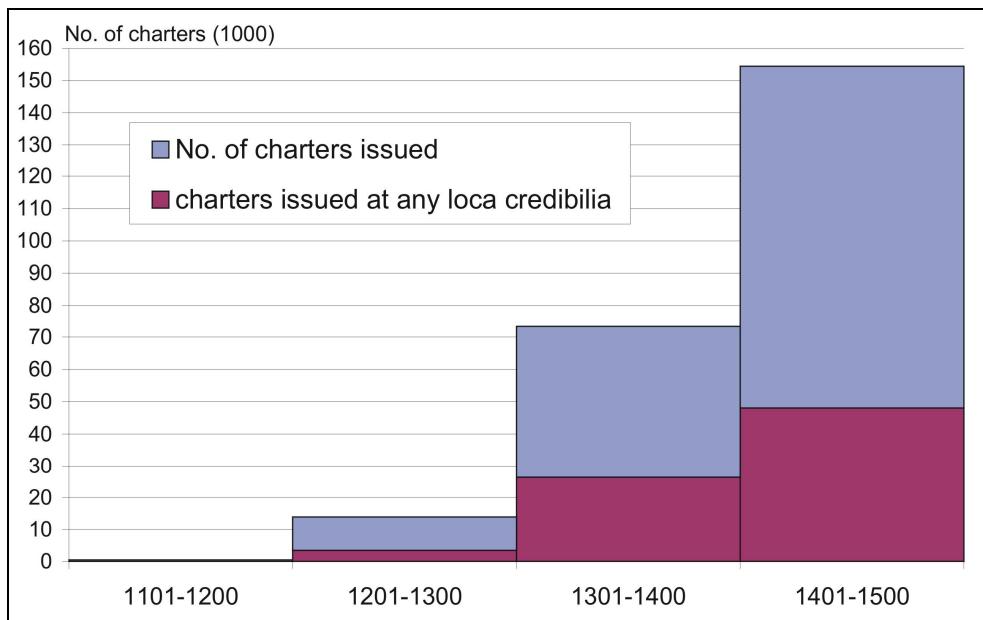
³³¹ See, for example: 1356: AO Vol. 6, ch. 331, p. 527. See also: *Tripartitum Pars 1, Titulus 87*, pp. 168-171.

³³² See, for example, 1325: DL 96117; 1335: AO Vol. 3, pp. 159-162; 1402: DL 78505; 1409: TO Vol. 1, ch. 257, p. 420; 1454: DL 44718.

³³³ For example, 1249: ÁUO Vol. 2, ch. 133, pp. 209-210.

³³⁴ See, for example, 1435: DF 278003; 1469: DL 16834.

³³⁵ The *loca credibilia* (places of authentication) were chapters and convents and thus, ecclesiastical bodies, but as places of authentication their task was related to the secular world: they had to take an active role in the local/regional legal procedures. In the later Middle Ages, especially in the 15th century, due to great amount of tasks they also employed as educated lay scriptors. Their role in legal procedures was essential in medieval Hungary, since – apart from the royal court – chapters and convents were the main places of authentication. For recent papers and summaries in English on the tasks and activities of *loca credibilia* in medieval Hungary, see, for example: Kőfalvi 2002, pp. 27-38; Hunyadi 2003, pp. 25-36. See also: Rady 2000, pp. 66-74. For a readily available concise overview of the very rich literature concerning the Hungarian research *loca credibilia*, see: Kőfalvi 2000, pp. 49-64; Mályusz 2007, pp. 423-431.



20. Fig. Medieval charter production of 'loca credibilia' compared to that of whole Hungary³³⁶

It is due to the fact that most of the legal processes connected to estates (landed possessions) reached the part when local field survey (settling of a landmark and/or measurement) was needed, in which cases a member or members of an official authorisation body (with the knowledge/ability of writing), mainly from the neighbourhood, had to be included.³³⁷ The places of authentication were responsible partly for the documentation of private legal transactions, and partly for solving the matters ordered by the royal (legal) administration in a *mandatum* (letter of order). After the successful process, a report (*litterae relatoriae*) had to be sent back to the administrative body or high officer, giving the task before.³³⁸

4.1.2.2 Preservation, published/unpublished evidence and present-day availability

Regarding Hungary, the presently available charter-collections cover only a small portion of all medieval charters available. Thus, the database is not based on the systematic survey of all medieval charters. Moreover, some of the medieval charters perished over the centuries, which clearly caused problems of proving/claiming property rights, for example, after the Turkish period. As for the historical reasons of destruction, among the most important ones were wars, with special emphasis on (Ottoman) Turkish wars from 1526 onwards.³³⁹

Additionally, while discussing differences in temporal coverage, other such questions as changing population densities (or ethnic groups/management practices) or differences in the

³³⁶ The data is based on: Kőfalvi 2006, p. 17.

³³⁷ This is clearly visible, for example, in the case of the well-studied chapter of Pécs: Koszta 1998, 324 p.

³³⁸ See, for example, Kőfalvi 2000. p. 49.

³³⁹ This misfortune mainly affected the medieval administrative material referring to the central and southern parts of the country. Depending on the archival conditions or possible survival of the archives of some land owners or administrative bodies, there were some exceptions. For example, the nunnery of the Dominicans at the Rabbit/Margit Island (in Budapest today) and the administrative archival collections of the Pécsvárad (see Kőfalvi 2006) or Pécs (e.g. Koszta 1998) chapters provide useful information. Nevertheless, large part of the lay (e.g. family, county) archives suffered irreversible/irreparable damages, mainly during the 15th-17th centuries.

administrative development of different regions should be considered as well.³⁴⁰ In some areas, due to their hydrological, hydromorphological conditions (e.g. sandy areas), the occurrence of a destructive flood event is also less likely.

General information on

1. published charters do not provide continuous coverage: it is fairly good, for example, for the Arpadian Period (1000-1301).³⁴¹ The proportion of published charters is even better for the Angevin period (1301-1387),³⁴² and for some counties, regions where a larger number of (or all remaining) charters are published in an area of good charter preservation (e.g. northwestern Hungary),³⁴³ or related to the archives of certain families, places of authentication and towns.³⁴⁴ Some other, published medieval charter collections less specific to any period can also be important in identifying flood events.³⁴⁵
2. published regesta collections: although many of these collections are available and concern certain areas (e.g. royal towns, selected counties), legal bodies (e.g. chapters) or certain families (e.g. Eszterházy, Kállay), the two periods of best coverage, largely thank to systematic, countrywide collections, are as follows:
 - a. the reign of King Charles I and beginning of the reign of his son, Louis I: 1301-1347 (regesta; with gaps)³⁴⁶
 - b. most of the reign of King Sigismund I: 1387-1424 (regesta).³⁴⁷
3. publicly available unpublished originals: a new set of Internet resources of county and municipal archives³⁴⁸ (a great improvement is in process) and also the photos of original charters (often with Hungarian regesta) from the collection of the Hungarian National Archives are available online.³⁴⁹ In general, depending on the person who elaborated the Hungarian regesta, contemporary environmental conditions or certain events (i.e. floods) might or might not appear in the abstract.³⁵⁰ Great advantage of this group of evidence is that this database largely covers the late medieval charters and other documents that remained to us either in original or in the form of photocopy.

In general, the availability of documentary evidence and the possibility of finding flood-related evidence is rather rapsodic. On the one hand it is largely dependent on later destruction of documentary, especially legal evidence, while on the other hand, we mainly have to rely on the

³⁴⁰ For example, the Iaso-Cuman areas with their special, separate rules which, especially in the late 13th and the 14th centuries, influenced the quantity of charters issued on landed property matters. See, for example: Gyárfás Vols. 2-3, 1873, 1883.

³⁴¹ See, for example: ÁÚO 12 Vols; Györffy 1992.

³⁴² AO 7 Vols.

³⁴³ SvO 2 Vols; ZmO 2 Vols.

³⁴⁴ One of the most detailed family archives published is the one of the count Zichy family: Zichy 12 Vols. For places of authentication, the most usual practice was to publish only regesta collections and not full charter transcriptions in Latin. A good example of an exception is the published medieval archives of the Pannonhalma convent: McP 2 Vols. Perhaps the most comprehensive, detailed urban archival collection refers to Sopron: SVT 1/1-7 Vols, 2/1-6 Vols.

³⁴⁵ Among these collections, the most extensive series is published in: Fejér 40 Vols.

³⁴⁶ AOKlt 1-24 Vols.

³⁴⁷ ZsO 12 Vols.

³⁴⁸ Somogy county archives (<http://smarchive.netii.net/menu/oklevel/oklevel.html>), Heves county archives (http://antares.hevesarchiv.hu/english/index_en.htm/) where the county made the pictures of the medieval charter-collection available, either accompanied with transcription or regesta.

³⁴⁹ See <http://mol.arcanum.hu/dldf/opt/a100515htm?v=pdf&a=start>

³⁵⁰ Except for the earliest years of the 14th century, in the regesta collection series entitled 'Anjou-kori oklevéltár / Documenta res Hungaricas tempore regum Andegavensium illustrantia' flood and other natural events were followed and systematically included in the texts. It is, however, not necessarily true for other regesta collections, such as those of the Hungarian National Archives (MOL, DL-DF collection) or the published series of the Sigismund period ('Zsigmondkori oklevéltár').

information available in published charter and regesta collections where flood-related information might or might not have been included.³⁵¹

4.1.2.3 Length of procedure: legal process of field survey and date of issue

Length of process and documentation

According to the early 16th-century *Tripartitum*, all royal donations (one of the most important charter-type) had to be corroborated within an year;³⁵² the same is true in the case of any *litterae fassiones*.³⁵³ With the aim of implementation in an ordinary legal process, the validity of *litterae statutoriae*, *reambulatoriae*, *admonitoriae* and *breves evocatoriae* lasted similarly for an year, in the case the charter started either with '*Cum nos debitum habentes respectum*' or '*Cum nos attentis et consideratis*'. More important is the regulation that *litterae introductoriae*, *statutoriae*, *recaptivatoriae*, and especially of *reambulatoriae*, starting with '*Dicitur nobis*' and closed with '*Ad terminum competentem*' were valid only for 60 days. According to the late medieval customary law preserved in *Tripartitum*, the whole procedure after issuing the *mandatum* with the order, together with written documentation (i.e. issuing the charter), had to be finished within this period of time.³⁵⁴ Moreover, in the case of *litterae introductoriae*, *recaptivatoriae*, *reambulatoriae* or *admonitoriae* an *octava* of a feast was provided as a deadline for carrying out the legal procedure, and then the implementation had to take place until the 8th day before the feast.³⁵⁵ Probably except for the *octava* deadline, which for example in the 1320s-1340s clearly referred to the 8th day after the feast, these basic rules were valid in the earlier parts of the late Middle Ages as well.

Even if to some extent these were valid in the earlier centuries (e.g. 13th-15th) as well, concerning places of authentication, the actual length of procedure after issuing the *mandatum*, the implementation and documentation had much shorter deadlines. In Hungary, after the actual field survey (implementation), in the Arpadian Period (11th-13th centuries), the King's man and the testimonies (i.e. canons from the actual place of authentication) had to stay at the place of the process (theoretically) for 15 days in order to allow the appearance of any contradicting parties. Thus, this was the theoretical deadline after which the final legal document, charter could be issued. This obligatory period of waiting shortened to 4 days from the early 14th century.³⁵⁶ However, this was probably more a general rule, because for example, according to Kőfalvi, in Pécsvárad place of authentication the time difference between the actual perambulation and the day of issuing the charter was 3 days on average in the 13-15th centuries, regardless of the century.³⁵⁷ On average, this duration was 3.5 days in the case of the authentication place of Pécs.³⁵⁸ Nevertheless, in general this duration could be even

³⁵¹ For the (old and present) methodology and types of source editions, and for an easily-available, short but concise work, see: <http://www.staff.u-szeged.hu/~kofalvi/forraskiadas.pdf>.

³⁵² *Tripartitum* Pars 1, Titulus 32, pp. 98-99.

³⁵³ *Tripartitum* Pars 1, Titulus 63, pp. 136-137, Titulus 66, pp. 140-141.

³⁵⁴ *Tripartitum* Pars 1, Titulus 33, pp. 98-99.

³⁵⁵ *Tripartitum* Pars 1, Titulus 33, pp. 98-99: 2. §.: "Si tamen in literis hujusmodi introductorii, seu recaptivatoriis, aut reambulatorii, vel admonitorii, terminus aliquis octavalis, ad quem scilicet evocatio (ex ratione in eisdem literis expressa) fieri debet denotatus, et conscriptus fuerit: extunc ad octavum usque diem illius festivitatis, cuius videlicet octavae inseruntur, et inscribuntur, executio cum illis, rite, legitimeque peragi poterit. Octava tamen dies ante festum, et non post, intelligatur."

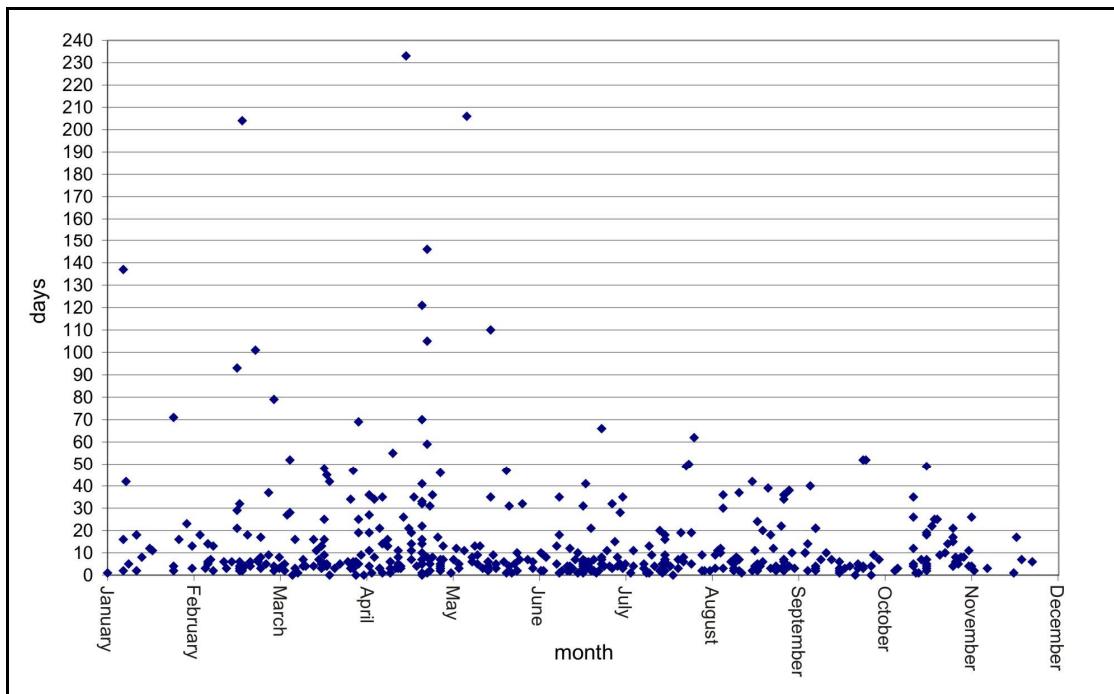
³⁵⁶ Koszta 1995, p. 257, Koszta 1998, p. 114.

³⁵⁷ Kőfalvi 2006, p. 41.

³⁵⁸ Koszta 1998, pp. 112-114. This duration, of course, was largely dependent on the distance the members of the chapter had to travel: in case of 'outside work' (to other counties), this average was 7.8 days, which is still a very fast and adequate handling of a legal process (see Koszta 1998, p. 113).

a week or so (depending on other circumstances, e.g. how overloaded the chapter was, how many 'workers' the chapter actually had etc).³⁵⁹

It seems that, at least concerning the 1320s-1340s, the general practice was predominantly the same in Hungary. This theory can be supported by a recent investigation in which case, out of more than 370 perambulations, over 80% of the cases the charter was issued within 15 days after the field survey, and approximately in 9% of the cases the legal document was issued within a month (see Fig. 21).



21. Fig. Duration (days) between the date of perambulation and the date of issuing charters in the 1330s-1340s³⁶⁰

Why these questions are important from our present viewpoint?

As we will see in chapter 5, in some cases no date of perambulation or precise information on the actual date of the survey (when flood was observed) remained. In these cases, one has to cope with the date when the charter, describing the results of the field survey, was issued and the date when the order for perambulation was published.³⁶¹ It has special importance in, for example, flood statistics: since the documentation predominantly took place only some days after the field survey, in many flood cases it is possible to provide information on the seasonality of the flood event and thus, charters of flood cases with only the charter-issue date can also be included in the seasonality analysis and statistics.

Date and duration of the actual flood observation

The perambulation or the observation of a piece of land usually took place within a day but, depending on the size of the boundary or land in question, it could take days as well.³⁶² In the order for the perambulation or observation of a landed property or boundaries, usually a date was provided until which day the task had to be fulfilled/finished.³⁶³ Thus, it was primarily

³⁵⁹ Koszta 1995, p. 257.

³⁶⁰ Tóber 2010, p. 35.

³⁶¹ See, for example, 1435: DL 54943; 1439: CD Vol. 11, ch. 97, pp. 222-224.

³⁶² Kőfalvi 2006, p. 42. Such cases, however, are difficult to detect which is caused by the fact that the final texts of charters were made (some days) later, after coming back from the area in question.

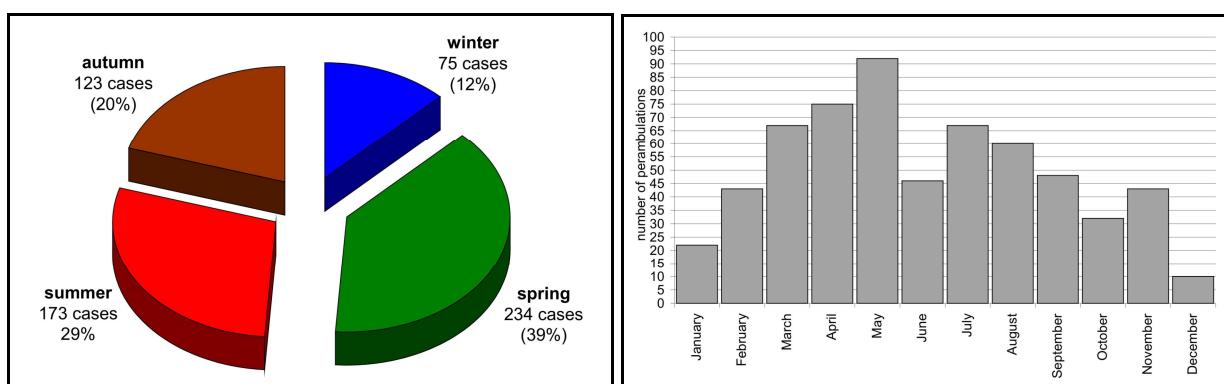
³⁶³ For these, referring to the 1330s and 1340s, see Tóber, M. 2010.

the task of the legal body, ordered to carry out the process (place of authentication), to choose the time appropriate for fulfilling the task in the most proper, adequate way.³⁶⁴ This means that, although the actual process usually had a date in the charter (when the perambulation/observation occurred), the land in question was observed also in other days around. This fact in many cases was also included in the charter: '*et dies sequentibus*',³⁶⁵ '*et aliis diebus sequentibus*',³⁶⁶ or '*diebusque aliis ad id aptis et sufficientibus*'.³⁶⁷ As a consequence, although for the actual process and for the observation of a flood event usually one day is provided, days before and after this actual date should be as well considered to be part of the 'observation'. In some cases, if the obstructing circumstances (e.g. flood) ceased to exist within a very short period (e.g. few days), the perambulation could be repeated in the problematic section and thus, no other deadline and new process had to be launched.³⁶⁸

This was also true not only for the perambulation process, but also for other legal cases, for example, when the parties or their lawyers/representatives had to appear at the court due to various reasons. In such case usually the judge and the other party waited for a couple of days, before making conclusions over the missing party, and in many cases the missing party had good (e.g. flood) excuse for his absence.³⁶⁹

Timing of field surveys: the role of perambulation charters

Although to date no general survey concerning medieval, late medieval perambulations has been carried out concerning Hungary, for some of the well-published periods (e.g. 1330s-1340s) it is possible to draw some conclusions concerning the seasonality of perambulations. In general it was concluded (*Figs. 22a, b*) that the number of perambulations was at that time the lowest in winter, while most of the perambulations took place in spring. The second largest number of perambulations occurred in summer and then in autumn. Out of spring months most perambulations took place in (early) May; while the least perambulations occurred in December.



22. Fig. Number of perambulation procedures according to seasons (a) and months in the 1330s-1340s (b)³⁷⁰

A clear peak in the number of perambulations can be detected on 1 May. Still 1 August, and partly 6 October, 8 November and 15 September are highlighted. Despite the fact that relatively low number of perambulations took place in mid- and late winter time in the 1330s and 1340s,

³⁶⁴ For a detailed description of the actual process see, for example: 1470: SvO Vol. 2, p. 467.

³⁶⁵ 1402: DL 49584.

³⁶⁶ 1426: SvO Vol. 2, pp. 105-106.

³⁶⁷ Haan Vol. 2, pp. 92-94 (1466-great flood of the Körös-Berettyó area).

³⁶⁸ 1344: DL 87162.

³⁶⁹ See, for example, 1367: DL 30394.

³⁷⁰ Tóber 2010 p. 32.

quite an important number of floods were reported in winter time (see chapter 5). It is also true for the summer period when, even if for perambulation procedures it was a relatively important month, surprisingly low number of charters contain flood information related to summer. In general, the great importance of spring, in both perambulation dates and the number of flood events, has to be emphasised.

These circumstances are important due to the fact that, at least based on the survey of the 1330s and 1340s, it seems that there are periods within the year when it is much more likely to have perambulations than in other periods. This also means, however, that in some parts of the year, especially in spring, May, with special emphasis on 1 May, it is much likely to have field surveys and thus ongoing flood events to be detected than in other parts of the year. Therefore, we can expect an overrepresentation of spring floods and an underrepresentation of winter (and maybe also of autumn) floods. Interestingly enough, as we will see, this does not automatically come out in the final seasonal distribution patterns of recorded medieval flood events: winter floods are rather well-represented compared to, for example, summer floods (see chapters 5 and the Catalogue: chapter 9).

Usual or unusual: why should we trust charters?

As we could see in the previous chapter, floods occur almost every year in the Carpathian Basin. Why can we say that the floods of mainly natural origin, reported in medieval charters, are predominantly different from the 'usual', 'ordinary' ones? Probably many of them were not really extraordinary in magnitude or consequences, but they did disturb everyday life, and they were irregular enough to be partly or entirely unexpected in their actual form.

First of all, it is important to understand the 'general level', the 'general' attitude of people towards flood, living in a 'countryside-based' traditional society, who took part of these legal procedures, field surveys. In the areas subject to flood events, even if small changes surely occurred, more or less the same population (one generation after the other) lived already for several decades or centuries (e.g. Žitný ostrov, Sárköz of Kalocsa, upper middle Tisza and its lower catchment). Observations of ethnographers (as experts on the general environmental policy of people of traditional society) can have special importance, and the conclusion of the ethnographer Miklós Szilágyi about the importance of floods in traditional fishery, can be valid in general:

"The usual 'nature' of floods, therefore, could be learnt by people and it was possible to adapt themselves to these 'usual' flood circumstances. The continuous practice adapted to these 'general features'; the 'different', the extraordinary – either flood or recession – was accounted as a 'natural calamity'.³⁷¹"

This statement can presumably be as well applied for medieval mentalities (as reflecting matters related to every day life): the main point is to 'distinguish the unusual'. An actual (flood) event which was in any sense unusual (timing, location, frequency, magnitude etc.), obstructive for the people in their usual, everyday practices. Not necessarily an 'impossible' or 'never-seen' event, but 'unusual' ('not usual', not something which occurs 'every year'). In this sense, the above statement can be predominantly generalised for everyday life matters. For example, we can presume that, even if there could also be exceptions, people generally rather used those lands as arable (or any intensive agricultural use) which usually were not subject to a flood event, and did not settle earth landmarks (with lots of work) in those places where it was likely to be (frequently) taken by water etc. And the same is true for other activities and economic values, for example fishing places and equipments. This does not mean that these

³⁷¹ Szilágyi 1977, p. 172: "Az áradások általában jellemző „természetét” tehát ki lehetett ismerni, s alkalmazkodni lehetett hozzá. A folyamatos gyakorlat ehhez az „általában jellemzőhöz” igazodott; az ettől eltérő, a rendkívüli – akár az áradás, akár az apadás elmaradását jelentette – „természeti csapásnak” számított."

areas had to be entirely free from flood events all the time, and only devastating floods reached them. However, the risk was clearly lower than rentability. Real problems occurred when this balance ceased to exist for shorter or (especially when for) longer period of time.

Secondly, on the level of individual perambulations, one has to face with the uncertainty that in many cases the order for perambulation or for another legal process came from a central office (e.g. royal court, chamber), thus far from the area subject to a survey. However, as we could see, these orders usually had an annual 'rythm'. Moreover, in most cases only a deadline was provided by which time the tasks had to be fulfilled. Thus, a period of time was provided, within which period the procedure had to be carried out.

It also has vital importance whether those who took part of the field surveys, who partly decided on the timing, were aware of the conditions, the environmental 'logic' of the actual area subject to field survey. So, who were (usually) these people?

1. member(s) of a '*locus credibilis*', thus that of a chapter or a convent (usually the closest place of authentication was asked)
2. in many cases a responsible nobleman, the 'king's man', as well took part of the procedure
3. owners of the land(s) or boundaries in question
4. neighbouring landowners
5. in some cases (locals: nobles and/or serfs) witnesses were also present (if asked).

In most cases we do not question the knowledge of the people belonging to groups No. 3-5. The king's man (No. 2) predominantly also comes from the neighbourhood.³⁷² Responsible member(s) of the closest (or the chosen) chapter or convent, the place of authentication came on order (following the orders of the *mandatum*). Since they were mainly members of the clergy or monks, they spent the least times outside of their 'home' environment. As we could see earlier, the speed of their part of the legal procedure (especially concerning field survey) was fast and rather accurate. At least this was clearly the case until the 16th century.³⁷³

Thus, altogether we can state that it had crucial importance that the key persons who took place in the perambulation had a clear and deep knowledge about the conditions of the given area. This does not necessarily mean that all of them were fully aware of all conditions, but in case of any debate or contradiction, witnesses (and previous charters) were immediately asked (and sometimes an oath towards the end of the procedure) in order to ensure maximum accuracy. Since the conditions, exact size and boundaries (and value) of a land were practically some of the most important questions, included in the charters (for long-term memory), the knowledge of the environment was of utmost importance.

4.1.2.4 Legal evidence II (ecclesiastical): Ecclesiastical jurisdiction and canonisation trials

Ecclesiastical jurisdiction: charters/permissions of the pope and the high clergy

Another very important source of long-term information is the group which belongs to the jurisdiction of the Hungarian clergy and the pope.³⁷⁴ Many of the flood-related ecclesiastical charter evidence, in the form of petitions sent to the pope and the permissions received afterwards, preserved in the papal court in regesta form (in protocols). Although most of the flood-related ecclesiastical charter evidence comes from these protocols, sometimes the Hungarian high clergy (e.g. archbishop of Esztergom) also issued permission charters in the same matters: allowing the establishment/separation of a new parish (church), and sometimes

³⁷² See, for example (concerning perambulations south to Lake Fertő), Kiss 2005b, 2006.

³⁷³ See, for example: Köfalvi 2006, pp. 38-44

³⁷⁴ For more information on the ecclesiastical jurisdiction in medieval Hungary, see: Bónis 1997, pp. 624-658.

giving permission for the destruction of a church or to choose a new place for a new church as a replacement of an old one.³⁷⁵

Moreover, the petitions sent to the pope and the jurisdiction of the holy seat in Rome (or Avignon), due to their long-term availability, can be treated as a full homogenous series. Thus, the dates or periods when such petitions (dealing with flood-problems and their social and administrative consequences) – among the many other petitions of other 'everyday' matters – appeared from Hungary might be possible to be used as a mark or sign (for a period) of flood-related problems. Although most of the evidence related to Hungary remained to us in the '*Regesta Supplicationum ...*' protocols of popes (see reference above), many charters were also preserved in the archives of various ecclesiastical bodies in Hungary.³⁷⁶

Flood-related information in canonisation trials

A clearly very high-quality group of evidence is the testimonies of eye-witnesses, provided in the documentation of canonisation trials. Great advantage of this source type, relatively rarely applied in environmental analyses, that contemporary descriptions of eye-witnesses as confessions are provided. In medieval Hungary, at present only the documentation of one, 13th-century canonisation trial is available which contains flood-related information. Remained in its 18th-century word-by-word copies, a very important source is the canonisation trial documentation of a mid-13th century royal princess (princess Margit of Árpád), in which the testimonies of more than a hundred eye-witnesses were preserved.

The information about Margit, provided by the witnesses (mainly nuns), in many cases were connected to everyday matters and thus, preserved documentation about such environmental circumstances as details on flood events. In the collection of her second canonisation trial (the only one which preserved to us), taking place in 1276, the most frequently mentioned miracle was the sudden (great) flood event of the Danube which entered the area of the cloister in winter. The same descriptions preserved the memory of a previous flood event of similar type.³⁷⁷ In respect to these two flood events, all related information were included in the later legends, based on the documentation of the (second) canonisation trial.

4.1.3 Non-legal evidence

4.1.3.1 Narrative evidence

Perhaps the most important document types concerning medieval flood events in Western and Central (but also in Southern) Europe belong to the group of narrative sources.³⁷⁸ In contrary, relatively few narratives remained to us, written in medieval Hungary. In remaining domestic narratives, however, the information on flood events is almost completely missing (3+2 cases). Nevertheless, in the narratives of neighbouring countries flood reports are sometimes available, providing precious information on Hungary (14 cases). Among these foreign narratives, one must emphasise the importance of Austrian and Italian-Hungarian evidence. Although less pronounced, but still in some cases Czech, French, Polish, Byzantine,

³⁷⁵ See, for example 1358: Bossányi 1918 Vol. 2, ch. 124, pp. 323-324; 1400: MVH Vol. 1/4/2, ch. 346, pp. 287-288. 1349: AO Vol. 5, ch. 124, pp. 323-324; 1424: Lukcsics 1931 Vol. 1, ch. 723, p. 156.

³⁷⁶ For the most important published charter collections, see the MREV and MES volumes.

³⁷⁷ MREV Vol. 1. Concerning the background of the canonisation trial, the oldest legend and an overview of secondary literature, see for example: Bellus et al. 1999, pp. 7-25.

³⁷⁸ See for example, for the Czech areas: Brázdič-Kotyza 1995, pp. 34-37, for German territories: Glaser 2008, p. 14, for the eastern alpine area: Rohr 2007, for the Byzantine empire: Telelis-Chrysos 1992, pp. 17-31.

Swiss and Russian narratives can as well contain flood data concerning medieval Hungary (see also Fig. 19 above).

Domestic narratives

The most comprehensive collection of medieval domestic narratives, the 14th-century chronicle composition, containing early domestic narratives from the 11th-13th centuries, almost contains no flood evidence.³⁷⁹ Few exceptions are the information about military campaigns of the Holy Roman emperors mainly occurred in the 11th century when the inundations of the Rába, Rábca and probably of other waterflows stopped the emperor's army to proceed towards the central parts of the country.³⁸⁰ These inundations sometimes, at least partly, were most probably of artificial origin.³⁸¹ Sporadic evidence is also available for the 13th century, referring to the military campaigns of Mongols and Czechs, even if in these cases information is rather fragmentary.

More data can be found in domestic narratives concerning the 15th century. 15th-century narratives are, however, not entirely domestic, since those who wrote these works were rather 'domesticated' foreigners than citizens of local origin. Important examples are the diary of Helena Kottannerin, German widow of a Sopron citizen, about the events of 1440,³⁸² or the extensive, 10 volume-work of the Italian humanist, Antonio Bonfini, containing contemporary information about Hungarian history in great length. Bonfini's works are of basic importance especially concerning the second half of the 15th century, since his descriptions are partly based on archival documents (of the cancellor's office), his own experience, and the experience of eye-witnesses, his friends and members of the royal court.³⁸³

Another group of narrative evidence is the legends of saints. In this type of domestic narrative evidence, flood events only exceptionally occur. Such an important exception is the legend(s) of princess Margit the blessed, the dominican nun: in her longer legend the testimony of at least two mid-13th century Danube flood events, presumably ice floods, were included.³⁸⁴ Nevertheless, due to the fact that the main source of her legends are the documented canonisation trials with the description of eye-witnesses, textual evidence of the Margit-legend is of somewhat secondary importance, compared to the information content and quality of the canonisation trial documentation (see the previous section).

Role of foreign narratives in detecting Hungarian flood events

From the narratives of the neighbouring areas, Austrian sources play the most important role in detection of Hungarian floods, since many waterflows in the western part of Hungary transport water from the alpine, partly or entirely Austrian, catchments. Nevertheless, we have to emphasize that still this role is somewhat marginal (6 flood reports) compared to the vast amount of charter evidence reporting flood events.

Out of these Austrian narratives, without any doubt, the contemporary source evidence on Danube flood events play the most important role. Concerning floods, for example, the

³⁷⁹ It is partly due to the fact that very few domestic narratives preserved from the high medieval period, but partly also because the nature or character of Hungarian narratives was different in several aspects from the western (central and eastern) European ones. For example, the proportion of prehistory or history of the past is much higher than the descriptions concerning contemporary history, which is a clear difference from the general medieval European tradition. See Veszprémy 1999, pp. 260-268.

³⁸⁰ See for example the 14th-century chronicle composition: SRH Vol. 1, p. 329.

³⁸¹ Concerning the German (imperial) attack in 1043: Oefele 1891, p. 33 (*Annales Altahenses Maiores*). For more information, see the next chapter.

³⁸² Mollay 1971, 95 p.

³⁸³ Bonfini 1936-1941.

³⁸⁴ Margit's greater legend: SRH Vol. 2. For a concise overview of the topic in English, see: Klaniczay 2002, 400 p. For recent literature see also: Deák 2005.

Continuatio Claustroneoburgensis,³⁸⁵ *Continuatio Novimontensis*,³⁸⁶ the chronicle of *Johannes von Winterthur*³⁸⁷ and the *Kalendarium Zwetlense*³⁸⁸ (although this latter one as a non-contemporary source) contain Hungary-related information. Nevertheless, in many cases merely the fact of a Danube flood, reported in Lower Austria, for example in the areas of Vienna or Klosterneuburg, already has importance. Austrian sources usually do provide reliable information of floods or flood waves of greater magnitudes – in the 15th century sometimes parallelly documented in Hungarian charter evidence.³⁸⁹

Beyond the work of the 15th-century Polish historian, Jan Długosz,³⁹⁰ eventually Czech sources, such as the *Annales Otakariani* (with the authorship of *Cosmas Pragensis*) or the (non-contemporary) *Rosenberger Chronik*³⁹¹ can as well contain useful information.³⁹² Especially concerning the high medieval period, sporadic flood-connected reference, referring to the most southerly parts of medieval Hungary, can as well be found in Byzantine narrative sources. Because of the poetic-symbolic, subjective style of these narratives, it is sometimes not easy to give full credit to these, otherwise contemporary, authors, such as *Ioannes Kinnamos* (poetic).³⁹³ Nevertheless, due to their historical (political) credibility, even if style and expressions are subjective, main content of these works, at least on the level of facts, are usually accepted.³⁹⁴ In exceptional cases other, western authors can also provide flood-related information, for example the information derived from travellers, such as Swiss³⁹⁵ or French contemporary narratives.³⁹⁶ Russian annals only exceptionally mention data concerning areas outside of Russian territories (in our case the borderline).³⁹⁷

4.1.3.2 Letters and poems

Letters in their 'outlook' show several similarities to charters; however, compared to charters, their importance is somewhat less pronounced in the number of flood evidence found for medieval Hungary (see Fig. 17). Although letters often mean private correspondence, some of the official ones may also contain useful information. Letters sent and remained to us, with reference to flood events, are mainly connected to the 15th century. Private letters may provide information, for example, on a flash-flood caused by prolonged rainfall and its agricultural consequences,³⁹⁸ or a great flood event which endangered landed possessions and probably also obstructed travel in about 1419.³⁹⁹ Among official letters, probably the most important ones

³⁸⁵ 1402: MGH SS 9, p. 736 (*Continuatio Claustroneoburgensis V*).

³⁸⁶ Neuberg an der Mürz in Styria, Austria (for more details, see Rohr 2007, p. 227).

³⁸⁷ 1342: MGH SRG NS Vol. 3 (*Chronica Iohannis Vitodurani*).

³⁸⁸ 1408: MGH SS Vol. 9, p. 697.

³⁸⁹ For example, in 1402: DL 78505.

³⁹⁰ 1383: HP Vol. 10, p. 80 (*Historia Polonica*).

³⁹¹ 1432: FRA S Vol. 6, p. 77 (*Rosenberger Chronik*).

³⁹² The information is related to a Morava flood. 1260: MHG SS Vol. 9, p. 184.

³⁹³ See, for example, Telelis-Chrysos 1992, pp. 17-31.

³⁹⁴ For brief summary of evaluation from a Hungarian point of view, see: Kristó et al. 1994, p. 114 (Ferenc Makk).

³⁹⁵ MGH SS Vol. 5, p. 454 (*Bernoldi Chronicum*): What he described was not his own experience, but he heard it from other(s). Nevertheless, since his information about Hungarian politics and other matters was always adequate, we have to take this report into consideration.

³⁹⁶ For example, Bernard de la Broquiére, as an ambassador in his journey back, travelled through the Balkan peninsula and Hungary from the Holy Land in 1433, he himself was an eye-witness of an extraordinary large Danube flood event. See in: MHHD Vol. 1/4, 323 p.

³⁹⁷ At present only such case is known, and even in this case the Hungarian Mountains (Carpathians), thus the borderline of the two territories is mentioned. 1229: Hodinka 1916, p. 366.

³⁹⁸ 1454: Zichy Vol. 9, ch. 337, pp. 461-462.

³⁹⁹ 1419(?): DF 290628.

(from the viewpoint of a flood-description) were written by King Matthias and his close environment, reporting about the circumstances of sieges and battles.⁴⁰⁰ Letters, both private and official, can as well be a good source on weather circumstances.

Although in the early modern period it has some importance, poem is an only exceptionally applied source type.⁴⁰¹ Such an exceptional case is the one described by the 15th-century Renaissance poet and bishop, *Janus Pannonius*, referring to a flood event most probably occurred in autumn 1468, described in his elegia. Due to the fact that the poems of *Janus Pannonius* usually contained information based on facts occurred in his lifetime, and themes of his poems were largely affected by actual events which he described in great details, in scientific literature the 1468 flood is considered as a real event.⁴⁰²

4.1.3.3 Economic evidence

Even if several types of economic sources and documentation are available from medieval Hungary (e.g. some manorial accounts, border tax accounts etc), in terms of direct and indirect reports of flood events, the account books of medieval towns with a larger waterflow in the close neighbourhood, have the most potentials. Floods were reported in most cases when damages occurred: most of these damages, when reported in account books, are connected to the bridge system. Such type of 'urban-bridge' damages may also appear in charter evidence.⁴⁰³ In this type of evidence, although based on some reported damages, the event of flood itself is relatively rarely mentioned.

Based on the nature of the material it is rather clear that the damages documented as bridge-reparation expenses in each year (usually with dates) are as well strongly related to the increased energy of the river. A clear reference of increased flux and speed of the waterflow directly connected to the increased amount of water transported in the riverbed (or already beyond). However, in most cases the so-called 'bridge master's accounts' are only sporadically available in medieval town accounts. Referring to medieval Hungary, perhaps the only exception of a relatively continuous series (with some years of interruptions) is the one, available for Bratislava.⁴⁰⁴ Concerning bridge-masters' accounts, for detailed description of methodology and analysis, the results of Czech⁴⁰⁵ and Austrian research are of basic importance.⁴⁰⁶

Another, small group is the accounts of tithe collectors, collecting tax for the pope, mainly in the 14th century. In this case flood is mentioned as part of the accounts which can as well be treated as travel notes. For example, the tithe collector in 1374 provided the information about the flood and high prices as reasons or excuses for spending quite much money.⁴⁰⁷

⁴⁰⁰ See, for example, 1476: Fraknói Vol. 1, letter 231, p. 334; Thallóczy-Áldásy 1907, pp. 388-390.

⁴⁰¹ Janus Pannonius: *De inundacione*. Published in: V. Kovács 1972, pp. 371-381. See full text in the Appendix (App. 2).

⁴⁰² The reliability of this poem as a flood historical source can be also supported by the fact that in the same poem he dated the flood with the appearance of a comet. See, for example: Varga-Both 1987, pp. 279-283.

⁴⁰³ See Section 2.1.2. For example: 1439: CD Vol. 11, ch. 98, pp. 224-225; 1496: DL 65441 (although this can be called as an urban bridge only with some restrictions).

⁴⁰⁴ DF 277059.

⁴⁰⁵ See, for example: Brázdi et al. 2000.

⁴⁰⁶ See Rohr 2005 and 2007a, b.

⁴⁰⁷ See 1374: MVH Vol. 1/1, p. 461.

4.2 Floods in space and time: distribution and limitation of the available source material

4.2.1 Spatial coverage on large- and small-scale level

Regional distribution of medieval flood evidence on large scale is uneven: whereas some rivers, e.g. Upper, and in a certain extent the Lower-Danube as well as the Upper-Tisza catchment and the northern part of the Middle-Tisza are quite well-represented, other areas, for example the southern Middle- and Lower-Tisza area, Danube-Tisza Interfluve and most of the Transdanubia and large parts of Transylvania, or present northern Slovakia are underrepresented.

On the small-scale, localisation causes problems: even if in most cases it is possible to localise the events, in some other cases exact localisation is a rather problematic task. Whereas narratives provide usually quite general and schematic information on location, giving only regions or the whole country as the place of flood event (1000s of km² or the whole country), legal documentation, similar to letters usually provide exact, mainly detectable information concerning location on settlement level (km²-level or even more detailed). In this later case, detecting medieval topography may cause difficulties, especially if location is provided in connection with deserted settlements or settlements changing location later several times, and thus with present localisation problems.⁴⁰⁸ Another problem can be the (weakly known) environment and landscape which probably has fundamentally changed since the medieval perambulation/information. Nevertheless, a detailed, small-scale analysis can highlight problems, show more the certainties and uncertainties of analysis, narrow down possible reasons (e.g. possibility of a flash-flood event is higher in hilly area with forest-clearings etc; iceflood is less likely on fast streams or waterflows etc). More flood evidence is reported concerning lowland areas than hills/mountains, which naturally also connected to socio-economic, such as population-density questions.

4.2.1.1 Best- and worst-documented areas

Apart from the question of localisation, in the case of charter evidence, a testimony of flood events remained to us only in such cases when a legal process was obstructed by a flood, inundation. In this way, and also due to lacking flood-documentation of domestic narratives, even great flood events of the medieval period could remain unreported.

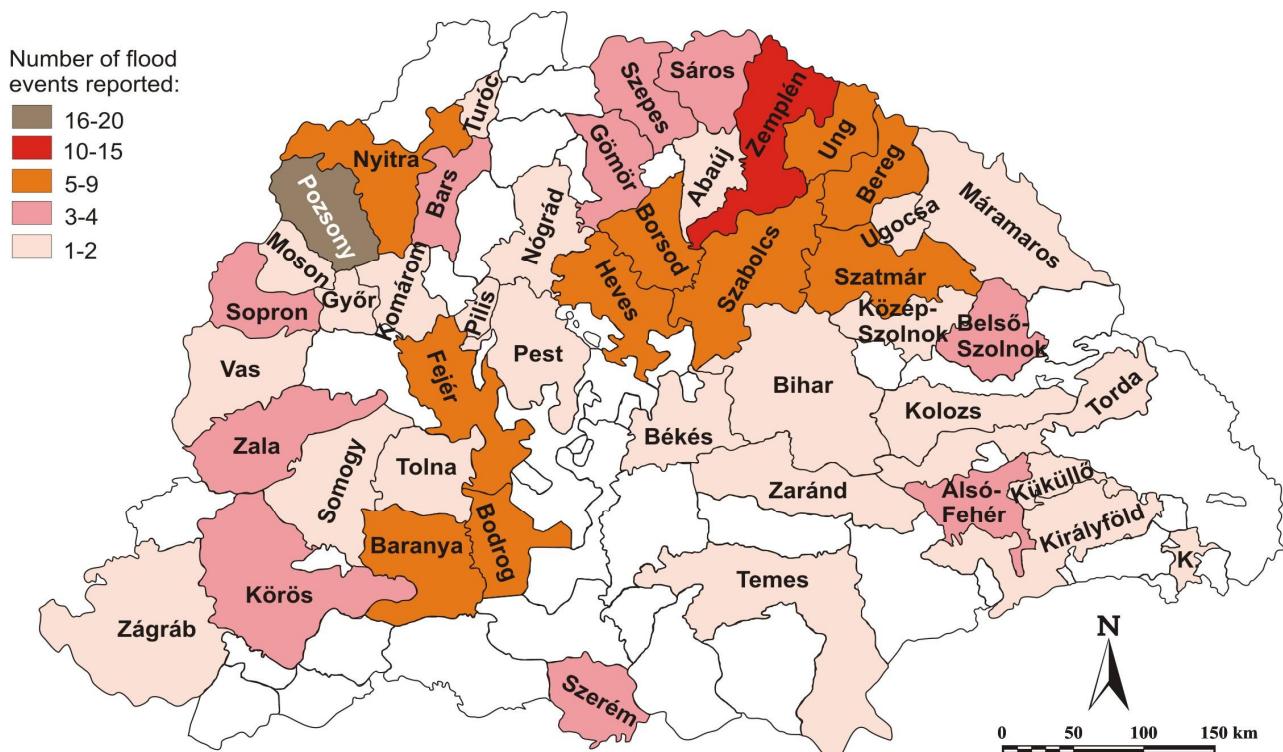
Best-represented areas are as follows (according to counties, see *Fig. 23*):

1. The medieval town of Pozsony/Pressburg (Bratislava-Sk), mainly due to the accounts related to bridge damages and the Csallóköz (Žitný ostrov-Sk) in medieval Pozsony county. The nearby located Nitra county is still quite well-reported concerning floods. This area (today's West-Slovakia) was well-developed and quite densely populated in the Middle Ages; moreover, was clearly less affected by Turkish destruction in the early modern period. It is rather richly documented concerning flood events, in spite of the fact that Pozsony county archives burnt down at the end of the 16th century.⁴⁰⁹

⁴⁰⁸ For deserted settlements whose former location is just approximately known see, for example, 1300: ÁÚO Vol. 10, ch. 254, pp. 385-387; 1338: DL 62697; 1342: DL 75835; 1342: AO Vol. 4, ch. 138, pp. 219-223; 1342: AO Vol. 4, ch. 172, pp. 278-282; 1413: DL 10105; 1435: SvO Vol. 2, pp. 197-198; 1443: DL 55253.

The village of Szeremle at the lower Hungarian sections of the Danube in the Sárköz area, for example, changed its location several times, especially in the 18th century. Bárth 1989, pp. 335-422.

⁴⁰⁹ Földes-Rudnay 1999, p. 64.



23. Fig. Spatial distribution of documented flood events (when exact location was reported) in medieval Hungary according to counties (based on the database included in the present work)

2. Territories of present Northeast-Slovakia and the West-Transcarpathian region (today's Southwest-Ukraine). It means the Upper Tisza in historical Zemplén, Szabolcs, Szatmár, Ung, Bereg, Borsod and Heves counties, namely the northeastern part of the Great Hungarian Plain, which is also the richest area in (the quantity of) remaining medieval charter evidence of official county administration, concerning medieval Hungary.⁴¹⁰
3. Quite well-represented areas (despite early-modern Turkish occupation and devastations) are the lower middle and lower sections of the Danube (Fejér, Bodrog and Baranya counties).

The rest, namely approximately half of the medieval flood reports are relatively evenly distributed all over the Carpathian Basin, but the south and most central, lowland parts of the Basin, together with eastern Transylvania provide very scarce or no medieval flood records (Fig. 23).

4.2.1.2 Possible reasons for an uneven spatial distribution

In some of the areas, the occurrence of floods has much less chance than in other areas, due to geomorphological, hydrological reasons. Typical examples are sandy areas, such as the Nyírség and the Sand Ridge area of the Danube-Tisza Interfluvium. Moreover, some parts of these areas were of scarce population. Similarly, the scarcity or lack of population and lands suitable for agricultural production (and thus, need for frequent field surveys) could be one of the reasons for the almost complete lack of flood documentation in the, otherwise really flood-endangered, areas with a great abundance of wetlands, waterlogged areas along the Middle- and Lower-Tisza, together with the lower catchment area of the Körös river. Similar problems

⁴¹⁰ C. Tóth 2003, Introduction.

may occur in mountain and densely forested areas (e.g. Carpathians; Northern Mountains in present Hungary etc) where rare perambulation cases only exceptionally provide evidence on flood events.

Another important reason for missing medieval flood documentation can be the (Ottoman-)Turkish wars and occupation in the early modern period, when due to problematic conditions and the collapse of legal administration many documents were destroyed.⁴¹¹ Nevertheless, as we could see, still there are some areas, formerly under Turkish occupation, where rather rich flood-reference material is available (e.g. Lower Danube).⁴¹² Thus, Turkish occupation alone cannot explain the lack of evidence, even if it surely had major impact on the preservation of original documents, especially in the lowland areas.

Another reason can be, for example in the (Iaso-)Cuman areas, the alternative ownership traditions of Cumans. In this area, it was only the 14th century when social differentiation speeded up, and consolidation of settlements took place only around the turn of the 14th and 15th centuries.⁴¹³ Location of Cuman tribes was determined by the second decree of King Ladislaus IV (1279), and can be mainly traced at the Great Hungarian Plain (today's Little and Great Cumania): between the Danube and Tisza rivers (sandy area of the Danube-Tisza Interfluvium), along the Körös river, the Maros-Körös Interfluvium and the area between the Maros and Temes/Timiş rivers (in many cases also with scarce population).⁴¹⁴

An important additional reason for an uneven spatial distribution is that areas of special regional authorities had their own rules and documentation practices and thus, their areas were taken off from the county-based legal system. In these areas (especially in the case of towns) perambulations were only documented if the regional integrity was disturbed (e.g. boundary debates between a royal town and the neighbouring landowner). The importance of this legal difference clearly appears, for example, in the case of the Iaso-Cuman areas, the southern Transylvanian Saxon area, the Szepesség (Spiš-Sk) region, Székely regions (East-Transylvania) and the areas belonging to royal towns (e.g. Sopron).⁴¹⁵

It is interesting, however, that for example in the Transdanubia, which was a generally well-documented area concerning the Middle Ages, and traditionally a relatively densely populated area of good soil conditions, rather few flood-reference is available for the Middle Ages. This question is also dependent on whether or not the medieval documents preserved were published in the form of chartularies (preferably in their original full Latin text form). Moreover, we cannot entirely exclude the possibility of small differences in legal practice (e.g. no perambulation carried out during floods).

4.2.2 Temporal distribution, coverage and sources

⁴¹¹ For example, due to the fact that medieval charters perished, in the 17th and 18th centuries, local peasant memory on medieval estate boundaries and possible landmarks had special importance in some parts of the domain of the Báta abbey, along the Lower Danube. For example Szeremle, one of the most important medieval areas where Danube floods were reported, belonged to the domain of the Báta abbey. Here several perambulation protocols/trials are available from the 17th-18th centuries where the knowledge of old peasants was used in the reconstruction of boundaries, during or after the 'messy' Turkish period. In: Molnár 2006, pp. 48-49.

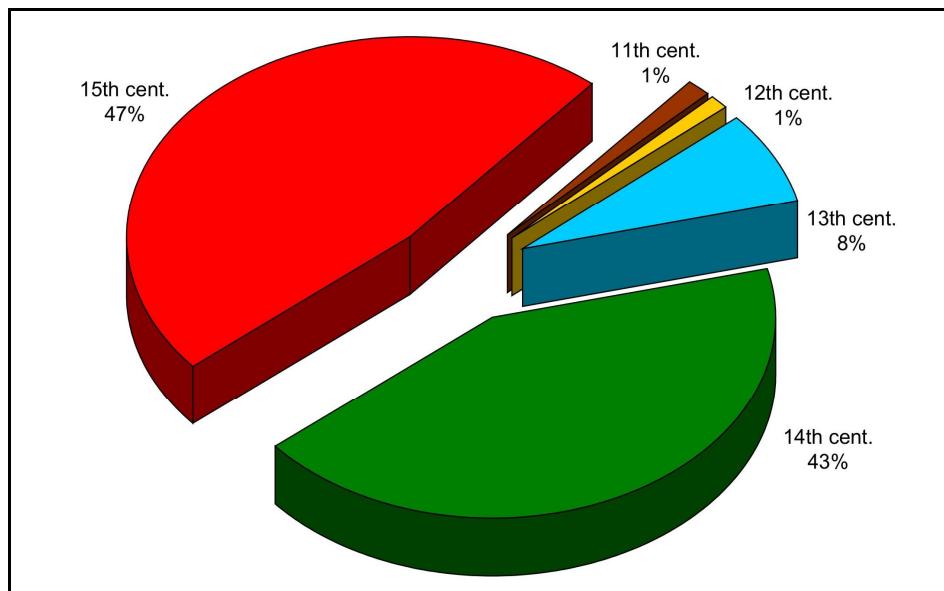
⁴¹² For example, the documentation of the Sárköz area along the lower sections of the Danube.

⁴¹³ Pálóczi Horváth 1989, p. 113.

⁴¹⁴ See, for example: Jankovich 1996, pp. 305-349; Pálóczi Horváth 1989, p. 61. Some Cuman groups still did not have fixed settlements in the 14th century.

⁴¹⁵ Even if royal towns are usually rather rich in economic documentation such as town account books, except for the Bratislava-accounts, no significant evidence is available on flood events. Thus, in spite of rich medieval documentation of towns in general, due to the almost complete lack of traditionally Hungarian type of field-related evidence, they are in fact rather poor in flood references.

Due to the uneven distribution of medieval documentary, but especially legal evidence referring to Hungary, the temporal distribution of documentary evidence on flood is also uneven. While the number of evidence referring to the 11th, 12th centuries is very low and direct application is mainly problematic (*Fig. 24*), a rapidly growing number of evidence, in general, is available from the second half of the 13th century, but especially from the first half of the 14th century. This process was mainly generated by the development and new foundations of royal central offices (thus, mainly connected to the development of legal administrative practices and administrative bodies). Before the 14th century, in the high medieval period (11th-13th centuries), written documents played less than marginal role in everyday life. Thus, based merely on the number of flood-evidence, due to severe shortage of early flood evidence, we cannot directly estimate or detect differences between (real) high-medieval and late-medieval flood frequencies or magnitudes.⁴¹⁶



24. *Fig. Centennial distribution of floods reported in 11th-15th-century documentary evidence*

Flood data, reported in the 11th and 12th centuries, are very sporadic. On the one hand, in most cases what is reported is not necessarily a natural flood event, or it may not be a flood or inundation event at all, even if it is referred to in that way.⁴¹⁷ On the other hand, in some of these early reports the natural events described are possibly connected to a flood event, even if the flood or high water-level event itself is not explicitly mentioned in the text.⁴¹⁸

Another important point to note is that in the 13th-century and before charters are dated merely according to year and thus, even if some flood events were (rarely) reported, no seasonality can be detected based on dating. It is probably due to the fact that the procedure was not so much date-dependent as later when legal process had to take place in a relatively short period of time. Thus, if the procedure was obstructed due to any reasons, then this fact and the realted circumstances had to be (immediately) reported. As a consequence, before the early 14th century the most important source, potentially containing flood information, partly falls out of any seasonality investigations.

⁴¹⁶ For more details, see for example: Szentpétery 1930.

⁴¹⁷ For example, the German military campaigns obstructed by inundations (caused by prolonged rainfall in the Alpine catchment) in 1051. However, the 1051 case seems to be a 'real' natural flood case when the reason of flood is also reported. See Section 3.1.3. about the military campaign of Henry III. In this case the style of Byzantine evidence leaves some doubts of flood-reference, mentioned in more detail in Section 2.1.1.2.

⁴¹⁸ 1092: MGH SS Vol. 5, p. 454 (*Bernoldi Chronicon*).

Even if charters are issued much less in quantity, and the quality of documentation is as well less detailed in the high then the later Middle Ages, the evidence (both charter and narratives) which is available from the high medieval period is much more known, collected and published than that of the late Middle Ages. This means that while the high medieval charters (those remained to us) are published either as Hungarian regesta or in their full Latin transcription, and Hungarian as well as foreign narratives referring to Hungary are collected,⁴¹⁹ late medieval evidence is still only partly known: this is especially true for the second half of the 15th century.⁴²⁰

As we will see, two flood waves are especially marked in the flood evidence of late medieval Hungary: the 1330s-1350s and the 1390s-1430s. These two flood peaks largely overlap with the periods covered by the published regesta volumes of the Anjoukori oklevéltár and the Zsigmondkori oklevéltár (1387-1433). Nevertheless, the two flood peaks cannot be the mere result of these overlaps, although this fact clearly influenced and increased the number of flood-related documents found.

1. At present, the Zsigmondkori oklevéltár ends up with the year of 1424, whereas the second most important known flood decade of late medieval Hungary is the 1430s, for which decade no any systematic countrywise regesta collection is available.
2. Already in the 1990s, well before the relevant volumes of the Anjou-kori oklevéltár were published, merely using published charters and the regesta collection of the Hungarian National Archives it was possible to detect the special importance of the decade of the 1340s and especially the year of 1342.⁴²¹
3. A very important flood decade is the 1350s for which, similar to the 1430s, no systematic published regesta collection is available.
4. On the other hand, not all the flood events of the 1390s, a rather important flood decade, appear amidst the regesta material included in the Zsigmondkori oklevéltár (e.g. 1399).⁴²²

It is, however, clear that there is less possibility to find all documented flood events for those periods when no countrywise regesta collections are available. There is practically no period uncovered in the Middle Ages, since the Hungarian National Archives published its regesta collection and charters.⁴²³ Thus, it is a rather lucky coincidence that relevant periods with flood peaks are partly also covered by systematic regesta collections. Although these circumstances certainly have some influence on the amount of flood events found in documents applied in the present analysis, this fact alone cannot fundamentally affect the main conclusions of the reconstruction.

⁴¹⁹ Besides the Szentpétery-regesta collection and the Wenzel series of full transcriptions, a detailed catalogue (with Latin and vernacular texts) of foreign narratives referring to the high medieval period is available in: Gombos 1937-1938, 3 Vols. In the present work, I have checked through this catalogue for flood references in foreign narratives, referring to Hungary, but then I applied the critical editions in references, and not the Gombos-catalogue itself.

⁴²⁰ See, for example, Kőfalvi 2006, p. 49.

⁴²¹ See Kiss 1996, pp. 61-69; Kiss 1997, pp. 238-241; Kiss 1999, pp. 51-64.

⁴²² For the case when the flood charter was not mentioned in ZsO at all, see: 12.05.1399: C. Tóth 2005, ch. 42, p. 252-253; when the charter itself was included, but no indication was available on the flood event: 07.03.1396: ZsO Vol. 1, ch. 4294, p. 469; 03.05.1399: Zichy Vol. 5, ch. 96, pp. 105-108 (ZsO Vol. 1, ch. 5846, p. 647); 11.12.1399: Smičiklas Vol. 18, ch. 355, pp. 127-141 (ZsO Vol. 1, ch. 6195, p. 689); 06.12.1400: MVH Vol. 1/4/2, ch. 346, pp. 287-288 (ZsO Vol. 2, ch. 686, p. 80).

⁴²³ Arcanum: Database of Archival Documents of Medieval Hungary.

<http://mol.arcanum.hu/dldf/opt/a101129htm?v=pdf&a=start>.

4.3 Methodological questions

In the present work largely the type of textual evidence is applied which up to now played a rather marginal or no position, and thus was largely neglected up both in domestic and international flood research. Defining methodology, especially in case of charters, is a crucial point. Therefore, in this subchapter such questions are discussed as: what to care about, what to do and what to avoid. Thus, it is provided to be a practical guide for showing uncertainties, define possibilities and the limits of applicability.

Dating has special importance if connected to political and/or social events, problems. Nevertheless, it can relatively easily happen that, working with thousands or ten thousands charters, mistakes occur in dating in critical editions or regesta. Naturally, this rarely means a shift in year or seasons; rather concerns one or two days of miscounting. Therefore, in the present work dates of reports (if provided) were checked back from the original document.

Thus, even if there is a rather strong homogeneity in the type of source evidence, temporal distribution of available contemporary evidence, mainly charters are clearly non-homogenous. Still, main higher-frequency flood periods, that appeared in Central Europe, can as well be traced in the present Hungarian medieval database.

4.3.1 Medieval terminology and definitions – most frequently applied words

Due to any possible differentiation as well as understanding of flood terminology in medieval Hungary, a quick overview of terms is needed: whereas in narrative evidence the application of terminology is in most cases rather clear, the terminological questions mainly of legal documentation, letters and economic evidence still have to be defined.

	Flood terms	Meaning
Latin	inundacio (aque, aquarum)	flood, inundation ⁴²⁴
	exundacio (aquarum)	flood
	tumositas aque / intumescentia ⁴²⁵	swelling of water/river ⁴²⁶
	amnis	
	aquarum tumefac(c)io ⁴²⁷	swelling of waters
	aqua torrens ⁴²⁸ /aqua intorrens*	(rain-water) torrential waters causing flood?
	Diluvium, dilatabat se aqua	water overflow, inundation ⁴²⁹
	accrescentia aque	increase of water
	(Danubius) insolenter....excrevit	(Danube) grew unusually (big)
	(Danubius) evagans alveos suos	(Danube) left its riverbed
	(h)abundantia aquarum	abundance of waters
	Impetu/impedimenta aquarum*	obstructed by waters
	vehementia aquarum*	flux/power of water

⁴²⁴ LexLat Vol. 5, p. 365: synonyms provided: incrementum, diluvium, actus terram aqua obruendi, eluvio. Pápai Páris 1708, p. 324: (Hung.:) Ki-áradás.

⁴²⁵ LexLat Vol. 5, p. 364: Intumesco=accrescere (de aquis). Pápai Páris 1708, p. 322: intumeo: (Hung.:) feldagadok, fuvalkodom, kevélykedem. Intumescentia locus: (Hung.:) Dombos-hely.

⁴²⁶ For the modern hydrological understanding of the term 'intumescentia' ("Temporary and mobile swelling of the water surface in a stream or a lake."), see, for example: <http://webworld.unesco.org/water/ihp/db/glossary/glu/EN/GF0699EN.HTM>.

⁴²⁷ Tumefacio: fedagasztom, felpuffasztom. Pápai Páris 1708, p. 571.

⁴²⁸ Torrens, -entis: (Hung.:) Patak, Folyás, Esőből-való visfolyás. Pápai Páris 1708, p. 322.

⁴²⁹ LexLat Vol. 3, p. 154: diluvium=inundatio (taken as words with identical meaning).

German	grasz wasser flus / (Tvna) gros war als dy Tvna (des tags) gestossn ward*	great water, (Danube) was large the Danube had struck
	eyssgu(e)ss(e) ⁴³⁰	ice (jam) flood

2. Table *Terms applied in medieval sources referring to flood events: the Carpathian Basin* (* does not always equivalent to flood event)

As it appears in *Table 2*, more than a dozen types of flood terms are applied in medieval evidence. Still, the vast majority of sources and thus, general terminology, is predominantly connected to the word '*inundatio*'.

4.3.1.1. 'The' term of flood event: '*inundatio/inundationes aque/aquarum/fluviij*'

Regardless of time period, '*inundatio*' is the most frequently applied word for a flood event in high and late medieval Hungary. This word is applied in almost all charter reference and in a large part of narratives. One problem or uncertainty is that, if circumstances do not suggest it more precisely, this Latin word can mean any type of flood, but as well a long-lasting inundation. In medieval charters, '*inundatio*' can stand with water ('*inundatio aque*') or waters ('*inundatio aquarum*'); but in many cases it appears in plural ('*inundationes aque/aquarum*'). In all charter cases when the word '*inundatio*'/'*inundacio*' was applied, in my interpretation it clearly meant a flood event or events (either short-term or long-lasting) which obstructed legal procedure.

4.3.1.2 Other (flood) terms applied – or not applied

Although the importance of the word '*inundatio*' in medieval Hungarian flood terminology is overwhelming, there are some other cases when other terms, clearly with the meaning of flood events, are applied (see *Table 2*):

1. Surprisingly enough, '*exundacio aquarum*' very rarely appears in Hungary related to natural flood events.⁴³¹ Even in those cases when foreign sources contain information in the direct neighbourhood, only few Austrian sources apply this word.⁴³²
2. The term '*nimia tumositas aque*' appears in connection with a fishpond ruined by the 'swelling of water'.⁴³³ At Bonfini, the impression '*intumescens amnis*' appears with the same flood of rivers (due to prolonged showers) meaning.⁴³⁴ With quite the same meaning '*per nimiam aquarum tumefaccionem et inundacionem*' also appears.⁴³⁵ This last information might suggest for '*inundatio*' a stronger flood meaning than that of '*tumefacio*', which in itself 'only' means 'damaging swelling of water'.

⁴³⁰ Kirschtein et al. 1990 Vol. 1, p. 776: güsse=Überschwemmung. Lexer 1974, p. 78: güsse=anschwellen und übertreten des wassers, schwall, überschwemmung. (Nevertheless, gusrégen=platzregen). I am grateful to Dr. Chantal Camenisch for her useful suggestions concerning dictionary entries.

⁴³¹ TO Vol. 1, ch. 257, p. 420.

⁴³² MGH SS Vol. 9, p. 696. (*Kalendarium Zwetlense*); Zahn 1865, pp. 33-34 (1316).

⁴³³ 1454: DL 36407. For Hungarian regesta, see: Jakó 1990, ch. 1151, p. 487.

⁴³⁴ Bonfini Vol. 5/4, pp. 248-249.

⁴³⁵ 1496: DL 65441.

3. The 'rain/water inflow' ('*aqua intorrens*') is mentioned in 1440 connected to problems around salt mining and/or transport,⁴³⁶ whereas the second case (private letter) the term '*aqua torrens*' is clearly described as a flash-flood (caused by great rain).⁴³⁷
4. The words '*diluvium*' and '*dilatabat se aqua*' are only mentioned in the Austrian (and Czech) narratives of containing information concerning Hungary, and are usually applied with reference to the Danube, when water left its riverbed and exceeded the banks. In one specific case with giving the size of inundated lands along the river.⁴³⁸
5. The '*accrescentia aque*', referring to Lake Fertő, was used as a kind of synonym or clarification for the previously applied '*inundatio*'.⁴³⁹
6. '*Danubius insolenter....excrevit*'/'*Danubius evagans alveos suos*' were used by the Italian Bonfini and the *Annales Mellicenses* as direct synonyms of '*inundatio*' of the Danube, respectively.⁴⁴⁰
7. The '(h)*abundantia aquarum*' (abundance of waters) with clear evidence to a great amount of water on the surface, sometimes accompanied by snow in text.⁴⁴¹
8. The term of '*impetu/impedimenta aquarum*' in the meaning of 'obstructed by waters' does not directly mean an ongoing flood event, and in some cases it is not possible to clearly state it was directly connected to a flood.⁴⁴² Nevertheless, in some other cases, such as in 1335 in Ung county, it can be clearly proved that in the same area, in around the same time there was an ongoing extraordinary great flood event.⁴⁴³
9. As a flash-flood reference, 'great water' caused by cloudburst/thunderstorm appeared in the memoirs of Helena Kottannerin ('da kam ain solcher grasz wasser flus').⁴⁴⁴ The same wording was applied for the high-water/flood of the Danube in the Bratislava accounts ('als dy Tvana als gros war').⁴⁴⁵
10. The phrase '*als dy Tvana des tags gestossn ward*' as well appeared in the same town accounts, and although it primarily refers to damage/destruction, it is likely to be connected to the more intensive flux of the river and thus, there is a good chance that a flood (of unkown magnitude) occurred.⁴⁴⁶
11. The term *eysgu(e)ss(e)* is applied in one case,⁴⁴⁷ when (also based on the surrounding text) it refers to a possible ice (jam) flood event, occurred on the Danube. However, the word

⁴³⁶ 1440: DL 55213: in this case, it is mentioned connected to salt mining, but no further specification concerning the exact meaning is available – this entry will be discussed in more detail in subchapter 3.5.5.

⁴³⁷ 1454: Zichy Vol. 9, ch. 337, pp. 461-462. It has to be noted that the term '*aqua torrens seu mortua*' is also applied in case of an artificial flood event, caused by mill-damming: in this case the term was used for the water outflow. See 1440: DL 13581.

⁴³⁸ For the word '*diluviumChronica Aulae regis*); 1402: MGH SS 9, p. 736 (*Continuatio Claustroneoburgensis V*); FRA SS Vol. 6, p. 77 (*Rosenberger Chronik*). With providing extension: '*dilatabat se aqua per unum miliare ad latus*' MGH SS 9, p. 736 (*Continuatio Claustroneoburgensis V*).

⁴³⁹ 1435: DF 278003. "..... que tempore inundacionis laci Fertew vocati verum si ipsi huiusmodi meatum seu exitum aque de ipso laco decurrentem quunque profundius effodi quandoque verum secundum accressenciam et decesscenciam aque laci Fertew prenotati iuxta temporis congruenciam obstaculis seu aggeribus claudi et demum dum opus esset aperiri facere liberam haberent facutatem," For full Latin transcription and Hungarian translation, see: Kiss-Piti 2005, pp. 182-183.

⁴⁴⁰ 1490: Bonfini Vol. 4/8, p. 162. 1490: MGH SS Vol. 9, p. 525 (*Annales Mellicenses*).

⁴⁴¹ 1338: Fejér Vol. 8/4, ch. 176, pp. 362-363.

⁴⁴² See, for example: 1343: Diaconescu 2004 Vol. 1, p. 39 (*impedimenta aquarum*). Indirectly also refers to flood: 1439: Fejér Vol. 11, ch. 98, pp. 224-225.

⁴⁴³ 1335: DL 31227 (*impetus aque*); 1408: DL 9399 (*impetu inundacionis*); also used together with '*inundacio*': ca. 1495: DL 28005 (*per inondacionem siue impetu aquarum*).

⁴⁴⁴ Mollay 1971, p. 35.

⁴⁴⁵ 1440: DF 277059.

⁴⁴⁶ 1440 (25 January): DF 277059, p. 219.

⁴⁴⁷ 1485: DF 277059.

gwss also appears in another case, most probably in the meaning of torrential rain, but the occurrence of a flood event cannot be excluded either.⁴⁴⁸

There is another, small group of terms which does not directly refer to flood events, but the application suggests high (or in the case of special areas, at least medium-level) groundwater-table conditions. These might also be possible signs of inland excess water, for example, in the case of a very muddy meadow (*'lutosus est nimis'*) called *Sárrét* ('mud-meadow'). This can sometimes be also an important information, especially if this high groundwater level was described in the inundation area/floodplain of a larger river.⁴⁴⁹

4.3.1.3 General hydrological terms applied – an aid (or not) for specifying the flood environment?

Application of certain hydrological terms, especially that of '*fluvius*' is a bit 'relative' in the Middle Ages and understood in a much wider sense of a waterflow than the 'word' river in today's terminology. Although in the majority of cases '*fluvius*' means river, a '*fluvius*' can be in other cases, a stream or even a small waterflow.⁴⁵⁰ It is, however, interesting to note that the rather rarely applied '*flumen*' as a large river is usually used in a more clear way: in most cases it refers to the main branch of the Danube.⁴⁵¹

As we could see, in most of the flood-cases '*inundatio aquae*' or '*inundatio aquarum*' appear in flood terminology. The word '*aqua*' has a very general meaning and in many cases it does (or does not) refer to a waterflow.⁴⁵² Only in those cases do we have clear evidence on the name of the waterflow in flood, when the river or stream is named. However, in many cases the name of the waterflow is not mentioned, and only on the basis of the location of the event and the hydrological conditions of the area we can decide over the question which waterflow or waterflows were most probably in flood.

In charters, the application of the Hungarian practical water management term referring to the function of a given place, called '*fok*', as a tool in defining flood events, can as well provide useful additional information: for example, in the case where such a *fok* or a group of *fok*-s are mentioned in connection with flood.⁴⁵³ It is, however, clear that the water of *fok* itself, being merely a channel/canal usually led water from a waterflow/lake to an inundation area, received its water from the parent waterflow/lake and thus, a flood in the areas of the *fok* clearly means the flood of the parent waterflow/lake.⁴⁵⁴

4.3.2 Methodological questions, problems and possible solutions

4.3.2.1 Settling statistics

Time/frequency-statistics: when and how many floods occurred?

⁴⁴⁸ 1496: DF 216076.

⁴⁴⁹ 1336 (1340): Fejér Vol. 8/4, ch. 253, pp. 488-489.

⁴⁵⁰ As for references, see for example: Jankovich 1996, p. 314. See also: Ortvay 1882; LexLat Vol. 4. (1993) pp. 114-115, where the following synonyms of the word are provided concerning Hungarian Latin terminology: *amnis*, *flumen*, *rivus*, *rivulus*.

⁴⁵¹ 1412: DF 227795.

⁴⁵² LexLat Vol. 1. (1983), p. 18.

⁴⁵³ 1344: Zichy Vol. 4, ch. 418, pp. 519-521 (Danube); 1435: DF 278003 (Lake Fertő); 1469: DL 16834 (Tisza).

⁴⁵⁴ For further medieval data and main groups of '*fok*'-s, see: Kiss-Piti 2005. For local case studies, see for example: Vajda 2001. pp. 125-137; Kiss-Piti 2005, Kiss 2009.

Accounting with individual flood events reported, four categories were settled (and data accordingly applied in mass analyses):

1. seasonal level: ongoing flood event documented, or exact date of (an ongoing past) flood event is provided
 - a. seasonal (annual) level: fixed date and year of (ongoing) flood event is available,⁴⁵⁵
 - b. seasonal (annual) level: fixed date and year of charter first documenting the event,⁴⁵⁶
 - c. seasonal (decadal) level: fixed date, but no specific year, only decade is known.⁴⁵⁷
2. annual level: only the year of the event is provided, no clear information on season.
3. decadal level: flood event occurred in the near past, no date or year, only a *terminus ante quem* date is provided, but from the textual context an approximate time (some years) can be estimated (e.g. landmarks destroyed, river changed its bed and cut off a piece of land).⁴⁵⁸
4. not included – might suggest other (medium- or long-term) hydrological fluctuations, anomalies:
 - a. evidence is not directly related to flood events, but it is possibly connected to high water-table conditions, or (longer- or shorter-term) change in water-table conditions,⁴⁵⁹
 - b. *terminus ante quem* dating is unclear, the decade of the event (or series of events) cannot be detected, not even with some uncertainties: most of the cases when during a perambulation process landmarks, damaged or destroyed by water are reported,⁴⁶⁰ or and area with frequent floods in general, without any specification is mentioned.⁴⁶¹

As a conclusion, in further analysis on the largest, regional level of medieval Hungary it is possible to give some information on the origin, sometimes as well on the type of an actual flood event. It is also possible to provide a time distribution on seasonal level, and it is necessary to do it even if, as we could already see, in some cases (although minority of the cases) we can only date the day of perambulation or the merely date of charter issue is provided.

Long-term information?

More complicated is the case when frequency and duration of floods have to be discussed. Due to the character of charters, in most cases no beginning, end and thus, duration of the flood event can be detected.

The terms applied in describing a preceding period of (more) frequent floods:

1. '*assidua (inundatio)*':⁴⁶² continuous floods, floods without an interruption,⁴⁶³
2. '*crebra (inundatio)*': frequent floods, many floods after each other,⁴⁶⁴

⁴⁵⁵ See, for example, 1446: Sztáray Vol. 2, pp. 398-399.

⁴⁵⁶ For example, 1435: DL 54943. In this case the proposed day of land division, when perambulators went to the actual land for the field survey and observed the flood (at the Tisza river) in the area of Tiszaeszlár and Tiszalök, is unknown. Nevertheless, the charter containing the description of the field survey is known: the charter was issued on 26 June.

⁴⁵⁷ 1495: DL 28005.

⁴⁵⁸ For change of riverbed (presumes at least one major flood event in the near past), see 1339: AO Vol. 3, ch. 394, pp. 597-598.

⁴⁵⁹ See, for example, 1344: Bossányi 1916, Vol. 1. ch. 159, pp. 82-84; 1349: AO Vol. 5, ch. 140, p. 271.

⁴⁶⁰ 1346: DL 2794; 1411-1415: DF 2009489; 1413: DL 10105; 1416: DF 273814.

⁴⁶¹ 1424: Fejér Vol. 10/6, ch. 273, pp. 620-621: at the uppermost catchment of the Dunajec river a small mountain basin, narrow floodplain area was mentioned, which might be inundated in each year – thus, it is described as a general characteristics of the area.

⁴⁶² The synonyms, mentioned in LexLat Vol. 1/1, p. 262: for *assiduus* are: *continuus, perpetuus, sempiternus*.

⁴⁶³ For example, 1426: SvO Vol. 2, pp. 105-106: ".... propter nimiam temporis vetustatem et assiduam aquarum inundacionem mete antique in ipso privilegio conscripte in paucis locis infractactis apparenter inveniri potuissent,"

3. '*frequens inundatio*': because of the above-mentioned frequent flood of the Hron river people cannot reach the parish church in the other village,⁴⁶⁵
4. '*saepiusque per inundationes aquarum....obscuretur*': together with other reasons (e.g. snow) floods destroyed the main road (highway),⁴⁶⁶
5. travel frequently/regularly obstructed by (several) floods '*fluviis inundantibus*' and '*eciam fluuijs* (Szamos, Kraszna rivers) *ex superh(ab)undanti pluuiarum multiplicacione inundantibus*',⁴⁶⁷ or that of the Ung catchment,⁴⁶⁸
6. previous floods caused damages, problems which had later long-term consequences (destroyed landmarks, obstructed areas to reach etc): '*inundaciones aque*',⁴⁶⁹ '*inundaciones aquarum*',⁴⁷⁰
7. a separate, small group of presumable long-term evidences is connected to general hydrological-environmental conditions: when it seems likely that a prolonged wet period caused problems.⁴⁷¹

The first four terms: *assiduus*, *crebras*, *frequens*, *saepius*, *multiplicatio* refer to high frequency (or at least higher than usual) of flood events in the preceding period. In the last case the content of the text and not the word applied provides similar information, although using plural ('*inundationes*') in itself only mean that more than one flood event had some sort of impact. Beyond the fact that these cases, later in statistical investigations, are worth even for a separate, deeper overview, it is clear that – although no evidence is available concerning the number or timing of previous flood events – these cases should be also included in the overall statistical analysis of flood events. An exception from this rule is group 6 which cannot be directly connected to flood events, and probably provides some information on general hydrological conditions.

Spatial extension of flood events

Another interesting information, suggesting greater spatial extension, is those references in which a 'general flood', flood of several waterflows; (all relevant) waterflows of a certain area are mentioned:

1. Waterflows in Hungary (without specification)⁴⁷² – this category is the most typical for foreign (especially Austrian) narratives, and most likely it has more relevance for the western part of the Carpathian Basin, hence the Danube catchment.
2. General flood conditions with some specification: '*inundacionem aquarum Danobii et aliorum fluviorum*'⁴⁷³ – in this case not only the Danube (separately mentioned), but several rivers are in flood.

⁴⁶⁴ 1395: DL 50193.

⁴⁶⁵ 1309: (DL 63903), Fejér Vol. 8/1, ch. 151, p. 351: ".... propter distanciam loci ac frequentem inundationem fluuij Goron,"

⁴⁶⁶ 1473: US Vol. 6, ch. 3966, pp. 554-555: ".... saepiusque per inundationes aquarum et nivium in tantum obscuretur, ut nemo per eandem viam ire neque redire posset,"

⁴⁶⁷ For example, 1417: DL 96927.

⁴⁶⁸ See, for example, 1422: DF 221404: "... propter invndaciones aquarum ad ipsam ecclesiam proaudiendum diuinis accedere non valuissent nec valerent neque plebanus dicte ecclesie ad dictum hunghwar propter premissas invndaciones aquarum adminstranda Sacramenta infirmis et Baptisma perueniorum facienda prodicisci non posset neque valeret"

⁴⁶⁹ See, for example, 1410: DL 9622.

⁴⁷⁰ 1413: DL 10105: "...unam metam dicte possessionis Jenew vocate fore alegasset, sed per inundationes aquarum ipsius Danobii eandem abolitam fore astrinxisset, ubi signum fecisset.... ." Similar case (landmarks destroyed by flood) is mentioned, for example, in 1416 (DL 10422).

⁴⁷¹ See, for example, 1349: AO Vol. 5, ch. 140, p. 271.

⁴⁷² 1402: MGH SS Vol. 9, p. 736 (*Continuatio Claustroneoburgensis V*).

⁴⁷³ For example, 1402: Zichy Vol. 5, ch. 256, p. 299.

3. In most cases simply they refer to the flood of waters, thus in plural (*'propter inundationem aquarum'*),⁴⁷⁴ or also probably its spatial (hydrological extension; meaning: not only one but several waters are in flood in the same time: '*inundaciones aquarum*').⁴⁷⁵

While the first case usually appears in foreign narratives and less likely can be found in domestic evidence, the second and third group of data are mainly available in domestic charters. The third type is especially frequent in charter documentation: usually mentioned in those cases when field survey, perambulation is obstructed by water cover. From the viewpoint of the legal procedure, it has major relevance why the task could not be fulfilled, while it has marginal importance which waterflow/waterflows were in flood.

Settling magnitude-statistics: flood indices on an 'at least' basis?

Although clear classification strategies are available and in international literature usually three, four or five intensity levels are distinguished, in the case of medieval Hungary this index-system (due to major difference in prevailing source types) cannot be automatically applied. As for international methodology, different index-systems were developed depending on the characteristics of the available flood descriptions.

Concerning the Rhine flood at Basel, five flood levels were distinguished:⁴⁷⁶

"Level 1: Water covered the streets along the river as far as the corner of the Crown Inn near the ship landing. No damage occurred.

Level 2: Water flowed onto the fish-market square and flooded the basements of the houses around it.

Level 3: The water could be reached by hand from the windows in the house at the landing-place (Schiffände) and it flowed into the lowest parts of the ancient fortification (Zinnen) on the opposite bank of the Rhine.

Level 4: Water could be laded from the bridge with the scoop. The bridge was in imminent danger of being swept away.

Level 5: Parts of the bridge were destroyed or damaged."⁴⁷⁷

Another major categorisation, mainly referring to German areas, is provided based on the magnitude of damages (*Table 3*):

Level	Classification	Primary Indicators	Secondary Indicators
1	Smaller, regional flood	Little damage, e.g. fields and gardens close to the river, wood supplies that were stored close to the river are moved to another place	Short flooding
2	Above average, or supra-regional, flood	Damage to buildings and constructions related to the water like dams, weirs, footbridges, bridges and buildings close to the river, like mills, etc.; water in buildings	Flood of average duration; severe damage to fields and gardens close to the river, loss of animals and sometimes people
3	Above average, or supra-regional, flood on a disastrous scale	Severe damage to buildings and constructions related to the water, i.e. dams, weirs, footbridges, bridges and buildings close to the river, like mills etc.; water in buildings. In part, buildings are completely destroyed or torn away by the flood	Duration of flood: several days or weeks; severe damage to fields and gardens close to the river, extensive loss of animals and people; morphodynamic processes like sand sedimentation cause lasting damages and change the surface structure

3. Table *Intensity classification of historical floods in (West) Central Europe*⁴⁷⁸

⁴⁷⁴ For example, 1409: TO Vol. 1, ch. 257, p. 420; 1416: DL 10422.

⁴⁷⁵ For example, 1409: DL 95663; 1411: DL 69750; 1421: DF 232868.

⁴⁷⁶ Brázdi et al. 1999, pp. 239-285.

⁴⁷⁷ However, level 5 did not occur at all in the studied 16th century.

⁴⁷⁸ Sturm et al. 2001, p. 15. Glaser-Stangl 2004, pp. 93-98. For more information on scientific literature overview, see: Rohr 2007a, p. 204.

On the bases of economic evidence (town accounts), a 4-scaled index-system was developed for the Traun river at Wels, Upper Austria:

"Instensity 1: Small and moderate floods without remarkable damage.

Instensity 2: Strong floods with damage, repairs lasting 2-4 weeks.

Instensity 3: Very strong floods with severe damage, parts of the bridge totally destroyed, passage with ferry boats necessary for at least some days, repairs lasting 5-12 weeks.

Instensity 4: Extremely strong floods with disastrous damage; economic and social life is severely disturbed for at least several months; people mark the level of the flood on bridges, churches and other public buildings."⁴⁷⁹

These categorisations were mainly developed for those floods described in mainly narrative, or economic evidence (e.g. accounts). The terminology and circumstances are fundamentally different in the case of the Hungarian data, which is mainly based on legal evidence, charters. In the Hungarian case, due to basic differences in source material, a completely new way and methodology of magnitude-statistics and classification had to be settled.

In the present specific, mainly charter-based, dataset three intensity levels were distinguished:

Level 1: '*inundacio aque/aquarum*', with clear sign in the text that legal process (or any other, 'usual activity') was disturbed: a landmark cannot be settled or land portion cannot be measured (with royal measure), only estimated;⁴⁸⁰

Level 2: '*nimia*',⁴⁸¹ '*maxima*',⁴⁸² '*tanta...* *inundacio aquarum*';⁴⁸³ legal process (greatly) disturbed and thus, at least part of the legal process has to be completely postponed;⁴⁸⁴

Level 3: flood of regional importance: some of the '*maxima*' or '*nimia*' floods are mentioned as floods of large areas, when the 'whole county',⁴⁸⁵ 'those areas',⁴⁸⁶ 'the district'⁴⁸⁷ are affected, or floods with obvious (extraordinary) great extension.⁴⁸⁸

In conclusion it can be stated that the most marked difference can be detected between '*inundacio aquarum*' and '*nimia/maxima.... aquarum*', that is to say a flood is either marked or not marked as a great one. Nevertheless, we cannot entirely exclude the possibility that some of the floods without any (special) marking can be as well great ones.

How to fit the information of other source types into this simple categorisation? As regards to narratives, letters (and poem), usually it is relatively easy to fit descriptions into any

⁴⁷⁹ Rohr 2006, p. 840.

⁴⁸⁰ See, for example, 1421: DF 232868; 1435: DL 54943. For the circumstances of medieval land measurements see, for short conclusion: Maksay 1971, pp. 191-200, and in details: Bogdán 1978, 385 p.

⁴⁸¹ See, for example, 1414: Zichy Vol. 6, ch. 205, pp. 309-311; 1416: DL 30773; 1476: Fraknói Vol. 1, letter 231, p. 334. Hitherto, an abundance of water with the same meaning can also appear with the word '*nimia*

⁴⁸² For example, 1412: DF 227795; 1421: Gyárfás Vol. 3, ch. 393, pp. 570-571; 1466: Hahn Vol. 2, pp. 92-94; 1499: DL 95737.

⁴⁸³ See, for example, 1419(?): DF 290628; 1473: US Vol. 6, ch. 3966, pp. 554-555.

⁴⁸⁴ Moreover, one can count Bonfini's flood report (thus, a narrative evidence) from 1490 into the same category: ".... item Danubius insolenter post obitum eius excrevit, multos pagis et accolias urbes inundavit," (1490: Bonfini Vol. 4/8, p. 162).

⁴⁸⁵ 1335: AO Vol. 3, pp. 159-162. Nevertheless, it has to be noted that exactly in this charter some land portions, which could not be measured, were estimated – and still, due to other details we know that this was not a flood of category No. 2, but No. 4. This also shows that categories or flood indices, presented here, are rather relative, and due to lacking detailed evidence, flood magnitudes can in some cases be easily underestimated.

⁴⁸⁶ 1334: Károlyi Vol. 1, p. 96; 1339: Fejér Vol. 8/4, ch. 176, pp. 362-363.

⁴⁸⁷ 1349: AO Vol. 5, ch. 137, pp. 263-267.

⁴⁸⁸ For example, 1402: MGH SS Vol. 9, p. 736 (*Continuatio Claustroneoburgensis V*); 1412: DF 227795. In the latter case not only '*maxima*' but also '*propter aque in ipso alveo existentis magnitudinem*' appeared, with reference to the (great) amount of water in the riverbed. One can also include here the ice-flood for the Danube in which case the river flooded both sides in winter 1453-1454: DL 44718.

of the three classes. In case of other types, usually no clear specification is provided concerning the magnitude of the flood events, so most of them simply fit into the group characterised by 'Level 1'. It is important to mention that this categorisation is applied only in the cases when ongoing flood events were reported.

4.3.2.2 Dealing with the uncertainties: flood/high-water event or not?

Perambulations and landmarks in swamps and wetlands: real uncertainties?

Although rather rarely documented, perambulations sometimes also took place in wetland areas, for example, reedy swamps.⁴⁸⁹ In general, it is more frequent that boundaries ran through meadows which were sometimes or most of the time wet,⁴⁹⁰ or floodplains of rivers.⁴⁹¹ Thus, if a perambulation could not take place in parts of these temporary or usually wet areas, this does not necessarily mean unusually or extremely wet conditions. It is, however, true in general that if perambulators could not reach some of the landmarks or some parts of the borderline due to wet conditions, the survey might have taken place in a wet period.

Land boundaries sometimes led through permanently watercovered areas. Quite clear are those cases when the boundary was itself a waterflow or led through an island, also referred in the *Tripartitum*.⁴⁹² Moreover, according to the testimony of some late medieval charter evidence, boundaries could as well lead through swamps⁴⁹³ or (temporary) wet meadows in the inundation area or in areas frequently waterlogged position,⁴⁹⁴ even if in some cases combined with a flood event.⁴⁹⁵ The number of these cases is, however, relatively low, and even in these cases landmarks were settled in places easy to reach (and renew) in normal conditions.

In 1361, for example, when after a presumably wet period in winter-early spring, a perambulation could not be finished due to the watercover which most probably occurred in western Hanság wetlands.⁴⁹⁶ In another case in 1344, boundaries of Bazza landed possession could not be determined by earth landmarks, but only by trees, since earth landmarks 'had never remained' there, due to swampy conditions.⁴⁹⁷ Or, what is even more frequent, lands or meadows/pastures in the inundation area could not be measured only estimated during a flood event.⁴⁹⁸ The high number of such events in certain periods either suggest a change in environmental conditions compared to earlier periods (i.e. higher number of flood or greater

⁴⁸⁹ See, for example, 1344: Sztáray Vol. 1, ch. 93, p. 174.

⁴⁹⁰ For example at the Sárrét, a former wetland at Székesfehérvár, see 1372: Fejér Vol. 4/4, ch. 259, pp. 449-451. For the perambulation in another Sárrét, at this time a (very) wet meadow located in the Csallóköz area, see 1336 (1341): Fejér Vol. 8/4, ch. 253, pp. 488-489.

⁴⁹¹ Basically all medieval flood cases concerning the Sárköz in the Kalocsa area and south to this region (e.g. the island area of Mohács) belong to this category, since it is a high flood terrain (higher inundation area). For a clear case when perambulators walked in between (and possibly through) wetland areas (e.g. swampy-reedy area), see example: Zichy Vol. 8, ch. 428, pp. 617-619.

⁴⁹² *Tripartitum* Pars 1, Titulus 87, p. 168.

⁴⁹³ For example, see Jankovich 1996, p. 314.

⁴⁹⁴ 1336 (1340): Fejér Vol. 8/4, ch. 253, pp. 488-489. Still even in this case, namely that even the naming of the meadow 'Sárrét' (mud-meadow) describes a meadow in waterlogged position, the 'lutosus est nimis' phrase may suggest at least medium or high groundwater table conditions in the island area of the Danube (Žitný ostrov/Csallóköz).

⁴⁹⁵ For example, 1466: DL 13245, Haan-Zsilinszky 1877, pp. 44-45.

⁴⁹⁶ 1361: MCP Vol. 1, ch. 111-114, pp. 123-127.

⁴⁹⁷ 1344: Zichy Vol. 2, pp. 125-127. Published regesta: AOkt. Vol. 28, ch. 518, pp. 298-299. However, this is the only case when I came across with a description in which it is actually mentioned that perambulators tried to settle (or at least it came up as an idea) landmarks in a wetland where it is 'never' possible to settle landmark. Even if in a swampy area usually it is possible to settle landmarks, if really necessary to do there, at higher terrains, islands.

⁴⁹⁸ 1413: DL 10086.

magnitude) or the practice of (a relatively intensive) utilisation and division of (lands in) the inundation areas.⁴⁹⁹

Nevertheless, a logical and clear tendency of keeping landmarks at a flood-free location can be detected, for example, in 1340 while settling a landmark near to the *Holtkwkwllo* (Holtküküllő: a former branch of the Küküllő river), reambulators consciously chose a dry place to settle there a landmark. This was caused by the fear that the common boundary at the Holtküküllő would have been flooded at the time of the flood event.⁵⁰⁰

Flood and water management: how to separate 'artificial' from 'natural'?⁵⁰¹

As we could already see it earlier, terminology connected to water management can help us to find out more about a natural flood event. Nevertheless, a considerable number of floods reported in medieval Hungary were partly or entirely of artificial origin. Beside studying the natural phenomena, concerning flood research, an important other direction is detecting artificial flood events. Not only the early 16th-century *Tripartitum*,⁵⁰² but several medieval charters, thus mainly the legal documentation, provide clear testimony of the importance of direct human impact in the contemporary water regime.

In medieval charters the main reasons of artificial flood events are connected to management and regulation works related to watermills (or fishponds). Artificial flood events were reported mainly in lower elevation areas. Here watermills were similar to present water power stations: due to little differences in elevation, the energy which made the wheels move, was gained from the large amount (accumulation) and not directly the speed of water itself. In order to have large amount of water, an artificial lake/pond had to be created which required damming.⁵⁰³ In many cases the building process of a new watermill was preceded by an alteration of the riverbed which partly or entirely was changed in this way. Fishponds, especially in the hilly area, also in many cases needed damming, and direct damages occurred due to mismanagement or unfavourable other conditions.

Artificial floods, connected to watermill and/or fishpond management, usually occurred in three main ways:

1. A new watermill was built (illegally) to a place too close to another, earlier-built watermill and the dammed water destroyed the mill at the upper section of the waterflow.⁵⁰⁴
2. The dam of the (new) watermill (or a fishpond) was built too high, and it banked up the water enough to flood fields and meadows of other landowners. This case can cause

⁴⁹⁹ In areas where it was difficult to determine exact boundaries and perhaps, due to low level of utilisation, it was not even very important for long time, there were no fixed boundaries: for example in some swamps or dense forests (Maksay 1971, p. 134).

⁵⁰⁰ CDT Vol. 3, p. 31: "Et licet meatus eiusdem Holtkwkwllo cum vicinis et commetaneis pro communi meta servaret, tamen timentes et advertentes ne processu temporum ex inundatione aquarum ipse meatus deperiret, ob hoc iux eundem meatum incipiendo in capite eiusdem, unde ortum habet, in arido loco, intra metas dictarum possessionum pro evidentioribus signis quattuor metas terreas erexissent."

⁵⁰¹ Naturally, due to the extensive or intensive landscape management patterns of the Carpathian basin catchment areas and also the management of waters, 'natural flood events' mentioned here are not meant to be floods without any human intervention. Nevertheless, I collected here those cases when floods have clear natural (either caused by precipitation surplus or the accumulation of ice jam etc) reasons, and the only (or chief) reason was not water mismanagement (too high mill-dams, damaged dam etc), which cases I distinguished as 'artificial flood events'.

⁵⁰² *Tripartitum* Pars 1, Titulus 87. § 1, 3, 4. p. 168; Titulus 133, § 36-37.

⁵⁰³ See, for example: Tringli 2001, p. 251; Pongrácz 1967, p. 71.

⁵⁰⁴ See, for example 1440: DL 13581.

greatest problems when the waterlevel of the natural waterflow is anyway high or flooding.⁵⁰⁵

3. Due to the damage of the dyke/dam (combined with fishpond), fields (or even mills, settlement) of other landowners got flooded.⁵⁰⁶

Since watermills as well as landed property played a key role in (late) medieval energy production and economy, damages caused by human impact often resulted great controversies and were followed up by detailed legal documentation on the circumstances and consequences. As such, while the harmful consequences of natural flood events in most cases remained unreported in the (later) Middle Ages, about artificial flood events we usually have a deep overview.

Thus, in this type of documentation, in majority of the cases main emphasis is on the artificial causes and the resulted damages – not included in the present investigations. Nevertheless, due to the detailed description of the legal procedure/inspection, in some of the cases it actually turns out that natural processes are also at least partly,⁵⁰⁷ or sometimes entirely⁵⁰⁸ responsible for the damages or changes caused by a flood event. Where it clearly appears in the charter that without natural circumstances (i.e. a natural high-water or flood event) the damage could not have occurred, it is possible to account with the case as a natural flood event, too.

4.3.2.3 Practical information: basic resources in finding, localising and dating the events

As we could see earlier in case of charter evidence, it is a key issue to find possibly the most flood-related evidence in those periods when no systematic charter regesta collections (e.g. AOklt and ZsO) are available. Moreover, in some of the volumes (especially the early, starting volumes) not all the texts of flood charters contain the flood information, which was included in the original charters.⁵⁰⁹ This is also true in case of the DL, DF collection of the Hungarian National Archives or the recently uploaded digital library of the National Archives, which collections, otherwise, provide excellent source of flood-related contemporary documentary evidence.⁵¹⁰

It is, therefore, of vital importance to study systematically the numerous charter editions in which the original charters in full length were provided. Reading through huge amount of charters of the studied period provides us with great help in the better understanding of legal, social and environmental conditions both in its general and case-specific sense (e.g. relationship to preceding and following legal processes, detecting possible changes etc).

In the identification and localisation of medieval lands and settlements (often deserted later) I used the historical geography/topography series of György Györffy (Az Árpád-kori Magyarország történeti földrajza/Historical geography of Hungary in the Arpadian period),⁵¹¹

⁵⁰⁵ For example 1445: DL 138591; 1492: DF 253097; 1495: DL 37693. For a combination with the previous case see, for example: 1463: DL 15842.

⁵⁰⁶ For example 1466: US Vol. 6, ch. 3452, pp. 232-233; 1499 (1502): DL 63494.

⁵⁰⁷ For example, 1499 (1502): DL 63494.

⁵⁰⁸ 1339: DL 58505.

⁵⁰⁹ It has to be emphasised, however, that this is already not valid for the volumes of the AOklt after 1320, and those of the ZsO concerning the first decades of the 1400s, in which volumes practically all flood charter evidence, what I previously found in other source or regesta collections, were included.

⁵¹⁰ In these cases by now several regesta-collections are available (and searchable) on DVD or on internet. The most important of all are, without doubt, the Collectio Diplomatica Hungarica. A középkori Magyarország digitális levéltára / Digital Archives of medieval Hungary. Budapest: Arcanum, 2008. (DVD-ROM); and the medieval collection available online: <http://mol.arcanum.hu/dldf/opt/a101127htm?v=pdf&a=start>.

⁵¹¹ Györffy 4 Vols. 1987-1998.

referring to the 11th-13th, sometimes also to the 14th centuries, while for late medieval conditions often the series of Dezső Csánki (*Magyarország történelmi földrajza a Hunyadiak korában / Historical geography of Hungary in the Hunyadi period*), mainly concerning the 15th, but partly also the 14th centuries were applied in most cases.⁵¹² Moreover, occasionally also some other historical geography/topography works, more concentrating on smaller geographical units such as a county or a town,⁵¹³ were also used in the identification of lands, settlements, and while detecting basic information in medieval landscape and environmental/hydrological conditions. Case studies concentrating on deserted medieval villages, when available, can also provide precious information.⁵¹⁴

In further identification issues, maps and satellite images were as well applied: concerning detailed modern conditions, I mainly applied thematic atlases⁵¹⁵ and the 1:10,000 scaled topographic maps of the Hungarian Institute of Geodesy, Cartography and Remote Sensing (FÖMI) and GoogleEarth satellite images. Although in some cases it was available, in most cases it is still difficult to reach high-resolution maps concerning those parts of the Carpathian Basin, located outside of the present country borders of Hungary. Concerning old, historical maps applied, in most cases the relevant maps of the First and Second Military Surveys (scale 1:28,800), covering the entire Carpathian Basin (at the end of the 18th and first half of the 19th centuries), appeared to be the most useful.⁵¹⁶ Occasionally other early maps of smaller areas were as well applied.⁵¹⁷ It has to be noted, however, that in a number of cases it is not possible (or only approximately) to detect the exact location a medieval settlement. This is due to complete desertion of the medieval settlement (in the Middle Ages or the Turkish period). Moreover, in other cases the settlement at one (or many) point(s) of its history changed its location within an area.

It is clear that in most cases other old maps are also helpful for the further understanding of historical landscape and hydrological conditions. However, in the course of the present investigations the main aim was to generally provide the basic, key environmental information about the individual micro-regions where floods were observed in the Middle Ages, and not to make full landscape reconstructions of the referred areas. That is why in most cases only the 'usual', basic information sources were applied. In some cases field surveys of the studied areas also took place, in most cases for the better understanding of the landscapes and environments referred, further in-situ surveys should be carried out in the future.

As for dating perambulations, and also for checking dates of charter issue, I applied the handbooks of Imre Szentpétery (*Chronologia/Chronology; Oklevéltni naptár/Calendar for charter studies*) most commonly used by Hungarian medievalists.⁵¹⁸

⁵¹² Csánki 5 Vols. 1890-1913.

⁵¹³ See, for example: Házi 2000, 614 p. for medieval Pozsony county, or Engel 1985, pp. 942-1005 for Ung.

⁵¹⁴ For example, Wolf 1986-1987, pp. 189-202.

⁵¹⁵ Apart from national and world atlases, the detailed atlas and database of historical Hungary in 1914 (Zentai-Kósa eds. 2005, 246 p) proved to be an especially useful tool.

⁵¹⁶ All are available in published form on DVD (georeferenced) in the series 'Digitized Maps of the Habsburg Empire': First and Second Military Survey/Az Első és Második Katonai Felmérés (1763-1787, 1806-1869); Grossfürstenthum Siebenbürgen. Budapest: Arcanum. 2007; Königreich Ungarn. The First Military Survey/Die Erste Militärische Aufnahme/Az Első Katonai Felmérés 1763-1785. Series: Digitized Maps of the Habsburg Empire. Budapest: Arcanum, 2006 (DVD); Königreich Ungarn. The Second Military Survey/Die Zweite Militärische Aufnahme/A Második Katonai Felmérés 1806-1869. Series: Digitized Maps of the Habsburg Empire. Budapest: Arcanum, 2006 (DVD). Partly (2nd survey) also available online (together with the mid-19th century cadaster survey, combined with GoogleEarth): <http://www.arcanum.hu>.

⁵¹⁷ For example: A kalocsai főegyházmegyei levéltár térképtára 1749-1945 (Map collection in the archives of the Kalocsa archbishopric). Budapest: Arcanum, 2009 (DVD-ROM).

⁵¹⁸ These originally two separate volumes are today included in one, extended version entitled 'A kronológia kézikönyve (Handbook of chronology).' See: Szentpétery 1985, 211 p.

5 Analysis of flood events

Majority of the flood events recorded in Hungarian medieval documentation can be traced back to floods of natural origin. Similar to the previous chapters, this analytic chapter is only concentrated on floods of predominantly natural origin. Based on the data of the previous chapters, in this main chapter a complex, detailed analysis of flood events are provided, taking as many aspects into account as possible. Main parts of the chapter are concentrated on distribution, frequency and magnitude, origin of flood events, floods of main rivers, periods with highest flood frequencies, possible long-term consequences and hydromorphological changes, weather and floods as well as human response on flood events both in its practical and spiritual/intellectual sense.

5.1 Basic hydrometeorological analysis of natural flood events

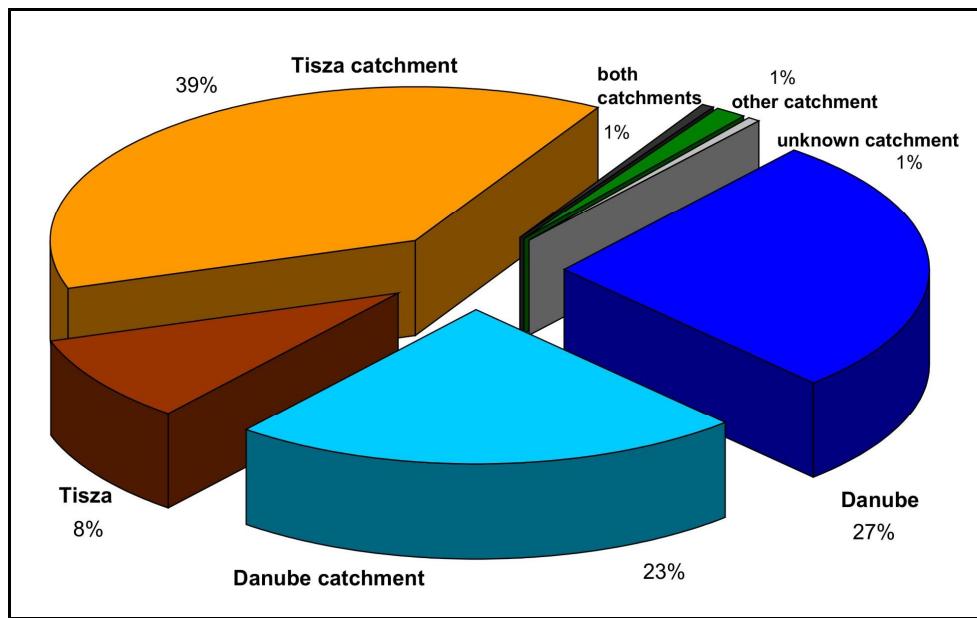
Caused by the fact that majority of the (ongoing) floods are rather precisely dated, in most cases it is possible to provide some sort of seasonality of the events. Whereas in several cases flood event or inundation without specification on magnitude or type is mentioned, in many cases great magnitude is also recorded and thus, in these cases it is possible to distinguish 'great' from 'normal' magnitude flood events. Thus, main topics of discussion in this chapter will be on frequency, magnitude, seasonality and types of flood events (if information is available).

At present, due to the possibilities, restricted by the available contemporary source evidence, one can write about flood events approximately from the 1230s onwards: data before this date are only occasionally available. Moreover, majority of sources appear only in the 14th and 15th centuries. While up to the mid-14th century, at least based on contemporary sources written in medieval Hungary, there is relatively limited chance for a substantial expansion of the database, there are still possibilities for database increase in the late 14th, but especially in the 15th centuries.

The 1330s-1350s, but particularly the 1340s with special emphasis on 1342 and 1343, have an overwhelming importance in studying medieval flood distributions in the Carpathian Basin. However, some other decades, such as the 1390s-1430s as well play an important role. Due to their significance, these decades are not only studied below in separate subchapters, but their characteristics are also analysed in more general thematic subchapters ad sections (e.g. on seasonality, spatial distribution and magnitude issues). Although not so pronounced, the traces or beginnings of a third flood peak can be as well detected with the end of the 15th century. This flood peak most probably continued (e.g. with great Danube floods) in the first decade(s) of the 16th century.

5.1.1. Spatial distribution and frequency of flood events: main rivers and catchments

The distribution of reported flood events, according to main rivers and river-catchments, are represented on *Fig. 25*. With regards to mass-analysis of floods concerning the largest rivers and their catchments, Danube floods have an undoubtable importance. More than one fourth of all known flood cases refer to the Danube, while hardly 10% refer directly to the Tisza. It is primarily due to the fact that, as we could see earlier, the Danube has no significant tributary in the Carpathian Basin down to the Drava-inflow, while the Tisza, flowing through the Great Plain, is supplied by its several major tributaries.



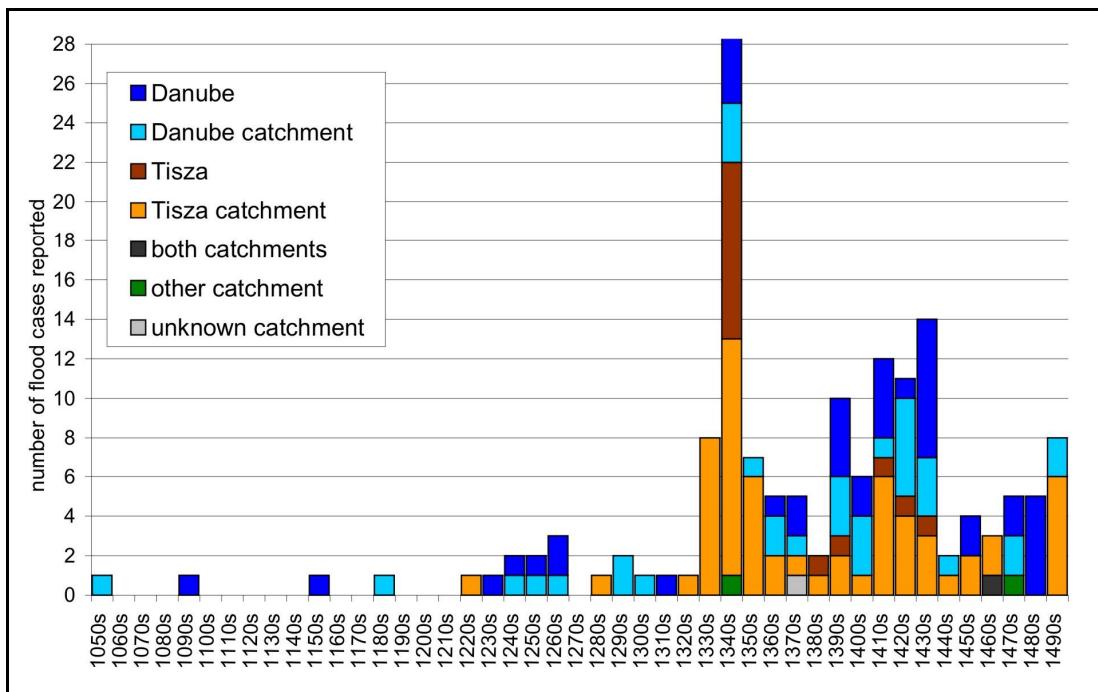
25. *Fig. Distribution of medieval flood events according to main rivers and catchment areas*

This means that while a flood in the Danube floodplain (crissed-crossed by Danube branches) predominantly means the flood of the Danube, the extensive Tisza floodplain cannot be divided from the floodplain of its major tributaries, such as the Szamos, Bodrog, Körös and Maros rivers.⁵¹⁹ As such, what is lost at the main river, the Tisza earns back with its catchment: more than one third of all known medieval flood events occurred in the Tisza catchment (*Fig. 25*).⁵²⁰ 23% of the flood cases refer to the external catchment area of the Danube which, amongst others, can be possibly caused by the fact that the Danube has a notably smaller catchment inside of the Carpathian Basin than the Tisza river.

In general, we can say that the number of medieval flood events is evenly distributed between the two main catchment areas of the Carpathian Basin. This means that almost equal number of floods are known from both the Danube and the Tisza catchments (50-48%, respectively). The number of reports concerning floods of rivers having an inflow outside of the Carpathian Basin is marginal (1%).

⁵¹⁹ As we could already see earlier, spatial distribution of available contemporary source evidence is uneven: while some parts of the country, such as the Upper-Tisza or the Upper-Danube area are quite well-represented, some parts, such as the central and southern parts of the Great Plain are underrepresented. Still, there are in fact very few regions of the country where absolutely no flood evidence is available. Reasons may also lie in the difference in settlement systems and the concentration of population (extensive waterlogged areas with low population density) as well as the differences in environmental conditions in general. However, clearly a reason of primary importance is that Danube is much more represented in practically all types of medieval source materials than the Tisza river. It is due to the western (Austrian) narratives which refer to the Hungarian part of the Danube, also due to the fact that important, well documented towns and practically the administrative and political centres of Hungary are located along the Danube which brings us the testimony of not only charters, but also narrative, economic and private evidence.

⁵²⁰ A more detailed graph, including inner- and outer-catchment divisions, was as well provided: Kiss 2011, 15 p.



26. Fig. Decadal distribution of recorded flood events according to main rivers and river-catchments

Even if the 11th-13th centuries are clearly underrepresented, some floods or high water events do appear for this period: almost all are related to the Danube or its catchment (see Fig. 26).⁵²¹ The first main flood peak of the 1330s-1350s, with special emphasis on the 1340s, is dominated by Tisza-catchment (and Tisza) flood events. In the second main period of higher flood frequencies, namely the 1390s-1430s, the greater number of Danube and Danube-catchment flood events can be detected. In general, compared to most of the 14th century when Tisza-catchment floods were in clear majority, the 15th century (already from the 1390s) brought a much more balanced situation. The number of Danube and Danube-catchment floods is somewhat higher than that of the Tisza catchment and the Tisza itself.⁵²²

5.1.2 Seasonality of flood events

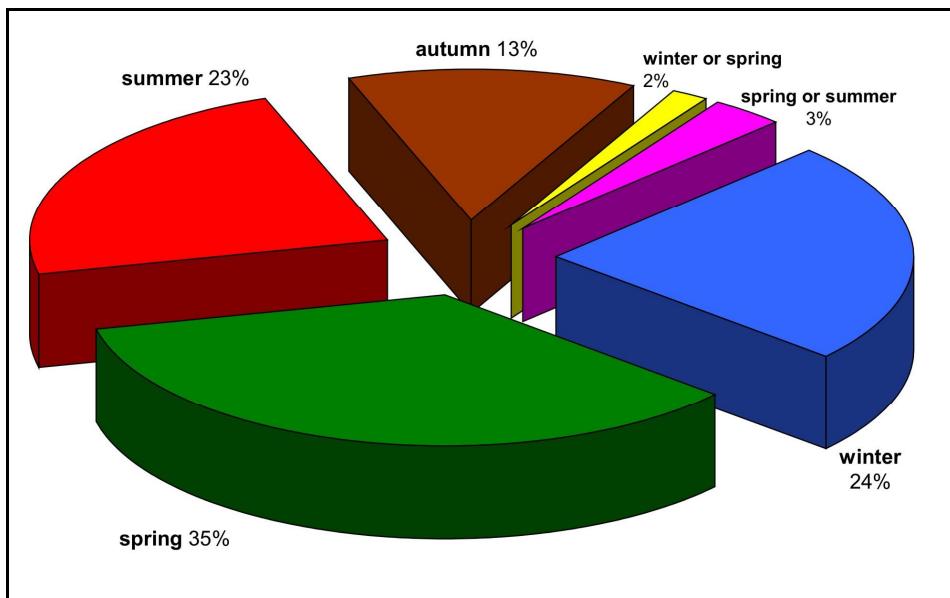
It is clear that the quantity of information, even in the 14th and 15th centuries, is far not enough for a continuous analysis. Still, almost three fourth of the reported flood cases could be connected to any seasons, which provides a number large enough to draw some conclusions (Fig. 27). Even if other reasons also play an important role,⁵²³ some clearly natural elements can be as well followed in the general seasonality distribution of reported medieval flood events: for example, the very low amount of flood reference concerning autumn floods in the Danube catchment is a well-defined characteristics of the river and its Carpathian-Basin

⁵²¹ This is on the one hand due to the fact that the importance of western narratives in the 13th century, in detecting flood events in Hungary, is larger than in the later centuries. On the other hand, more domestic evidence remained from this period in the western part of the country that is the chance for finding flood or flood-related documents was greater than for the eastern parts, where the written documentation of legal processes, on large scale, appeared somewhat later.

⁵²² For the representation of individual years, see App. 3a.

⁵²³ As we could see earlier, another reason of distorted distribution is that the distribution of the number of legal processes in the year is uneven. Presumably, more legal case and perambulation or land division took place in late winter and spring than in summer and autumn.

catchment, since the Danube is mainly missing Mediterranean influence on its, both the German-Austrian and the Carpathian Basin, upper catchment.⁵²⁴



27. Fig. Seasonality distribution of flood events reported for medieval Hungary⁵²⁵

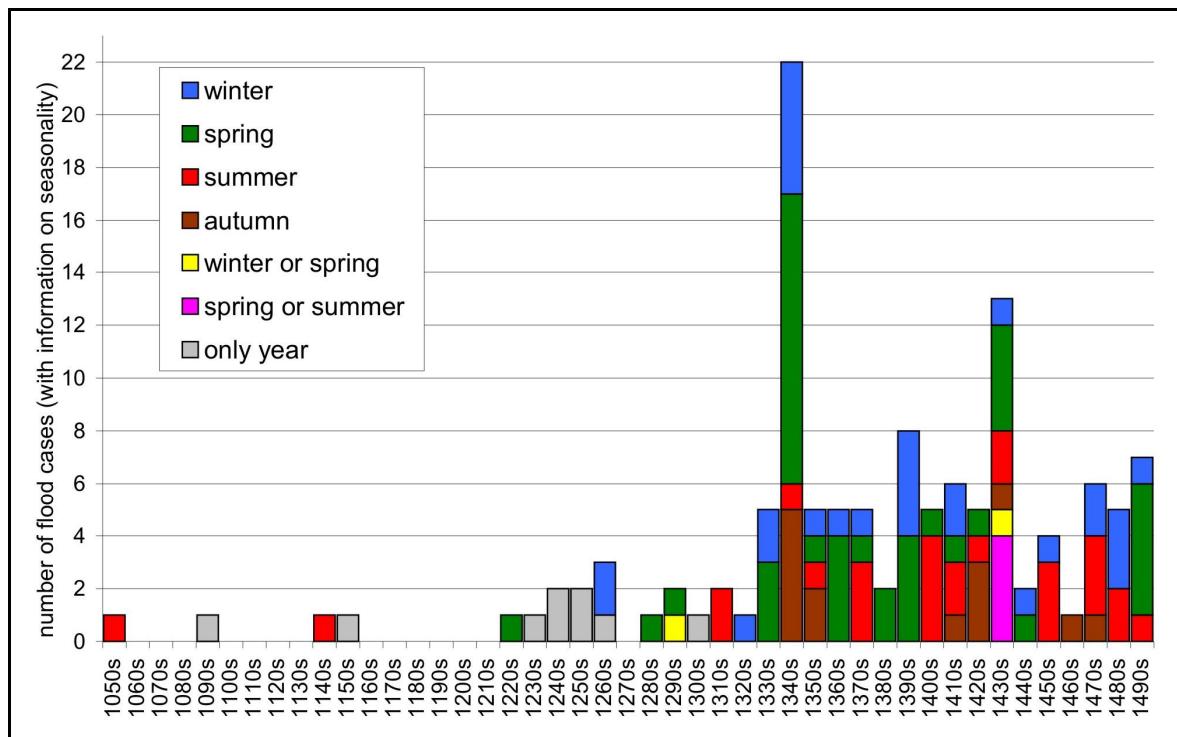
Even if there is an overrepresentation of spring floods (see *Figs. 27, 28*): this can be treated as a natural, 'good sign'. Spring is the most important flood season, and before water regulation works the number of winter floods, especially the number of destructive Danube winter floods, were much higher than that is today.⁵²⁶ The number and proportion of summer floods are almost equal to those of the winter. The fourth, but (due to its clear connection to Mediterranean cyclons) still important flood season (13%) is autumn. In some cases, due to the lack of dating (or only *terminus ante quem* dating is available), it is not possible to detect exact seasonality of the event, but still possible to provide an interval when the event most probably occurred; for example: winter or spring, spring or summer.

Concerning temporal distribution of the seasonality information (*Fig. 28*), except for some isolated cases, almost nothing is known about high medieval floods. The 14th century is characterised by the high number of spring floods reported. Second most important groups are winter and autumn floods, and only a few events are known from the summer.

⁵²⁴ In this respect, the Danube differs from (some parts of its catchment and) the Tisza catchment where, caused by the higher mountains, air masses coming from the southwest bring larger amount of precipitation in autumn (especially in October). The occurrence of autumn floods in the Tisza catchment are more likely to be connected to a specific area, namely to the northeastern tributaries of the Upper-Tisza and upper Middle-Tisza. This influence is much more rare in the Transylvanian catchment (see chapter 2). Another natural character is the relatively high proportion of winter and summer floods of the Danube and its catchment.

⁵²⁵ However, it has to be mentioned that, although based on dating exact seasonal categories could be defined, this date always means the date of observation of the ongoing event. This also means that, for example, a 2 December or a 6 March flood event is now in the categories of winter and spring respectively, although the event itself quite probably started at least some days earlier and thus, might belong to the previous season. Nevertheless, the number of such cases is very restricted and does not influence the overall proportions.

⁵²⁶ See Section 9.4.10.3.



28. Fig. Seasonal distribution of individual flood events, presented here on decadal level, in medieval Hungary

Clearly an increased importance of summer floods and the much lower number of spring flood reports can be observed in the 15th century. The result is a seasonality distribution much more even than in case of the 14th century. This is partly caused by natural reasons (e.g. increased early and late 15th-century activity of the Danube). In general, the high number of mainly summer, winter and only rarely spring floods of the Danube in the early, and the second half of the 15th century clearly do influence over all decadal seasonality patterns. Apart from natural reasons, differences in source types can as well influence this distribution.⁵²⁷ Moreover, we cannot completely exclude a change in legal practices, influencing charter issue and perambulation practices, either.⁵²⁸

5.1.3 Detecting great flood and inundation events: questions of magnitude

Since most of the source evidence is available in charters, the magnitude classification of reported flood events mainly depends on the information preserved in charters. In this section a robust decadal and a more detailed annual overview, based on index-scaling, are

⁵²⁷ As we could see earlier, in chapter 3, in the 14th century almost all flood-information is derived from legal documentation (charters), while the types of sources applied in the investigation are more varied in the 15th century: charters have lost their overwhelming importance in the analysis.

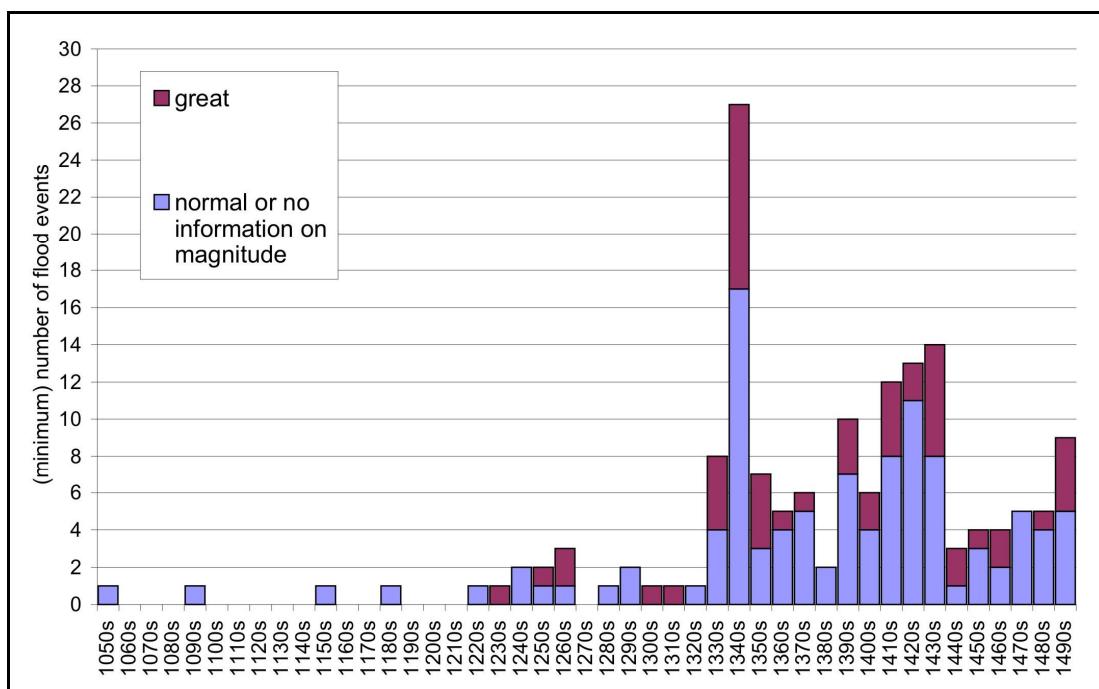
Proportions are also rather influenced by the fact that an intensively growing number of flood evidence is available concerning the Danube with the introduction of a new source type (town accounts). Additionally, with the intensification of Turkish wars along the southern borderlines, the actual physical conditions of the Danube and other major rivers of the defence line have increased importance in contemporary documentation (e.g. letters, narratives).

⁵²⁸ For example, while the one fourth of land as a dovery (filial quarter) was given out mainly in landed property (thus, often with introduction and perambulation procedure), this practice changed with time: by the early 15th century in more and more cases it is paid in cash rather than in lands. See, for example: Banyó 2000, pp. 76-92.

provided to detect the annual and decadal magnitude of floods (when possible), with special emphasis on great flood events.

5.1.3.1 Number and magnitude of flood events: a robust decadal analysis

In the case of flood events, not only spatial and temporal distribution but also the magnitude of flood events are important issues (simple decadal: *Fig. 29*; 3-scaled annual: *App. 3c*). Due to the application of specific terms (*nimia*, *maxima*, *valida* etc.), in several cases it is possible to distinguish great and sometimes very great (or extraordinary) flood events. Although a clear division from cases treated as 'normal' is provided here, in reality it is also possible that some of the flood events in the 'normal' category were as well great floods, but their greater magnitude remained unrecorded.



29. *Fig. Simple decadal distribution of floods marked or not marked as a great one*⁵²⁹

As we could see, in the study period of ca. 300 years, when information concerning magnitude might be available, there are decades with clear peaks in which decades the number of reported great floods is higher than usual, even if most flood events remained still in the 'usual' or 'normal' category without any specification (e.g. 1340s, 1430s). The 1330s, 1350s, and 1490s are notable not because of their high significance concerning frequency issues, but rather due to the fact that floods of an extraordinary magnitude occurred (see *Fig. 29*).

Similar to other cases, the Danube has special importance with its eleven great flood events reported, but eight of the Tisza floods were also great in magnitude. This has special importance due to the fact that these floods refer to the precipitation (and hydrological) conditions of large catchment areas, either primarily receiving waters from the Alps or the northern and eastern parts of the Carpathians.

⁵²⁹ Flood data of decadal resolution are also included. To some extent, this might influence flood proportions (e.g. the high number of preceding flood events mentioned in the 1420s partly refer to the previous decade).

While Danube and Tisza floods (depending on the river section) reflect on the conditions of large catchments, floods of mountains or hilly areas are usually connected to one well-defined smaller catchment. It is also interesting to note that most of the great flood events were reported concerning larger⁵³⁰ and smaller⁵³¹ waterflows of the Tisza catchment (16 cases). Floods of the Danube tributaries (6 cases) in the Carpathian Basin play a somewhat less significant role, compared to those of the Tisza catchment (see *App. 3c*).

5.1.3.2 An index-based analysis of annual flood magnitude

Concerning the flood years with great magnitudes, a three-scaled index-analysis of annual resolution was also possible to carry out (*App. 3c*), providing a more detailed overview than the simple decadal distribution (*Fig. 29*). It has to be (re)emphasised that these indices were produced and categories made on an 'at least' basis.⁵³² Consequently, there is a chance that some of the floods belonging to index value No. 1 (simple event) could be not just simple, but great ones (No. 2) in reality, but the available information allows us to place it only in the first group of lowest magnitude. So, while there is relatively less chance for an overestimation of some events, a greater source of error can be underestimation. Moreover, many of the great flood events (and most of the smaller ones) clearly remained unreported throughout the Middle Ages, and therefore, cannot form a part of the present analysis.

Whereas *App. 3c* refers to (highest) annual flood magnitudes,⁵³³ *App. 3a, b* gives us a picture about the number of flood events reported in certain years. Regarding the number of flood events per year in the 13th-15th centuries, the greatest documented flood years, without any doubt, are 1342 and 1343 (7 and 6 cases, respectively). Other important years with four mentioned (ongoing) flood events are 1399 and 1440, while references on three individual, ongoing flood events are known from 1357⁵³⁴ and 1454.

Concerning magnitude, amongst the floods in index value category No. 3 (*App. 3c*), the importance of the extraordinary flood in spring 1335 ('whole Ung count is under water') and the great floods (with special emphasis on those of the Danube and Tisza) in 1342 have to be especially emphasised. Among the greatest reported Danube floods, the ones occurred in 1396, 1399, 1433 and 1454 have to be (probably the most) highlighted.

Moreover, it is important to mention that, as we can see in the Catalogue part (chapter 9), a significant number of flood reports (e.g. referring to preceding flood events) could not be considered here, because of their terminus-ante-quem dating. Nevertheless, a deeper look on *App. 3d-f* provide more information, which 'strengthens' the position of some other flood years, not listed here among the individually important flood years (either concerning the number or magnitude of flood events). These cases are discussed in chapter 5.3.

⁵³⁰ For example: Uh/Latorica: 1335; Sajó (Slaná): 1342, 1347; Küküllő (Târnava): 1416; Zazár (Sasar): 1419(?); Sebes-Körös (Crişul Repede) and Berettyó (Bärcau) area: 1466, Szamos (Someş): 1496. See sections 9.4.4.2, 9.4.5.2, 9.4.5.6, 9.5.2.5, 9.5.2.7, 9.5.8.1 and 9.5.11.3.

⁵³¹ For example, the Szinnye: around 1355; Noska-ér: 1356; Tibériás: 1357. See sections 9.4.6.1-3.

⁵³² See section 4.3.2.1.

⁵³³ Only flood data with at least annual resolution are included. In case of more than one flood data per year, the highest index-number (greatest magnitude of flood event) of the year is applied. 13th century is underrepresented. For further details and the definition of different index-values, see chapter 4.

⁵³⁴ In this, exceptional case end of 1356 and first half of 1357 together considered due to the fact that alone none of the two years would be great flood year, but floods, reported in early December 1356, then the spring and summer floods of 1357 together clearly form an important interannual flood-peak and thus, it has to be included in the list.

5.1.4 Types and origin of flood events and inundations

Due to the nature of available contemporary written evidence, it is very rarely possible to distinguish among flood types. In the majority of cases we can only suggest what is the most likely reason based on the description. This is especially true for ice (jam) floods, because this is the flood type which was not directly mentioned with separate name (except for perhaps the word *eissgüsse*) in the Middle Ages and thus, a particular event can be only indirectly detected, based on signs typical for ice flood events. In the following section an overview of main flood types is provided together with those medieval examples which either surely or most probably belong to these main groups.

5.1.4.1 Probable ice flood (or related flash flood) events

- a. In winter 1267-1268 (or 1266/1267), two floods of the Danube were reported which occurred on the Margit island (today Budapest). The first flood event took place after Christmas and presumably lasted for three days, while the second one happened around mid-January and ended up within a day. In both cases, but especially in the well-documented second case, the description, namely the sudden great rise of water level and then soon its considerable decrease suggest that the mentioned flood events were ice floods. Moreover, in the case of the second one an eye-witness also mentioned that flood came with great noise, which can be a quite distinct characteristic of an ice flood.⁵³⁵
- b. The Danube flood on 23 March in 1344, in the area of Szeremle and Bátmonostor was reported as a great flood. Nevertheless, this great flood clearly passed within two days which provides us with some possibility that it was related to an ice flood (great and fast) or a flash flood caused by an ice flood of the upper Danube sections.⁵³⁶
- c. The great, presumably long lasting (for weeks?) Danube flood event in mid- and late February of 1396 which obstructed travel all along the Danube between Bratislava and Esztergom.⁵³⁷
- d. On 12 March in 1399, similarly in the Bátmonostor-Szeremle area, the great increase and the vehement flood ('*nimia excrescencia valida inundacio*') was reported on the (Lower) Danube. Due to the early spring date, great magnitude and vehemency (great speed and destruction?) of this flood it is likely to be related to an ice flood event.⁵³⁸
- e. Reported in January 1411 (but the probable event might have occurred before 1406), defendant of a legal case stated that the Raba river would have previously changed its riverbed due to preceding ice-jams. No exact information was provided about the date of these events and unfortunately, we have no clear proof whether this change of the riverbed had occurred in the past, since the defendant's arguments were rejected.⁵³⁹
- f. One of the rather clear cases is the letter of the town citizens of Bratislava, written on 1 January in 1454, when they reported an ongoing great Danube icy flood event: water inundated both banks and obstructed travel to Buda in any way. This data suggests cold December conditions.⁵⁴⁰

⁵³⁵ Section 9.3.4.1.

⁵³⁶ Section 9.4.5.4.

⁵³⁷ Section 9.4.10.2.

⁵³⁸ Section 9.4.10.3.

⁵³⁹ Section 9.5.2.1.

⁵⁴⁰ Section 9.5.7.1.

- g. Some of the evidence, related to damages caused by ice of the Danube – recorded in the Bratislava town accounts – may refer to floods with ice in 1440,⁵⁴¹ but also in 1477,⁵⁴² 1482, 1485 and probably in 1487.⁵⁴³ Only in one case, namely in 1485, there seems be a clear evidence (*eyssguss*) for the occurrence of an ice (jam) flood event, documented in the Bratislava town accounts.⁵⁴⁴
- h. In 1496, ice and great accumulation of waters destroyed the bridge and damming at Őrmező (Jibou-Ro), one of the most important crossing places along the salt route from Transylvania to the inlands of Hungary. Due to the fact that the three main characteristics, namely greater amount of ice, great accumulation of waters and rather significant damages were mentioned at a bridge and damming (which are anyway places with a higher ice-flood probability), this flood was most probably an ice flood.⁵⁴⁵

Ice (jam) floods or related (flood) events in the Carpathian Basin had special importance in the past, since they commonly provide clear sign of hard winter conditions of preceding weeks. Moreover, ice flood is one of the most destructive flood type, often accompanied by significant material damages and other serious consequences (e.g. casualties), especially in towns.

5.1.4.2 Torrential water and flash floods

Flash flood – typical cases

Usually caused by an extreme precipitation event with large quantity of short-term rainfall (often with preceding wet conditions):⁵⁴⁶

- a. The major Danube flood event, occurred in 1235, was caused by incessant rains of 3 days and nights, and – according to Austrian narratives – resulted great damages both in Austria and Hungary. Due to the fact that causes, magnitude, speed and results of the event are relatively well-reported, it seems rather likely that a flash flood occurred in the Danube Basin.⁵⁴⁷
- b. In 1260 the Morava river at the borderline of Moravia and Hungary, due to great rainfall (shower and thunderstorm) great flooded occurred ('nimium inundasset').⁵⁴⁸
- c. The flood in spring 1285 during the second Mongol invasion in the east-central parts of Transylvania, according to the description of sources was also a flash flood, caused by cloudburst (or according to some of the sources partly snowmelt) in the mountain region of eastern Transylvania.⁵⁴⁹
- d. In spring 1454 possibly another flash flood was reported in the central parts of Transylvania. This flood is a not a 'clear' natural flood event: the fishpond was ruined possibly also due to bad management. Based on the described circumstances, still it seems more probable that the fishpond would not have been ruined by the great accumulation of waters ('propter nimiam tumositatem aque'), if there had been no any flood event in this hilly area.⁵⁵⁰

⁵⁴¹ Section 9.5.5.5.

⁵⁴² Section 9.5.9.2.

⁵⁴³ Sections 9.5.10.2-4.

⁵⁴⁴ Section 9.5.10.3.

⁵⁴⁵ Section 9.5.11.3.

⁵⁴⁶ By definition, flash floods may also occur after an ice flood event on the river sections under the ice jam. This category, however, cannot be distinguished from any other ice-related flood events and thus, these ice-related (flash flood) potential cases were listed above, in the previous section.

⁵⁴⁷ Section 9.3.2.

⁵⁴⁸ Section 9.3.3.2.

⁵⁴⁹ Section 9.3.6.1.

⁵⁵⁰ Section 9.5.7.1.

e. A sudden late-winter flood, caused by vehement rainfall, was reported for 25 February 1499 which destroyed the dam of a fishpond in Bars county (today's western Slovakia) and caused flash flood. In this case, due to the detailed description, we can clearly speak about a flash flood event. Due to the mentioning of vehement rains, this case shows strong connections to the next, torrential water references.⁵⁵¹

A common sign of flash-flood events is that they are often not directly referred as flood events of a certain waterflow, but more as great amount of waters suddenly appearing and possibly causing destruction (negative effects often multiplied by human mismanagement).

Torrential rain/water – resulting (flash) flood and/or inland excess water

Despite its obvious connections to the previous, flash flood section, the group of floods named as torrential water (often mentioned together with rain(s) and causing considerable damages) has to be discussed separate, since it forms a rather well-defined terminological group (*aqua torrens, guss*) in contemporary documentation. Moreover, a typical characteristics of the descriptions is that – although flood even clearly occurred – the rainfall origin and caused damages are usually more emphasised than the flood itself:

- a. Intensive rainfall and flood (together) were mentioned to be responsible for the problems the Hungarian army suffered from, while crossing the Carpathians towards Halič in 1229.⁵⁵²
- b. According to the memoires of Helena Kottannerin, around early June in 1440 there was a great ('*grasz wasser flus*'), 'never-seen' torrential rain and flood event caused by rains in the Sopron area. Beyond the fact that there could be a flash flood, this information to some extent can be combined with the evidence available in the Pozsony/Bratislava accounts, in which flooded celar is mentioned, referring to late June. Apart from the description of Helena Kottannerin, there is a good possibility that at least May (or as well June) of 1440 was rich in precipitation.⁵⁵³
- c. In roughly the same period, another information suggests that May and perhaps also June were rather rainy in 1440: a torrential water ('*aqua intorrens*') caused a (temporary) decline in salt transport, reported in the area of Dés (Dej-Ro), but could happen elsewhere in the salt mining, transporting area (probably the Szamos?).⁵⁵⁴ In this case there is also a possibility for water inbreak in (salt) mines.
- d. Water destroyed the castle of Chery in 1443, in the catchment area of the Timiș river in the south. No clear sign refers to the type of the flood event. Nevertheless, torrential water and abundance of waters were mentioned as reasons for the destruction of te castle/fortress.⁵⁵⁵
- e. In 1454 (reported in August, but probably happened before harvest), another flood occurred in the area of Kisvárda (northeast Great Plain) where the intensive rainfall and the (a never-seen '*aqua torrens*') torrential water, accompanied by inundation (probably also inland excess water staying on the ground?), caused great damages to the agriculture.⁵⁵⁶
- f. In 1496 probably also torrential rain/water and rainfall (*gws und regen*) caused the damage of some parts of the town wall in Buda.⁵⁵⁷

A common characteristics of cases in this (double) group is that in the documents rains and floods were often accompanied by mentionings or even descriptions of major damages.

⁵⁵¹ Section 9.5.11.4. The other, major flash-flood event, occurred in Transylvania in the same year (Section 9.5.11.4 – next after the referred event), apart from human mismanagement, might be also caused by a natural flood event.

⁵⁵² Section 9.3.1.

⁵⁵³ Section 9.5.5.5.

⁵⁵⁴ Section 9.5.5.5.

⁵⁵⁵ Section 9.5.6.1.

⁵⁵⁶ Section 9.5.7.1.

⁵⁵⁷ Section 9.5.11.3.

5.1.4.3 Floods predominantly caused by prolonged rainfall

A typical difference from the previous cases that the prolonged rainfalls and long-lasting wet character, as a major reason of flood, is emphasised in the documentation:

- a. Flood on the western Hungarian rivers with west-Hungarian or eastern alpine catchment (e.g. Zala), were reported (among others) for West-Hungary in summer 1051, which was caused by prolonged rainfall of a wet summer.⁵⁵⁸
- b. Incessant rains caused the great flood on the Danube (and waters in general) in 1316: caused by this rainfall in the alpine area, most significant tributaries of the Danube flooded, and mainly these circumstances caused the great flood of the Danube.⁵⁵⁹
- c. The great (ongoing) rains (and foggy conditiona) mentioned in the charter most probably had major responsibility for the floods of waters occurred in late November in 1359, in the area of today's southeast-central Slovakia.⁵⁶⁰
- d. One of the most interesting cases is the one reported in 1417, when the nobles of Vaja complained because their travel was frequently obstructed by floods caused by rainfalls, and due to these problems they were often late with legal procedures and court hearings. In this case probably the precipitation surplus of the Szamos and Kraszna catchments caused the problem.⁵⁶¹
- e. Prior to August 1422 the flood of the Ronva river at Lastovce (SE-Slovakia), caused by rains, was mentioned in a legal case. No information is available on the date of the flood or the date or duration of the rainy period, but rains and not one single event was blamed for the flood event.⁵⁶²
- f. The poem of *Janus Pannonius*, presumably referring to the autumn of 1468, described a flood event occurred on several major rivers of the country, together with its reason: prolonged rainfall and a southern wind. These two data clearly reflects on Mediterranean influence, and suggests wet conditions around October.⁵⁶³
- g. In 1494 floods/high waters caused by prolonged rainfalls in (late?) April (or May) kept the Polish delegation in the Lőcse (Levoča-Sk) area to proceed towards Poland. Similar to the previous case, it is a clear sign that higher amount of fluid precipitation had fallen in the area (present northeastern Slovakia).⁵⁶⁴

Summer and autumn floods are precipitation signals referring to the preceding period (month/s). In this sense, any late spring-summer or autumn flood events, occurred in the Carpathian Basin, can be connected to some sort of precipitation surplus in the catchment area of specific rivers. Nevertheless, due to the fact that it is often not clear whether a long-lasting inundation or a (sudden) flood event is mentioned in the documents, dating and duration, magnitude of the rainfall event are often uncertain. Thus, here only some examples of the most typical summer floods and their clearly documented precipitation connections are presented.

5.1.4.4 Flood/inundation caused predominantly by snowmelt

- a. In late February of 1338, most probably melting of much snow (which was still partly present) caused the flood or inundation which obstructed legal procedure in Sáros county,

⁵⁵⁸ Section 9.1.3.

⁵⁵⁹ Section 9.4.2.1.

⁵⁶⁰ Section 9.4.6.5.

⁵⁶¹ Section 9.5.2.6.

⁵⁶² Section 9.5.3.2.

⁵⁶³ Section 9.5.8.2.

⁵⁶⁴ Section 9.5.11.1.

- today's northeastern Slovakia, thus in a hilly area. This event on the one hand refers to a preceding period rich in solid precipitation. On the other hand it is a clear sign that warm air masses (might be also rich in fluid precipitation) arrived to the area.⁵⁶⁵
- b. Although not directly reported, it seems very likely that the great snow and frosty time reported in early spring of 1361 close to Lake Fertő presumably in its inundation area had direct connection to the larger extent of water cover and mud mentioned for around the same area in April 1361, thus, only few weeks later (when perambulation was repeated). This case can as well possibly be connected to inland excess waters (see below).⁵⁶⁶
 - c. The flood of the Sava river, during the siege of Šabac in late January 1476, was (due to the earlier mentioning of snow and frost) by the melting of snow.⁵⁶⁷

Although only three quite clear cases are available when snowmelt as a primary reason can be mentioned in principal, most of the winter and early spring floods have to be connected to this group.

5.1.4.5 Probable cases of inland excess waters

Although its origin is clearly connected to either rainfall, snowmelt and/or groundwater surplus, inland excess waters most likely appear before and/or after flood events. It is the most difficult to find 'clear' cases; we can define only some 'suspicious' cases:

a. The very muddy (*'lutosum est nimis'*) pasture called Sárrét in the Csallóköz (Žitny ostrov in Slovakia) area at the end of July in 1336 can most probably either refer to medium or high soil water table being under the direct influence of the Danube or to precipitation surplus kept by the impermeable soil layer of the Sárrét (meaning: 'mud-meadow'). In both ways we can talk about a typical case of inland excess waters connected to preceeding wet period – either due to high ground water-table or previous rainfall.⁵⁶⁸

b. In 1342 the problem of great amount of waters (*'multitudo aquarum'*) appear both along the Danube (11 April, Lower Danube: today's Apatin area in N-Serbia) and the Tisza rivers (3 May, upper Middle Tisza). The great extension of waters and the seriousness of problems can be also supported by the fact that, due to the large amount of water, lands were out of use. Much water, lying on the ground, means a higher probability of long-lasting inundation (especially if weather conditions do not become significantly drier and warmer). Great amount of water can be originated from flood or inland excess water, or both.⁵⁶⁹

c. A real, serious case of environmental disturbance is described in the year of 1344, when the archbishop of Kalocsa (Danube higher inundation area) complained that in his area – due to lack of workers caused by the Tatar attack⁵⁷⁰ – shortage in the number of workers resulted a decline in agriculture. Lack of management in the area not only caused the decline of agriculture, but in the waterlogged areas water stayed and smell became unhealthy and unstandable. From the preceeding years at least two (1342, 1344) Danube floods area known; one of the two flood events, occurred in spring time, is mentioned concerning the same area. Although there is no any information in the letter about the quantity of water, namely there was more than usual, such a situation probably would have caused much less problems in dry

⁵⁶⁵ Section 9.4.4.4.

⁵⁶⁶ Section 9.4.7.1.

⁵⁶⁷ Section 9.5.9.2.

⁵⁶⁸ Section 9.4.4.3.

⁵⁶⁹ Section 9.4.5.2.

⁵⁷⁰ This major Tatar attack in Hungary and its importance, which was presumably the one occurred in 1340, is yet relatively underrepresented in the scientific literature. Nevertheless, among others the Swiss chronicler, Johann von Winterthur, described this attack and did mention the fact that Tatars proceeded in Hungary along the Danube river (*Chronica Iohannis Vitodurani* MGH SRG Vol. 3, p. 183).

periods. It is not yet known whether the archbishop finally moved to Pétervárad (Petrovaradin in Serbia; located on a 'hill' more to the south along the Danube), but the pope gave the permission to do so.⁵⁷¹

d. A repeated problem appeared in two years, concerning the same piece of land and the same, rather long-term, legal procedure close to the Drava river, around Vajszló-Hirics-Luzsok, in Baranya county. Both in early autumn 1342 and spring 1346 there were problems around the perambulation and land estimation due to the inundation. This can be a result of Drava flood events, but it also can be an inland excess water case (presumably not independent from the water-level conditions of the Drava river).⁵⁷²

e. In 1349 the chapel of Panyit in Gömör county (Gemerská Panica in Slovakia) was mentioned: the area of the earlier chapel, surrounded by trees and fence, and accompanied by a cemetery was too wet to build the new (stone) chapel there. Thus, inhabitants applied to the archbishop for choosing another, drier place where they wanted to build the new chapel. Their application was accepted, so they were allowed to build there the new chapel. The place of the old chapel might be a subject to inundation of inland excess waters as well (i.e. higher frequency of high groundwater-table).⁵⁷³

f. Apart from snowmelt as a possible reason in early spring of 1361, close to Lake Fertő presumably in its (or the Hanság/Wesen wetland) inundation area a larger extent of water cover and mud were mentioned in April 1361. Due to the strong possibility that a greater amount of snow melted and water remained on the surface, in this case presumably the perambulation was obstructed by inland excess water.⁵⁷⁴

g. Maybe high groundwater table or inland excess water was mentioned in Southwest-Hungary in 1377, where during perambulation an inundation was mentioned on a meadow (but no waterflow was mentioned in its close neighbourhood).⁵⁷⁵

h. In the neighbourhood of Gyula town, in the low-lying floodplain of the Fehér-Körös river a perambulation was obstructed in autumn 1438 by uninhabitable wetlands. There is a possibility that this report reflects the presence of (long-lasting) inland excess waters.⁵⁷⁶

Similar to ice floods, inland excess waters are not directly reported: we have to find out from the available circumstances the most probable origin of water in specific cases.

⁵⁷¹ Section 9.4.5.4.

⁵⁷² Sections 9.4.5.4-5.

⁵⁷³ Section 9.4.5.8.

⁵⁷⁴ Section 9.4.7.1.

⁵⁷⁵ Section 9.4.8.3.

⁵⁷⁶ Section 9.5.5.4.

5.2 Years and decades of highest flood frequencies documented

Flood frequencies in general were already discussed concerning a 300-year period. However, some decades, with their relatively large amount of flood documentation, provide the possibility for a deeper investigation. Out of the 300 years, but especially from the well-documented late medieval period, some decades seem to be especially important and have to be highlighted in more detail: the most characteristic decades are the periods of the 1330s-1350s and the 1390s-1430s.

As we could see in chapter 3, in the 20th century, usually in the Carpathian Basin three or four main flood waves may occur. However, this does not mean the occurrence of three or four flood events in a year, but it means only periods: in any of them there is a chance that flood may occur (or may not occur). This is especially true for the cases when flood reaches the level that actually disturbs any human activities. What does it mean in our, historical case? The frequency, the number and seasonality of disturbing or destructive flood events, taking place per decade, are all important. It becomes a really important information and a sign of higher flood activity when this arrives to an annual (or seasonal) basis. Thus, not only decades, but also individual years with extraordinary flood events have to be discussed separate.

5.2.1 The period of the 1330s-1350s and the years of 1342 and 1343

To some extent already starting from the mid-1330s, the 1340s and the years of 1342 and partly 1343 are the most interesting or characteristic period in the history of reported medieval flood events.⁵⁷⁷ Although 1342 and 1343 are clearly the most characteristic flood-years of the decade, almost each year with flood events of the referred period has its own peculiarities. In the 1330s, for example, probably the greatest known medieval flood event in Hungary was recorded concerning the year of 1335, and three floods were reported for the single winter of 1338. In the mid-1350s a complete village was swept away by floods, whereas late 1356 and 1357 together form a complete flood year (of four events) with great floods. Moreover, long-term effects and consequences of floods also appear in some important references.

5.2.1.1 Floods of the 1330s

Reported in mid-spring 1334, a great flood occurred in the lowland catchment area of the Už river.⁵⁷⁸ West to the area of the 1334 spring flood event, in late March of 1335 in an area under the influence of the Latorica and Už rivers, perhaps the greatest flood event known in medieval Hungary is described, when the whole county (inhabited lowland parts?) was in flood. A month later travel was still not safe enough due to obstructing waters in Ung

⁵⁷⁷ For an earlier analysis of the 1342 weather and flood events reported in Hungary, see: Kiss 1996, pp. 61-69.

⁵⁷⁸ See Section 9.4.4.1.

county.⁵⁷⁹ In the Žitný ostrov area, thus under the influence of the Danube, at the end of July 1336 a wetland pasture could not be perambulated due to increased muddiness.⁵⁸⁰

Some time before mid-January 1338 (perhaps in the previous year?), a mill was destroyed by the flood of the Berettyó river. In late February great waters and snows obstructed perambulation in the northern hilly areas, in medieval Sáros county. Damage of waters and the great heights of reed and grass was reported in early March at Reszege (Resighea-Ro) in the catchment area of the Ér waterflow in medieval Szatmár county.⁵⁸¹ Some time before August 1339, due to previous floods, the *rivulus Halbokapataka* (Sajó tributary) changed its watercourse.⁵⁸²

Although only a few flood events are known from the decade, the ones in the mid-1330s were clearly great floods, and one of them (1335) is probably the greatest reported flood event of the Middle Ages in Hungary. As for direct consequences, perambulations were obstructed in four and travel in two cases. Preceding flood events caused change of a riverbed in one case.

5.2.1.2 The extraordinary flood decade of the 1340s

In mid-April 1341 a great flood obstructed settling landmarks in the immediate vicinity of the Topl'a and Ondava rivers in Zemplén (present eastern Slovakia). In early November, a land could not be measured in Gömör county, in the area of present-day Southeast Slovakia due to flood (Rima catchment).⁵⁸³

As mentioned earlier, 1342 and 1343 are the two years richest in floods, reported in medieval Hungary.⁵⁸⁴ In the following section the flood events of the two years are briefly discussed in a broader, Central European context.

The millennial flood year of 1342 in a Central-European context⁵⁸⁵

In Central Europe and in the Carpathian Basin, due to prevailing weather conditions, at least four main flood waves occurred in 1342:⁵⁸⁶

1. WINTER: the first main wave arrived in the form of ice floods (At the beginning of February), caused by the sudden arrival of mild southern air masses after hard winter conditions, which clearly had devastating results on the Bavarian and probably also some of the Austrian sections of the Danube as well as in the Czech Basin on the Moldau river. According to the Swiss *Johann von Winterthur*, the flood flashed through the upper, alpine section of the

⁵⁷⁹ Section 9.4.4.2. The winter of 1335 was severe, long and rich in snow in the Czech Lands and in Austria (Brázdil-Kotyza 1995, p. 114). The late March dating of the extraordinary flood of 1335 in the northeastern upper catchment area of the Tisza makes it probable that the winter was also rich in precipitation in this area, which might have been followed up by sudden melting.

⁵⁸⁰ Section 9.4.4.3.

⁵⁸¹ For more information, see Section 9.4.4.4. In the first case we do not have firm evidence that the flood would have happened at the same winter or before. The second and third mentionings are related to late winter and (very) early spring period, but since in the third case already the consequences of the flood event (and also some probable long-term signs) can be as well detected, there is a possibility that the second and the third cases are connected to a late winter flood.

⁵⁸² Section 9.4.4.5.

⁵⁸³ Section 9.4.5.1.

⁵⁸⁴ For an early comparison of 1342 weather and flood events, see: Kiss 1996, pp. 65-66. For the more detailed analysis of the 1342-1343 flood and weather events, see: Kiss 2009c, pp. 37-47.

⁵⁸⁵ For Hungarian evidence of 1342 flood events, see Section 9.4.5.2.

⁵⁸⁶ To some extent this major flood period started earlier, namely in 1341, when already two flood events, one great spring event and an autumn event, occurred.

Danube on 2 February. In the same time, sea surge caused damages in Venice.⁵⁸⁷ Most probably this mild interruption is responsible for the sudden great flood event in the area of the Hejő and Szinva waterflows at the direct neighbourhood of the Sajó river (Tisza catchment) in the area of present northeastern Hungary, observed on 9-11 February.

2. SPRING: In Central Europe and some other parts of Europe the spring flood-wave (on 'all smaller and larger rivers of Europe'), occurred due to melting of snow and ice, caused catastrophic damages in early April.⁵⁸⁸ In the Carpathian Basin four spring flood evidence, scattered in time and space, are available. The first, early March great flood event was reported at the upper lowland section of the Tisza. Great extension of waters was mentioned in early-mid April at the lower Carpathian Basin section of the Danube (in present North-Serbia), in which case at least one March flood wave on the upper Danube sections can be presumed. A third ongoing flood event was reported in late April on the Žitava river (present Southwest Central Slovakia). Finally, in early May an extensive water cover is mentioned at the Upper-Tisza, likely to be the cummulative result of more than one earlier (spring?) flood waves.

3. SUMMER: In West Central Europe one of the greatest known flood series occured around 21-24 July. This, however, was less characteristic at the eastern alpine region or the Czech lands. This summer flood event of extraordinary magnitude, caused by extreme summer rainfall in July, is entitled as the 'millennial flood event' in large parts of western and west-central Europe, especially on the Rhein in the German territories. On the other hand, in and along the eastern alpine region, namely at the Austrian and Czech areas only marginal damages or no damages (or flood event) were reported this summer.⁵⁸⁹ Similarly to the situation in Austria and the Czech Lands, no direct information on a summer flood is known in Hungary.

4. AUTUMN: Starting from early August and lasted practically throughout the whole autumn, rainy weather prevailed in the southern German territories.⁵⁹⁰ Maybe partly similar wet conditions resulted the inundation at the lower sections of the Drava river, reported in mid-September. In autumn, flood caused damages along the Bavarian sections of the Danube.⁵⁹¹ Moreover, in Lombardia and Padova rains caused flood in November, documented by *Johann von Winterthur*.⁵⁹² Presumably caused by the influence of warm humid air masses coming from the Mediterraneum, an autumn flood clearly appear in Hungarian contemporary charter evidence: reported on 11 November, along the upper lowland section of the Tisza but also close to the Latorica river (frequently a subjet of autumn floods⁵⁹³), land measurements were obstructed by an ongoing flood event.

Concluding the events of 1342, north to the Alps the summer flood event had overwhelming importance, early February and early April floods seem to be of more general importance also in more southern and eastern parts of Central Europe. However, autumn also appeared with flood mentionings from northern Italy, through the Carpathian Basin up to Germany.

⁵⁸⁷ FRA SS VIII. (Cap. IV) pp. 568-570. For the analysis of flood event, occurred in the Czech territories affecting several larger rivers including the Vltava, Elba, Morava, see: Brázdl-Kotyza 1995, pp. 114-115. For Austria and Bavaria, see: MGH SRG Vol. 36/2 (*Iohannis Vitodurani Chronica*), pp. 225-226. For analysis: Rohr 2007, pp. 227-228; Glaser 2008, pp. 230-231.

⁵⁸⁸ Rohr 2007a, p. 228. Presumably this flood event was mentioned in (the non-contemporary): *Iohannis Abbatis Victoriensis Liber certarum historiarum*. MGH SRG Vol. 36/2, p. 189.

⁵⁸⁹ For the analysis of Central European flood sources, see: Brázdl-Kotyza 1995, p. 168; Rohr 2007a, pp. 226-227, 273-274, 278-279, 322, 393; Glaser 2008, pp. 230-231. While the great July flood of 1342 (probably the greatest one of the Middle Ages) affected large parts of Europe (especially in the German territories), it did not really appear in the eastern Alps or in the Czech areas. For more details, see Brázdl-Kotyza 1995 and Rohr 2007a.

⁵⁹⁰ Glaser 2008, pp. 88-89.

⁵⁹¹ See Rohr Ch. 2007, p. 227.

⁵⁹² MGH SRG Vol. 36/2 (*Iohannis Vitodurani Chronica*), p. 195.

⁵⁹³ See, for example: Hajós 1954, p. 24.

Moreover, in the Carpathian Basin the overwhelming importance of spring floods, occurred on both major catchment areas, has to be emphasised. While there was at least one flood wave on the Danube in March-early April and there was ongoing flood in late April on one of the northern tributaries, inundated areas were reported in early March and the consequences of a serious preceding flood-period in early May, both on the major river of the eastern Carpathian Basin. Most of the floods mentioned in 1342 in the Carpathian Basin were great flood events, evenly distributed between the Danube and Tisza catchment areas.

Another extraordinary flood year: 1343 in the Carpathian Basin and beyond⁵⁹⁴

Clearly another significant series of floods took place in the following year, in all four seasons:

1. WINTER: Winter of 1343 was mainly mild in the southern German areas;⁵⁹⁵ no important winter floods are known from Central Europe. Roughly in the same time as in the previous year (on 11 February) a flood of waters was reported at the Upper-Tisza floodplain.

2. SPRING: Cool and wet spring prevailed with prolonged rains in the southern German areas.⁵⁹⁶ According to *Johann von Winterthur*, great rains around Easter caused flood.⁵⁹⁷ These weather conditions might have resulted the Danube flood, occurred in spring affecting the lands underneath the monastery of Oberalteich in Bavaria.⁵⁹⁸ At the turn of March and April a great flood was reported, most probably affecting extensive areas around the lower, lowland sections of the Upper-Tisza. A flood wave or a series of flood waves were detected in early May both the upper (1 May) and upper middle (8 May) sections of the Tisza: flood reports with some days difference most probably refer to the same flood wave on the Tisza.

3. SUMMER: After rainy June and July in some areas already great flood occurred and the great incessant rain in early August caused another flood wave in the southern territories: this summer was again clearly unusually wet and unfavourable for agricultural production in the German areas. Great amount of precipitation was also witnessed at the end of August and early September which caused further flood waves in the same areas, for example at Bodensee and the great flood of the Rhein.⁵⁹⁹ Unfavourable circumstances in the German areas, already affecting large areas in the second year of bad harvest, caused hunger in 1343-1344.⁶⁰⁰ In Hungary, an ongoing flood was witnessed in mid-July in the immediate vicinity of the Sajó river, not far from the Tisza.

4. AUTUMN: In early September a probable ongoing flood event might have been responsible for problems in safe travelling in Central Transylvania. The only known autumn flood of 1343 was reported in Ung county in early October, in the catchment area of the Už river. In this area the secondary (October) flood maximum is rather pronounced in the 20th century, and clearly shows the arrival of Mediterranean humid air masses. No Central European parallels of this flood are yet known.

The spatial and seasonal distribution of the 1343 flood events suggest the occurrence of an especially important flood year when floods took place in each season, at the upper catchment area of the Tisza river. While floods of 1342 affected both main catchment areas, namely those of the Danube and the Tisza rivers, all six (or seven) evidence referring to 1343 reflects on the flood events of the (upper and upper middle sections) of the Tisza catchment. Thus, concerning the eastern parts of the Carpathian Basin 1343 has at least the same or even

⁵⁹⁴ For the Hungarian flood evidence of 1343, see Section 9.4.5.3.

⁵⁹⁵ Glaser 2008, p. 76.

⁵⁹⁶ Glaser 2008, pp. 84-85.

⁵⁹⁷ MGH SRG Vol. 36/2 (*Iohannis Vitodurani Chronica*), pp. 203-207, 213, 215.

⁵⁹⁸ Rohr 2007a, p. 227.

⁵⁹⁹ MGH SRG Vol. 36/2 (*Iohannis Vitodurani Chronica*), pp. 200-201, 216, 238.

⁶⁰⁰ Glaser 2008, p. 66.

more importance than 1342. Nevertheless, concerning magnitude, only the minority of flood events were distinguished as a great one.

Floods of the 1340s after 1343

In the years of 1344-1350 the memory of 'only' four floods, a report on a previous flood event and another reference on probable long-lasting high groundwater-level conditions (thus, altogether six data) can be detected. Even if it is much less in number, the importance of these years at least partly relies on the fact that some of the information might show some connection to the previous great flood years.⁶⁰¹

An early February flood was observed in 1344, again in the Uh/Už catchment, at the (southern) slopes of the Vihorlat mountain (today in Slovakia and Ukraine), clearly connected to mild(enned) weather conditions. In late March a great flood event was observed at the lower sections of the Danube (Bátonostor area): this surplus of water significantly decreased within two days. In the same lower floodplain of the Danube in early October 1344 the archbishop of Kalocsa applied to the pope to move his seat to a higher location due to extensive (smelly) unmanaged swamps and unhealthy conditions.⁶⁰²

No flood information remained to us from 1345.⁶⁰³ The next evidence in 1346 comes from an area of the lower Drava river, where in 1342 there was already a problem with inundated landmarks: now again in spring time water stood and landmarks were under water. Resettling of major landmarks had to take place in the Žitný ostrov area, because floods previously destroyed them some time in the (near) past, before November 1346.⁶⁰⁴

In the neighbourhood of the area where flood was already reported in summer 1343, at the lower sections of the Sajó river, a great flood was observed in late February 1347, and another case when a flooded valley is mentioned in the west, close to the Mura river.⁶⁰⁵ In late October of 1348, the flood of the Kis-Küküllő (Târnava Mică-Ro) river was recorded in Transylvania where secondary, autumn flood is not a frequent phenomenon due to its clear Mediterranean origin.⁶⁰⁶

The last known, great flood event of the decade occurred in mid-January 1349, affected the whole area of the Upper-Tisza and Szamos (Somes-Ro) rivers.⁶⁰⁷ Similarly in 1349, a petition referred to the situation that the place of the (former) church (with cemetery) of Panyit (Gemerská Panica-Sk) village was too muddy and thus, inhabitants wished to place the new stone church to a drier place. This is a rather interesting indirect evidence which may refer to problems of contemporary wetter (constantly higher groundwater-level) conditions, similar to the case when the Poprad river on the north changed its riverbed, prior to autumn 1349⁶⁰⁸

Floods in the 1340s: a brief analysis of events

Concerning the observed flood events of the 1340s, five occurred in winter, ten in spring, one in summer and five in autumn time. Thus, visibly spring floods were reported in the

⁶⁰¹ For example, the winter and spring floods in 1344 can be treated as a continuation of the (1341-)1342-1343 flood wave.

⁶⁰² Section 9.4.5.4.

⁶⁰³ Winter of 1345 was mild and the summer was hot and dry in the Czech lands and Austria (see Brázdič-Kotyza 1995, p. 115). Dry conditions of the year or generally less precipitation could be one possible reason why no any evidence on obstructing flood evidence available.

⁶⁰⁴ Section 9.4.5.5.

⁶⁰⁵ Section 9.4.5.6.

⁶⁰⁶ Section 9.4.5.7.

⁶⁰⁷ Such a great winter flood presumes the arrival of mild air masses and rapid melting in the preceding period. A great flood event can sometimes as well occur due to accumulation of ice and melting, or if ice-flood does not occur, it presumes large amount of precipitation (snowmelt and rain) in the catchment.

⁶⁰⁸ For flood- and high water-level references, see Section 9.4.5.8.

greatest number, but also the number of winter and autumn floods are quite high, while summer floods are especially underrepresented. Out of the seven documented great flood events, three were in winter (most of the winter floods were great floods) and four occurred in spring.

The high number of spring floods can be largely thank to the four spring floods in 1342, and three in 1343. With regards to the winter floods, it is important to note that in average every second winter there were considerable warm spells and precipitation (surplus) which resulted flood event (1342, 1343, 1344, 1347, 1349). This is especially true for the catchment area of the Tisza river, where all the great winter floods occurred. The number of autumn floods are quite large even if one of them, namely the flood occurred close to the Drava river, reported in mid-September, might have already been a summer flood event. Moreover, all of the other four floods took place in the Tisza catchment. Striking is the clearly very low number of summer floods: only one 'clear' summer flood is known from 1343.

During the decade two Danube floods (1342 és 1344) are known, presumably both of them (1344) was a great flood event. Moreover, the destructive consequence of a previous Danube flood event is also mentioned in 1346, in the Žitný ostrov area. Seven flood events occurred on the Tisza river: three of them were marked as a great one. On the Danube catchment three, on the Tisza catchment nine floods were documented regarding the decade. In the 1340s the floods of the upper and upper middle sections played a leading role. Whereas in 1343 floods clearly affected the upper and upper middle sections of the Tisza catchment, in the case of the 1342 flood event both great catchments, namely those of the Danube and the Tisza were involved.

In most of the cases descriptions concern individual events and thus, usually no information is available beyond the lands that the perambulations reached. In consequence, there is a possibility that in those cases not only the mentioned lands and waterflow(s) were affected, but other, more flood events also occurred which remained unrecorded (due to lack of legal problem, field survey etc.). This is also true in spatial distribution and the further effects of flood events: usually if one river is in flood, it is likely that the neighbouring waterflows with same climatic-morphological conditions have high water level (or flooding) as well. For example, when the Sajó river was in flood in February 1347, this was (also knowing broader parallels) the result of the arrival of warm air masses to the Carpathian Basin and beyond, which obviously affected not only the catchment area of the Sajó river – but the consequences in other areas of the Carpathian Basin (or even that of the close neighbourhood) remained unreported.

As for direct consequences, perambulations were obstructed in twenty cases, sometimes this meant only missing measurements, but in some other cases no perambulation at all could be carried out. In three cases travel (or safe transport of charters) was endangered or completely obstructed by floods, in one case change of riverbed occurred, while in another case probable high groundwater conditions caused a change in location of a newly planned chapel.

In conclusion, compared to other periods, the decade was an extraordinary one due to the great amount of flood events recorded. This is, nevertheless, largely the result of two, clearly extraordinary, years: 1342 and 1343. In these two years, but especially in 1342 we can presume that the year itself was unusually rich in precipitation which became the main reason (connected to large-scale patterns) of multiple flood events and waters standing on fields for longer period of time; thus, causing extraordinary water cover along the main rivers of the Carpathian Basin. While both catchments were clearly affected in 1342, only the Tisza catchment was reported to be (heavily) affected in 1343.

5.2.1.3 Great and long-lasting floods and a possible long-term consequence: the late 1350s

Although most probably the flood events of this decade cannot be entirely separated from the events and consequences of the (1330s?)-1340s, due to the characteristicly different type and importance of events, especially of the mid- and late 1350s, it is worth to discuss the reported events of this decade separate from the previous one(s).

Some time in the mid-1350s in medieval Sáros county, the village of Monyhád (Chmiňany-Sk) was swept away by a series of preceding flood events in the valley of the Svina waterflow.⁶⁰⁹ In late November of 1356 flood of the Mura river occurred at the Austrian borderline. Probably still the same late autumn wet weather conditions are reflected in another, early December flood report, in the opposite, northeastern parts of the Carpathian Basin, when the Noska stream (Už tributary) was in great flood, affecting the whole area. Since both floods were reported in late autumn, beginning of December, on the one hand in the southwest, on the other hand in the northeast, there is a rather good chance that the two floods occurred for the same reason: wet air masses coming from the direction of the Mediterraneum.⁶¹⁰

At the beginning of May in 1357, the great flood of waters, difficulties caused by wetness/moisture and great mud were mentioned in the lowland area of Bereg county, Northeast Great Plain. At the same place floods and the density (compactness) of pastures in late August still caused problems in the same area. It seems likely that the spring inundation stayed on the fields (or at least on pastures) also for summer time, and was supported by other flood(s) in spring or summer.⁶¹¹ Probably also related to the great floods of the previous year, in February 1358 a northwestern Transylvanian village received right for full parish status for their church, since distance and (preceding) floods (often) obstructed them to reach the official parish church.⁶¹²

Finally, great rains, floods of waters and the dense fog obstructed perambulation of the ecclesiastical estate of Jászó (Jasov-Sk) at the lands of the mining towns, Szomolnokbánya (Smolník-Sk), Gölnic (Gelnic-Sk) and Idabánya (Zlata Ida-Sk) in the Upper-Bódva valley, in late November of 1359.⁶¹³

Compared to the previous decade, the 1350s is much less 'extraordinary' concerning the amount of flood events. Nevertheless, there is a clear concentration of destructive flood events of great magnitude around the period of late 1356 and most of 1357. Moreover, a major destructive event (disappearance of a village) caused by floods took place around the mid-1350s. All occurred in the northeastern areas of the Carpathian Basin, in the northern parts of the Tisza catchment; only one flood of the Danube catchment is known in this decade. Thus, while the decade (similar to the 1330s) is clearly less well-represented in the number of flood events compared to the 1340s, some great flood events of major importance (again similar to the 1330s) and with further consequences make the decade rather significant.

Majority of the flood events were of great or extraordinary in magnitude. Amongst direct consequences, one village was entirely swept away, and in five cases obstructed perambulation and legal process.

⁶⁰⁹ Section 9.4.6.1. Since exact dating is not known, there is a possiblity that this event happened not in 1355, but one or two years after (or before).

⁶¹⁰ Section 9.4.6.2.

⁶¹¹ Section 9.4.6.3.

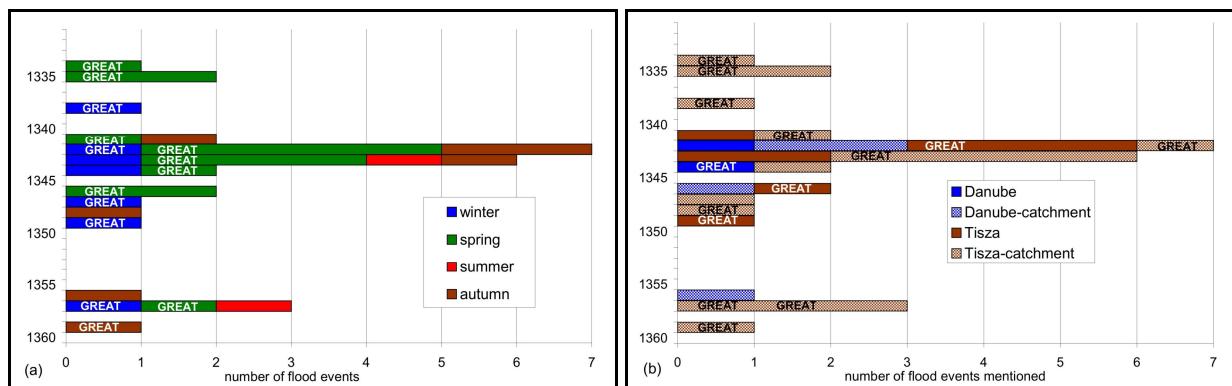
⁶¹² Section 9.4.6.4.

⁶¹³ Section 9.4.6.5. In the Czech Lands, the summer of 1359 was wet, and resulted a great flood of the Vltava at the beginning of September. No autumn floods were reported (Brázdil-Kotyza 1995, p. 115).

5.2.1.4 Floods of the 1330s-1350s: an analytic overview

Typical features of this major flood period:

1. The flood peak can be characterised by the overwhelming importance of the years 1342 and 1343.
2. In all three decades a large part of the flood events were reported as great or extraordinary ones. This is true not only for the 1340s, in which decade the extraordinary two flood years of 1342-1343 were included, but also for the 1330s with the probable greatest known medieval flood event of 1335, and the 1350s in which an entire village swept away by floods.
3. Two major Danube floods and the damage caused by earlier Danube floods, and eight Tisza floods (three mentioned as great ones) are known (all from the 1340s).
4. Majority of flood events occurred on the Tisza river and in the Tisza (upper) catchment area (see Fig. 30).
5. Some long-term consequences of the flood peak and long-lasting high (ground)water-level conditions can be detected, especially from the late 1340s and 1350s (see App. 3d).



30. Fig. Distribution of floods in the 1330s-1350s according to main rivers, catchments (a) and seasonality (b)⁶¹⁴

With reference to direct consequences, in 29 cases perambulation was obstructed by floods (*Table 4*). In some cases no perambulation at all could be carried out, but sometimes this meant only missing measurements or the settling of one or two landmarks. In five cases travel was either completely obstructed or 'only' endangered by floods. In two reported cases, one-one waterflows changed their beds. In one-one cases a village was swept away by floods, a parish separated due to (constant or repeated) flood problems, and a probably multiannual problem of high groundwater-level (without mentioning flood) was as well reported.

decades and cases	perambulation process obstructed	travel disturbed or obstructed	village destroyed	administrative change (parish) /change in location	change of riverbed / increased sedimentation
1331-1340	4	2			1
1341-1350	20 (!)	3		/ 1	1 / 1
1351-1360	5		1	1 /	

4. Table Documented main consequences of flood events on the human activities: the 1330s-1350s

⁶¹⁴ In this case only those flood reports could be considered which referred to an ongoing flood event and thus, it was possible to detect at least exact year and month of the observation. Note that two 1343 Tisza spring flood events might be the same: in this case 'only' five floods might be counted (and a travel-problem). For more information on the flood events of the 1340s, see: Kiss 2010, pp. 181-193.

What distinguishes these three decades from the others and makes them special in the Carpathian Basin is the extraordinary large number of actual, ongoing flood events reported, the large number of floods great in magnitude, and the relatively large scale and number of reported direct and indirect (medium- and long-term) consequences. As such, a clear difference from other periods refer to not only extraordinary high flood frequency, but long-term hydrological problems. It is clear a similarity with the 1390-1430s: groundwater-level problems, hydromorphological changes, cases when floodwater clearly stood and remained present extensively for several months, and administrative changes clearly blamed for many floods. The overwhelming importance of the Tisza catchment area and the years of 1342 and 1343 can be detected, the number of Danube (and Danube catchment) floods is obviously less pronounced than in the next, long-lasting flood period of the 1390s-1430s.

5.2.2 Floods of the period 1390s-1430s

According to our present knowledge, the second most important flood period concerning the amount of reported flood events is the 1390s-1430s, including the decade with the second most important (after the 1340s) when four great flood events recorded. Moreover, also the great Danube (and other) floods highlight its importance. The decade before the 1410s was already rather rich in flood events reported, and a great Danube flood event as well occurred in summer 1402. In addition, probably some charters prepared in the 1410s also contain flood-information referring to the previous decade. The 1410s, due to many floods what cannot be dated precisely, is not so much and clearly marked as the 1340s. Still, the quantity of events and some floods with greater magnitude make it especially pronounced.

Whereas the 1420s are mainly characterised by the great flood of 1421 and the constant problems occurred at some places afterwards, flood reports of the 1430s are mainly concentrated on the (relatively underrepresented) great flood event of 1432, but especially around the problematic period occurred at the end of the decade. Although longer in time, apart from the 1330s-1350s, these decades together form a second medieval flood peak. Even if probably somewhat less flood reports are available per year than that of the 1330s-1350s, longer-term evidence even more clearly highlights the importance of this second flood period (1390s-1430s) than that of the other one (1330s-1350s). And, what is an equally important question, importance of Danube floods and their consequences are even more pronounced in this second main flood period than in the first one.

5.2.2.1 Floods of the 1390s, with special emphasis on 1396 and 1399

Floods of the 1390: the course of events

Reported in late November 1393, previous floods caused a change in the course of a Danube branch at the southwestern Žitný ostrov area.⁶¹⁵

Two separate cases, one on 23 February 1396, and another which took place a week earlier suggest that a great Danube flood event of regional importance, probably with several waves, occurred latest in mid- and late February, along the Danube sections from Žitný ostrov

⁶¹⁵ Section 9.4.10.1. In this particular case, however, the low water level of the Danube and other Central European rivers in 1393 could have been an additional reason for the problems causing a later legal debate (for the Central European dry conditions see, for example: Brázil-Kotyza 1995, p. 119).

through Győr and presumably Esztergom.⁶¹⁶ In late April, flood of a Sava tributary obstructed perambulation in Central Slavonia. Thus, in 1396 floods were reported in late winter and in spring time. The late winter flood on the Danube was a great and long-lasting (set of) flood event(s) which affected large areas along the upper course of the Danube.⁶¹⁷

Presumably, the severe winter floods of the Tisza in 1399 caused the fact that roads were destroyed and ferry (and toll) place had to be moved at Tiszasüly and Tiszaroff along the Middle-Tisza. Around mid-March a great Danube flood was reported at its lower sections (in Bodrog county): a perambulation could not take place in mid-March and on the following days, because of the great Danube flood.⁶¹⁸ At the beginning of May flood partly obstructed perambulation at the lower sections of the Sár river. Exactly in the same time forests, pastures and waters of a land – close to the Szamos, at the edge of the wetland of the Ecsedi-láp – were not perambulated due to an ongoing flood event. In early December, flood of the Lonja river (Sava tributary) in Central Slavonia (Körös county) similarly obstructed one part of a perambulation.⁶¹⁹

In December 1400, in Southwest-Transylvania along the Crișul Alb river, a village successfully applied for a parish church of their own, blaming preceding flood events for travel problems.⁶²⁰

Seasonality and spatial distribution of main flood events of the 1390s

In the 1390s, at the moment we can distinguish two main flood years: 1399 on the first place, and 1396 on the second, with two major Danube flood events. In 1396 a great late-winter flood of the Danube (probably with several waves) is mentioned, and another, spring flood as well occurred in Slavonia and thus, also in the broader catchment area of the Danube.

With its five flood reports, 1399 (after 1342 and 1343) is the third most important flood year in medieval Hungary. In 1399 we see examples from both main catchment areas: whereas winter floods occurred on the Tisza river, the three known spring flood events of 1399 took place in the Danube catchment (two spring, one early winter), and one spring flood is reported in the Upper-Tisza (lower) catchment. In 1399 the great Danube and Tisza (tributary) floods, similarly to the one occurred in 1396, might be a consequence of the hard (and changeable) winter conditions.

Moreover, in two cases also some longer-term problems, connected to flood events, are mentioned which suggest that Danube floods occurred and caused changes prior to late 1393. Furthermore, flood or longer-lasting inundation caused difficulties in travel at the upper sections of the Fehér-Körös (Crișul Alba-Ro) river in Transylvania, prior to late 1400.

Probably the most characteristic elements of the decade are on the one hand the great importance of the year 1399 with at least four (but possibly even more in winter) flood events, from which almost all were reported either as great or as rather destructive ones. On the other hand, the spectacular activity of the Danube as well have to be emphasised: both in 1396 and 1399 we meet up with great Danube flood events; moreover, further Danube floods (and their consequences) are as well mentioned prior to late 1393.

Among the most obvious direct consequences on human activities, in the 1390s, floods obstructed travel and thus, legal process at least in five cases, and a great Danube flood obstructed perambulation in one case. A set of Tisza floods destroyed roads and a crossing

⁶¹⁶ These datings (namely 16-23 February) nicely fit the Central European tendencies, as the Danube was frozen over until 14 February (i.e. in Austria). This can mean the day of clear ice break-up after which immediately a major flood course started (ice flood?). See: Brázdil-Kotyza 1995, pp. 119-120.

⁶¹⁷ Section 9.4.10.2.

⁶¹⁸ For possible parallels, see the events of 1784 late winter, early spring: Brázdil et al. 2009.

⁶¹⁹ Section 9.4.10.3.

⁶²⁰ Section 9.4.10.4.

place. Earlier floods resulted in some change in the watercourse of a (main?)branch of the Danube.

5.2.2.2 The 1400s: less in quantity, same in quality?

On 27 June in 1402, a perambulation was obstructed by a (major) flood at the lower sections of the Danube in Bodrog county. In early August the Rába river was in flood at its middle sections. Danube flood of extraordinary extension and magnitude was reported in Austrians narratives for two days later, referring to Austria, Bavaria and Hungary.⁶²¹

The reference on continuous flood events concerning the Sárvize waterflow in the north-central Transdanubia, mentioned in 1405,⁶²² might be partly or entirely artificial, but clearly a natural flood event took place in the Žitný ostrov area some time between 1 July and 15 September in 1406, obstructing travel through/on the Danube, which was presumably the same event as the one reported in Austria (under 23 June).⁶²³

The next years of the decade are characterised by one-one flood events per year: the 1408 late-March flood report on the Sebeş river in Transylvania refers back to an earlier destructive flood event, which probably did not occur long time before, and might show some connections to the fact that the winter of 1408 was quite cold in large parts of Central Europe.⁶²⁴ In early August 1409, floods made the areas of the lowland Banat (area of Berzava and Pogonis rivers) unreachable: a more significant flood of waters obstructed travel in the whole area. The next information is about an early April flood in 1410; flood was reported at the lower course of the Sár/Sió river in the southeastern Transdanubia.⁶²⁵

Similarly to the 1390s, the decade of the 1400s is also characterised by two memorable great Danube floods reported. Floods stopped perambulation in one and obstructed travel in three cases, and in one case the destruction of a mill by preceding flood(s) was as well reported. On the Danube sections west to the Carpathian Basin this decade is especially rich in reported great Danube flood events: 1402, 1404, 1405, 1406, 1408;⁶²⁶ some of these flood events also appear in the Hungarian documentary evidence.

5.2.2.3 Floods in the 1410s

The course of flood-related events reported

In 1411 a mid-autumn flood/inundation of waters was reported (on streams) in the immediate catchment of the Túr river (Upper-Tisza tributary). Another flood event, occurred within two years before September 1411 (but most probably in 1411) on the Bednje river in Central Slavonia. It was only partly connected to a natural event: damages occurred due to human (mis)management (new mill). The negative impact of a natural flood event was enlarged by human intervention, but the natural flood event anyway occurred. Another flood of the past is also mentioned with a problematic dating (some time between 1411-1415?), at the Borsva river (Upper-Tisza tributary).⁶²⁷

⁶²¹ Section 9.5.1.1. See also Rohr 2007a, p. 231.

⁶²² 1405 was rather rich in precipitation in Central Europe, which caused floods also in other areas (Brázdil-Kotyza 1995, p. 120; Rohr 2007a, p. 232).

⁶²³ Sections 9.5.1.2-3.

⁶²⁴ Section 9.5.1.4. In Bavaria, thaw caused major ice (jam) flood on the Danube (Brázdil-Kotyza 1995, pp. 120-121).

⁶²⁵ Sections 9.5.1.5-6.

⁶²⁶ See Rohr 2007a, p. 232.

⁶²⁷ Section 9.5.2.1.

A great winter flood of Danube branches, some time between 21 January and 12 February, in the Žitný ostrov area occurred in 1412.⁶²⁸ In the east-central parts of country, the wet meadow at the Hosszú-ér, an outflow of the Tisza river (middle section), in mid-May suggests relatively wet environment in that area.⁶²⁹

The testimony of two floods remained from 1413 referring to the area of the Tisza and the Danube rivers, respectively. In late June, due to the inundation of waters at the lowland sections of the Upper Tisza, it was not possible to determine boundaries and divide lands in a meadow and a reedy area.⁶³⁰ The other flood case refers to the Danube: reported in late August, previous Danube floods destroyed a landmark at the lower middle section of the river.⁶³¹ In 1414 a great Danube flood obstructed legal process in mid-July at the middle section of the river. This shows a clear parallel to the rainy and flooding summer (July) conditions in some other parts of Central Europe (e.g. Poland).⁶³²

Whereas no flood report remained concerning 1415, the late January flood of probably the Latorica river (and waterflows connected) in 1416 caused the fact that only land division and no perambulation took place in the Kisdobrony area. In this year of 1416, another preceding Danube flood was reported in early summer: many major landmarks of a landed possession, destroyed by the flood, had to be replaced in the Žitný ostrov area.⁶³³ Similar case appeared in Transylvania at the Târnava Mare river, where a great flood destroyed landmarks and thus, new perambulation and settling new landmarks were needed in early November of 1416.⁶³⁴

Another indirect evidence, rather important for the preceding period, appears in 1417: the nobles of Vaja (first Szatmár then Szabolcs county) complained about the serious travel problems due to floods (most probably of the Szamos-Kraszna catchment), caused by multiple, abundant rainfalls of the previous periods. This information has primary importance, since this practically the only case when the source directly provides data about the chief long-term reason of increased flood activity: abundant rainfalls.⁶³⁵ The last flood report of the decade remained to us from mid-spring of 1419: the mountain tributaries of the Upper Tisza catchment (Zazar, Upper Tisza and some tributaries?) were in (great) flood.⁶³⁶

Floods of the 1410s: a short analysis

Out of the thirteen flood reports eight refers to the Tisza and five to the Danube catchments. Typical for the decade that both concerning the Danube (1413, 1416) and the Tisza

⁶²⁸ However great the flood was, still perambulators could, for example, use the roads between settlements and some of the boundaries could be perambulated and thus, they did not have to face with major difficulties everywhere in the area.

⁶²⁹ Section 9.5.2.2. Naturally, this later case does not seem to be a very unusual circumstance, but it is still worth mentioning, because it provides some hints to the better understanding of spring conditions.

⁶³⁰ Although not directly the flood of the Tisza river is mentioned, from the circumstances the flood of the main river of the area (probably together with the Takta river) seems to be the most likely reason of problems. This charter is a good source of information for the fact that, though sometimes boundaries were also established in wetlands, those were usually reachable, and a flood of waters (thus, and additional water surplus) was needed to cause problems to reach these landmarks. See: DL 10086 (14.07.1413).

⁶³¹ Section 9.5.2.3.

⁶³² Section 9.5.2.4. For parallels, see: Brázdič-Kotyza 1995, p. 121.

⁶³³ Since no date of the flood is provided, it may as well be the same as the previous Danube flood event (in 1414), but it seems more likely that it is a separate one due to the fact that important, key landmarks were destroyed which had to be resettled.

⁶³⁴ For reported flood events of the year 1416, see Section 9.5.2.5.

⁶³⁵ See Section 9.5.2.6. Although reported much earlier, in this area a 1325 flood event was reported, during the perambulation process of Vajai and Tisza landed possessions.

⁶³⁶ Section 9.5.2.7. This great spring flood in the northeastern catchment of the Tisza river might refer back to hard winter conditions, also observed in other parts of Central Europe, for example, in Austria (Danube firmly froze over: see Brázdič-Kotyza 1995, p. 122).

catchment previous floods (1411, 1417) and their consequences are mentioned, which might refer to precipitation-surplus problems on an at least multiannual level. This later idea might be supported by the comment included in the 1417-charter that the frequent flood events were caused by abundant rainfalls. Thus, they faced with an obviously more wet period than what was usual for people (inhabitants of the area) before.

A relatively large number of flood cases refer either to previous flood events, or cases when the exact date of floods are unknown. When a more precise dating is possible, one winter, one spring, two summer and two autumn floods are mentioned.

Whereas the Tisza catchment is relatively active in this decade, when it comes to the floods of the Danube catchment, except for a case on a Sava-tributary, only the floods of the Danube river are mentioned. The relatively high flood activity of the Danube also continued in this decade: two great Danube floods (winter 1412, summer 1414) are mentioned and in two other cases (1413, 1416) previous Danube floods caused damages.

Floods obstructed perambulation in four cases; in three other occasions landmarks had to be resettled (with new perambulation process) because the previous landmarks had been destroyed by river floods. In two cases floods were blamed for travel problems, and in one case it seems that these problems were valid on the long term, too.

5.2.2.4 Floods of the 1420s

Floods in the first half of the 1420s: the course of events

First time appeared in a document in February 1421, the regulation related to the ore mines, previously flooded by water (Smolník-Sk), were mentioned (Lower Hungarian mining area; today West-Central Slovakia). Documented in mid-August 1421, an earlier flood resulted a change in the course of the Váh river, which was followed by a legal debate of a land property in the area north to Martin (Turóc county).

In mid-September 1421, along the middle sections of the Tisza river, perambulation was obstructed by great floods. Caused by floods, the revision of a mill in Heves county was not carried out in mid-October 1421.⁶³⁷ Hardly more than three weeks passed between the two reports on previous flood events in the same county. Therefore, there is a possibility that at least partly the same flood wave(s) are mentioned in the charters and caused problems in roughly the broader area in the northern parts of the Great Plain. In the second case perhaps floods of a broader area (of several counties from Heves to Zemplén) obstructed travel.

Referring to (previous) 'well-known' constant flood problems, in late February of 1422, the difficult situation of a village in Ung county (close to Užhorod-Uk), causing the separation of a parish, is described. Short (weeks or less) before early August in 1422, the Ronyva waterflow (caused by rainfall) flooded some lands. Some time in 1422 or before, a mill was destroyed by the vehement flux of the Nitra river, at its middle sections.⁶³⁸

In early April of 1423 the meadows along the Korpona river (Krupinica-Sk) at Ság (Šahi-Sk) were muddy due to the ongoing flood.⁶³⁹ Reported in February 1424, constant floods and wet conditions ruined a chapel along the lower sections of the Sebes-Körös river. A land,

⁶³⁷ For floods reported in the year 1421, see Section 9.5.3.1. It is interesting to note that the charter, in which the perambulation procedure was included, was issued more than two weeks later (unusually late) than the perambulation took place. All information suggests that there was an ongoing inundation in early September along the middle sections of the Tisza river. This was caused by previous very great flood events (but still with ongoing consequences) which, one after the other, caused a longer-term inundation along the Tisza, and suggests that the northeastern catchment of the Tisza river was in flood.

⁶³⁸ Section 9.5.3.2.

⁶³⁹ Section 9.5.3.3.

subject to frequent flood events, at the upper course of the Dunajec river was mentioned concerning a donation in mid-autumn 1424. In late autumn 1424, along the Nitra river in the same area and legal debate concerning the damage of a mill, already mentioned concerning 1422, a field survey was obstructed by an ongoing flood event.⁶⁴⁰ Old landmarks had to be resettled in early September of 1426 along the Rába river at its middle sections, because the continuous (repeated) flood events previously destroyed most of the landmarks. In the same year of 1426, preceding destructive Danube floods, occurred in the Žitný ostrov area resulted important royal orders on flood protection issues.⁶⁴¹

Floods of the early 1420s: why is it important?

Compared to other flood decades, probably except for the flood year of 1421, there are no really significant years in this decade, at least based on the number of flood events reported. The number of flood reports in the two main catchments are evenly distributed (two Tisza, two Tisza-catchment). The importance of this decade relies on the large number (majority) of related to preceding high frequency (constant) and intensity of flood events which resulted long-term consequences and problems, in both main catchment areas.

Concerning direct consequences, in two cases either a perambulation was obstructed by a great flood, or a field survey could not take place due to an ongoing flood event. In another case, caused by similar reasons, a mill-examination was postponed. Previous (repeated) flood events were reported to be responsible for travel problems in seven cases; once floods constantly obstructed travel and thus, a village required separate parish of their own. In another case a mill was destroyed by (preceding) vehement flux of a river, a previous repeated floods destroyed landmarks and a new process for resettling landmarks had to be launched. Apart from large-scale damages – caused by repeated previous floods – in fields, a chapel got ruined, flooded mines were mentioned, whereas in one case the change of riverbed (caused by flood), and in another occasion flooded lands (with debated origin of flood event) resulted legal debates.

5.2.2.5 The 1430s, and the flood years of 1432 and 1440

Floods of the decade: an overview

The flood that was observed some (short) time before early May in 1432 on the Nitra river is an important one due to the fact that if the Nitra river was in flood, there is a good possibility that other rivers, northern tributaries of the Danube (e.g. Hron, Váh) were also in flood around this time.⁶⁴² This flood event was followed by one of the most well-marked, extraordinary flood event of the Middle Ages in summer 1432: on 21 July in 1432 a very great flood was reported in a number of Central European (thus foreign) narratives, which occurred in Bohemia, Moravia, Austria and Hungary. No such detailed information is available about the famous July 1432 flood event in Hungarian documentation. However, concerning 1433, the

⁶⁴⁰ Section 9.5.3.4.

⁶⁴¹ Section 9.5.3.5. Even if referring to earlier floods, these flood mentionings are rather interesting, because both 1426 and the preceding year (with winter) were rather warm/hot and dry (also spring and summer of 1426 in Austria). See: Brázil-Kotyza 1995, pp. 124-125.

⁶⁴² The winter of 1432 was long and severe in Central Europe: winter conditions prevailed in March, there was ice on the Vistula until late April. Thus, the flood of the Nitra river in early May could be even the result of late melting of snow in the mountain areas, especially because in Bohemia there was great heat and drought from late April (see Brázil-Kotyza 1995, p. 126).

extraordinary great flood of the Danube was reported at Belgrade in mid-April, which shows connection to the severe winter conditions of 1433 prevailed in Central Europe.⁶⁴³

The water level of Lake Fertő was most probably high in early (spring?) 1434. Some time before late June 1435, flood of the Tisza river was reported from the Middle-Tisza area.⁶⁴⁴ Two reports from the lower sections of the Danube provide the evidence that the Danube was in flood both in mid-May and early August of 1436.⁶⁴⁵ In (late?) winter 1437 floods of water obstructed travel in the northern areas of the Great Plain.⁶⁴⁶ In early November 1438 uninhabited wetlands were mentioned in an area where a perambulation, renewing of boundaries should have taken place which might suggest (longer-lasting) high groundwater-level conditions along the lower course of the Fehér-Körös river (close to Gyula town).

Reported in mid-summer of 1439, it was difficult to use the waterway of the Danube at Bratislava because of the accumulation of sand and wood, brought by previous floods and fluctuations of the Danube. Moreover, the bridge was as well in ruins. Since in mid-February a destructive Danube flood occurred in Austria, even if unreported, this flood might be also responsible for the above-mentioned problems existed on the Danube waterway in 1439.⁶⁴⁷

Documented in mid-March, after the hard winter of 1440, ice caused damage on the Danube bridge(s) of Bratislava, when reparation payments were carried out.⁶⁴⁸ Referred in late May, the same or another Danube flood event caused the damages on the same bridge and swept away ships. Around early or mid June a torrential rain, also causing flood event, occurred in the Sopron area. Reported in mid-June of 1440, major problems of salt transport in/from Transylvania were caused by disease and torrential waters. Still in the same month, at the end of June, flooded cellar is mentioned in Bratislava. Finally, the memory of either the same or another flood wave was preserved from late July, reporting about the paid work of the fishers (at Bratislava), when the water level of the Danube was high.⁶⁴⁹

Floods of the 1430s: a leading decade of great Danube floods?

Floods of the decade, especially marked with great flood events, partly occurred on the Danube. Even if not directly reported in Hungarian documents, one can highlight the extraordinary great flood event of 1432. In 1433, the Danube at its lowermost sections was so huge 'as never before'. Even a more marked set of floods, predominantly connected to the Danube, was observed in the last years of the decade (1440). Moreover, it seems that flood problems of the Danube on a multiannual level also appeared (1439).

Whereas 1432 was not very well reported in Hungary, in other five or six cases Danube floods, partly great ones, were clearly reported in Hungarian contemporary sources. Moreover, in this case complexity of source types is also interesting: beyond the charter and economic evidence (town accounts), a contemporary memoir (indirectly) can be as well applied in the analysis.

⁶⁴³ See, for example: FRA SS Vol. 6, p. 77 (*Rosenberger Chronik*). For Austria: Rohr 2007a, pp. 232-233; or the Czech Lands, an entire paper was dedicated to the comparison of this and a 21th-century major flood event: Brázdi et al. 2006a, pp. 848-863. See also: Brázdi-Kotyza 1995, p. 126. For Hungarian evidence, see Section 9.5.5.1.

⁶⁴⁴ Sections 9.5.5.2-3. The water-level conditions of Lake Fertő refers to the hydrological conditions of a specific small catchment area of the southwestern Little Plain and partly the Vienna basin.

⁶⁴⁵ Section 9.5.5.4. Flood was reported in mid-summer of 1436 in the Czech lands (Brázdi-Kotyza 1995, p. 129).

⁶⁴⁶ Section 9.5.5.5.

⁶⁴⁷ Section 9.5.5.6. For the flood with ice in Austria (after a hard winter), see: MGH SS Vol. 9, p. 740 (*Continuatio Claustroneoburgensis V*). For more data and analysis, see: Brázdi-Kotyza 1995, p. 129. Probably connected to this event, see: Rohr 2007a, p. 234.

⁶⁴⁸ The winter of 1440 was severe, snowy and very long in Central Europe (Brázdi-Kotyza 1995, p. 129; this fact we can also follow in the notes of Helena Kottannerin about western Hungary). Nevertheless, the wet character of May-early June seems to be detected in Frau Kottannerin's memoires.

⁶⁴⁹ Section 9.5.5.7.

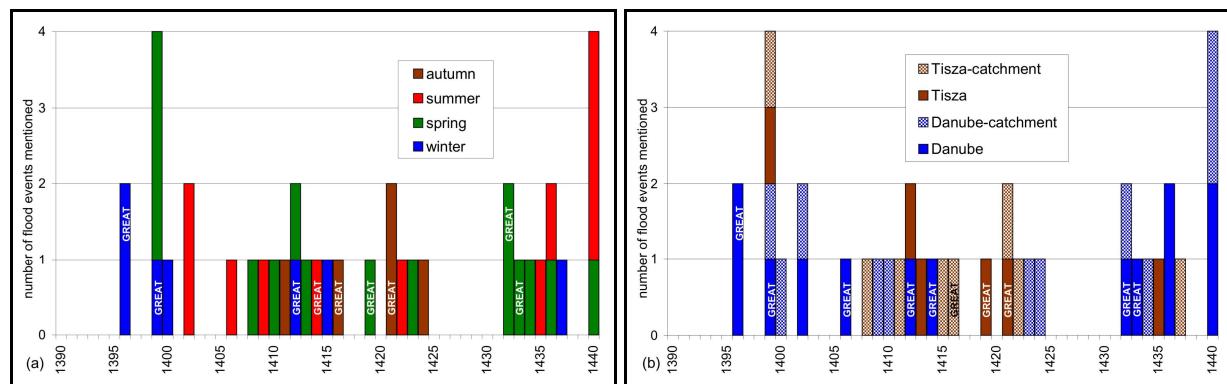
There are only a few other decades in the Middle Ages which is so much characterised by Danube flood events and their harmful consequences as the 1430s. Also taking the previous decades into account, this might be part of a tendency which already started earlier. Great flood events are concentrated around two years: 1432(-1433), but especially (1439-)1440. Even if 1432 is a great flood year in other parts of Central Europe, comparable to the great flood year of 1342, in Hungary up to now relatively small amount of evidence is available. Much more important is the year of 1440 when, the various types of source evidence are chiefly concentrated to the western areas of the country. It is also one of the exceptional decades when almost all the flood references are related to the Danube and Danube catchment, and up to now only one flood event is known from the Tisza.

Among the direct consequences, in three cases flood, while in one case possible high groundwater-level conditions obstructed perambulations and other legal processes. In four cases, either at a certain time or on multiannual level floods disturbed travel or transportation on major waterways, in at least two cases some information is also available about material damages, and in another case part of the village got deserted due to flood(ed land) problems.

5.2.2.6 The flood period of the 1390s-1430s: an analytic overview

Typical for this major flood period:

1. Accounting with the amounts, the number of reported flood events are clearly lower and the flood peak period is longer than in the 1330s-1350s.
2. Great importance (and high number of) Danube floods, and most of them were reported as great ones – with the 1430s in peak (see Fig. 31).
3. Another main characteristics, that in a particularly large number of cases previous intensive and repeated/constant floods (higher flood frequency?) were blamed for a number of long-term problems and changes.
4. Distribution of flood events between the two main catchments is approximately opposite to what we could experience in the 1330s-1350: majority (almost double) of reported ongoing flood events occurred either on the Danube or in its catchment area.
5. Looking at the human-impact (*Table 5*), striking is the low number of obstructed perambulations and related legal processes. Either on long- or short-term, travel and transportation problems play a much more important, prevailing role.



31. Fig. Distribution of floods in the 1390s-1430s according to main rivers, catchments (a) and seasonality (b)⁶⁵⁰

⁶⁵⁰ Only those flood information with reported ongoing flood event was included.

The two most important flood years of the period documented are 1399 and 1440, but much less characteristic than 1342 and 1343, and floods are concentrated to only two-two seasons. Compared to the 1330s-1350, the number of ongoing flood events mentioned are lower, but most of them, especially the great ones occurred on the Danube or the Danube catchment. While in the 1330s-1350s very few summer floods were reported, significantly more appears in the 1390s-1430s.

decades and cases	perambulation / legal process obstructed	travel / transportation disturbed	riverbed moved / increased sedimentation	land-marks damaged	mill / church / bridge damaged	administrative change (parish / county affiliation)	managed fields / mines damaged
1391-1400		1 / 5 / 1	/ 1			1 /	
1401-1410	1 /	3 /			1 //		
1411-1420*	4 /	3 /		3		/ 1	
1421-1430*	2 / 1 (mill)	7 /		1	1 / 1	1 /	2 / 1
1431-1440	4 /	4 / 4			// 2		1 /

5. Table *Documented main consequences of flood events on the human activites: the 1390s-1430s.* *Note that the cases referring to previous floods might partly concern events of the previous decade

In 1393 and 1405 possible riverbed alteration (caused by preceding floods), whereas in 1417, 1421, 1424, 1426 and 1439 long-term hydrological problems were reported. All these evidence, but especially those of the 1410s-1430s refer to water/precipitation surplus occurred on multiannual or multidecadal level.

Compared to the 1330s-1350s, there were much more Danube great floods reported and thus, the Danube-catchment proved itself to be relatively more 'active' than before. Other, clear speciality lies in the long-term changes and consequences, which seems to be especially striking in these 40 years. This means, for example, the signs of long-term problems (hydrological change? increase of wetland surfaces?) around wetland areas such the Körös 'waterworld' or the wetlands of the Ecsedi-láp. Long-term hydrological problems in this sense are more pronounced and caused more reported problems in the everyday life (even if sometimes not so striking ones) than in the 1330s-1350s.

5.3 Documented flood events of the largest rivers: present stage of knowledge

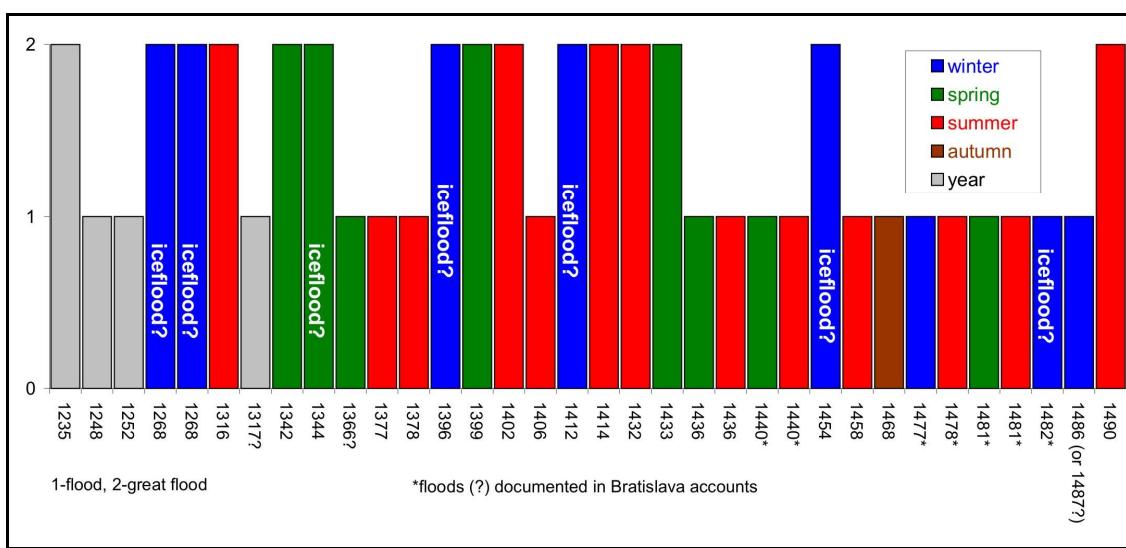
5.3.1 Floods of the Danube

5.3.1.1 A general overview

At present, the evidence of thirty years with flood events are available concerning the Danube. Around one third of the events were reported as great floods (*nimia, maxima, valida*; or: '*abundantia et multitudine aquarum*').⁶⁵¹ Out of all cases when seasonal information is available, most of the floods were reported in summer (thirteen cases), eight-eight cases in winter and spring, and one (reported by Janus Pannonius) from autumn (see Fig. 32). Most of the Danube floods were reported either from the upper sections (Bratislava and Žitný ostrov, W-Sk), or from the lower sections, namely from the Dunaújváros-Sárköz area down to the Apatin area (N-Serbia).

The most important group of floods occurred in summer: out of the thirteen known summer flood cases five maybe considered as great floods. The 1235 and 1316 great flood events,⁶⁵² both caused by rainfall, were reported in Austrian narratives, whereas the rest of the summer floods mainly appeared either in charters or in accounts. The summer-flood group is not only important because it is the largest in number, but also because a summer flood on the Danube clearly refers to the precipitation surplus occurred in its alpine catchment.

Five of the great floods occurred in winter and one in early spring, and probably all of them were ice-related flood events. In one further (1482) case, description might refer to a similar origin. Two of the winter (ice)floods appeared in the mid-13th century canonisation trial documentation of princess Margit,⁶⁵³ four in charter evidence⁶⁵⁴ and at least two in town accounts.⁶⁵⁵



32. Fig. Reported medieval flood events of the Danube⁶⁵⁶

⁶⁵¹ Section 9.4.5.2.

⁶⁵² Sections 9.3.1 and 9.4.2.1.

⁶⁵³ Section 9.3.4.1.

⁶⁵⁴ Sections 9.4.10.2, 9.5.2.2, 9.5.7.1. and 9.5.9.3.

⁶⁵⁵ Sections 9.5.8.3 and 9.5.9.2.

⁶⁵⁶ In the present case, for an easier application, only great floods were distinguished from floods without any specification on the magnitude. For a more elaborated 3-scaled magnitude graph, see App. 3c.

At present, eight medieval spring floods of the Danube are known concerning Hungary. While three of them were reported as great flood events (1344, 1399, 1433), presumably a fourth one (1342: '*abundantia et multitudine aquarum*')⁶⁵⁷ also refers to a very extensive water cover. Only the poem of Janus Pannonius refer to an autumn flood event of large rivers, amongst others the (Lower-)Danube, in 1468.⁶⁵⁸

The 1235 and 1316 floods, appearing in Austrian narratives, refer to the Danube and Hungary in general. The two, 13th-century winter floods (presumably ice floods) are connected to the Pest-Buda area, namely the Margit Island. Two floods of unknown date and type were as well reported (in charters) concerning the Žitný ostrov area. 14th-15th-century floods are spatially rather concentrated: most of them were reported either referring to the Žitný ostrov (e.g. 1336, 1396, 1406, 1412, 1416?),⁶⁵⁹ the neighbouring Bratislava area (e.g. 1439?, 1440, 1454, 1477, 1481, 1485 or 1487)⁶⁶⁰ or the Danube section close to this area (Győr-Esztergom: e.g. 1396).⁶⁶¹ The other main area where Danube floods were reported in the greatest number is located at the lower and lower-middle sections of the Danube. In this case flood mainly appeared in medieval Bodrog and Fejér counties, between Szalk, Dunapentele (today Dunaújváros), the Sárköz area and Aranyan (Northwest Serbia) in, for example, 1342, 1344, 1377, 1378, 1399, 1402, 1414, 1436, 1458.⁶⁶² Similar to the 13th century conditions, some floods are only reported as 'Danube floods' without mentioning any specific location (e.g. 1432, 1433, 1468, 1490). In further other cases (e.g. 1346, 1413, 1416, 1426 and 1439),⁶⁶³ although Danube floods are mentioned, only *terminus ante quem* dating is possible and thus, in the present investigation they are treated as events similar to the Danube flood events in the years around (1412, 1414).

In the studied period there are two decades when at least two great Danube floods were reported: the 1390s (1396, 1399) and the 1410s (1412, 1414 – in this case there might be even more). However, there is a third period which, although not directly documented, probably also caused Danube flood-problems, greater than usual: 1439-1440 (and probably a bit before). Indirect signs, such as the problems recorded in the Bratislava account books (damages of several flood events) as well as a charter of Albert I (dated 1439) suggest that due to Danube floods the riverbed had to be cleaned, and major (bridge) reparation works had to be carried out by 1439 in the area of Bratislava.⁶⁶⁴ The later problems more frequently got reported in the 15th-century town accounts after 1439.

5.3.1.2 Flood or not? Damages of Danube bridge(s) at Bratislava

Beyond the obvious flood evidence, some data are also available concerning the damages of the Danube bridge(s), located at Bratislava, in the mid and late 15th centuries (marked in Fig. 32 with *). Although in many cases it is not evident whether or not a flood occurred, damages of the Danube bridge(s), preserved in the town accounts, can highlight some years and provide possible additional information to the known Danube flood events.

⁶⁵⁷ Section 9.4.5.2.

⁶⁵⁸ Section 9.5.8.2.

⁶⁵⁹ See sections 9.4.4.3, 9.4.10.2, 9.5.1.3, 9.5.2.2 and 9.5.2.5.

⁶⁶⁰ Sections 9.5.5.4-5 and 9.5.7.1.

⁶⁶¹ Section 9.4.10.2.

⁶⁶² See sections 9.4.5.2, 9.4.5.4, 9.4.8.3-4, 9.4.10.3, 9.5.1.1, 9.5.2.2-4 and 9.5.7.2.

⁶⁶³ Sections 9.4.5.5, 9.5.2.3, 9.5.2.5 and 9.5.5.4.

⁶⁶⁴ Section 9.5.5.4.

Presumable Danube flood events at Bratislava, which caused damages in the bridge, have to show connections to the floods of Lower Austria. Thus, even if only the floods with greater damages were reported in Austrian narratives, the data on Danube floods (either or not marked as a great one) from the Bratislava-Žitný ostrov area may directly report back to flood event (of unknown magnitude) of Lower Austria.

Nevertheless, while discussing damages on bridges, caused by the strong flux and/or flood of the Danube, we have to take into account that the 'story' of the bridge over the Danube at Bratislava is clearly more complicated than those over the Traun and Salzach rivers, studied and analysed by Ch. Rohr.⁶⁶⁵ Neither the structure of the bridge was simple: in this case a large river with significant depths and strong flux (and with islands) had to be considered. Thus, from the 1430s onwards, even if documented in the town accounts, the history of the bridge is not continuous: information is available about the existence (and damages) of at least 5 different bridge constructions (and some years of gaps in between) until the end of the 1490s.⁶⁶⁶

Still, in several cases direct evidence provide proof on damages and destruction caused by the high water levels or the ice of the river – not reported in charters or (Lower) Austrian narratives. Even if this presented dataset is clearly not the full data available related to the problem, some years with damages caused by the Danube can be detected only by using these direct and indirect information, preserved in the town accounts. Thus, this question has great potentials and needs further investigations, which should be carried out in the form of joint work.

It is interesting to note that, similar to the situation in the 18th century,⁶⁶⁷ reported damages are generally greater in the second than in the first half of the 15th century. This can be due to the changing amount and type of documentation, but possibly also of greater number of buildings located in flood-endangered areas of the Danube.

5.3.1.3 Danube floods in Hungary and Austria: is it possible to compare?

Differences and similarities in documentation and the question of comparison

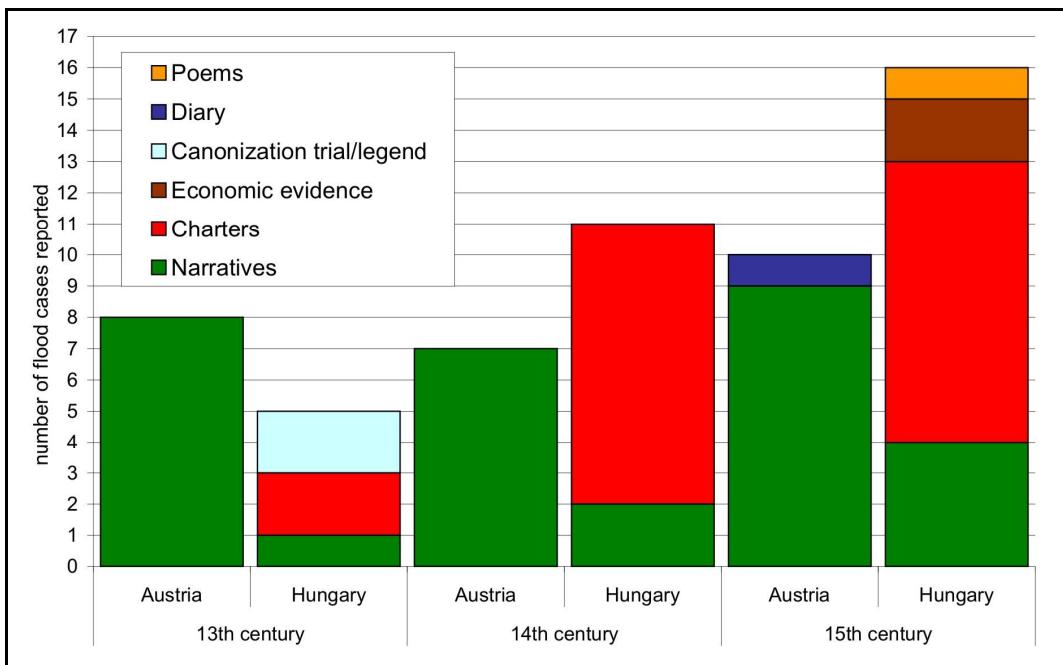
A detailed collection of medieval floods of the Upper Danube (in the eastern alpine region) and Lower Austria (just before the Danube enters the Carpathian Basin) was recently published by Ch. Rohr.⁶⁶⁸ This published dataset, based on contemporary documentation, makes us enable to provide some preliminary comparison between the database provided in the present work and the Austrian collection of medieval flood evidence.

⁶⁶⁵ See, for example: Rohr 2003, pp. 37-49; 2006, pp. 834-847.

⁶⁶⁶ Concerning the medieval bridge(s) of the Danube, rather detailed information can be found, written by Ortvay (1889 Vol. 2/2, pp. 399-408). According to the author (richly supported by quotations of original evidence) King Sigismund in 1430 ordered to build a bridge: this bridge (No. 1) was destroyed up to 1439 by the floods and fluctuations of the Danube. In Ortvay's opinion, the captain of the town neglected his task, and that is why the floods and fluctuations of the Danube could so soon destroy the bridge. The next bridge was built up in 1439 and was in use until 1445 (No. 2a): partly it was based on ships and partly on yokes. Perhaps another bridge (No. 2b) was built in 1454, but no information remained about it. The next bridge was built up by 1473, but this bridge(s) on the Danube did not contain ships (it was based on yokes; No. 3). After the ice of the Danube destroyed it, in 1487 it was built up again at another place (No. 4). This bridge existed until 1490. The new bridge, built in 1493 (No. 5), partly also contained ships. This bridge disappeared from the 15th-century town accounts after 1496.

⁶⁶⁷ See, for example: Kiss 2007, pp. 271-282.

⁶⁶⁸ Rohr 2007a, 640 p; Rohr 2007b, pp. 63-115.



33. Fig. Source types in which Danube floods are referred: medieval Austria and Hungary (based on Rohr 2007a, b, and the present work)

There are some considerable differences which do influence comparability of the two databases:

1. In Austria analysis is predominantly based on narrative evidence. In Hungary, ca. 80% of the evidence were found in charters, and the rest in several other source groups (see Fig. 33).
2. In Austrian Danube flood evidence predominantly refers to great flood events. In Hungary, due to the nature of source material, most of the flood events are not especially marked as great ones.
3. Material damages and casualties are in most cases also listed in Austrian evidence. Although Hungarian Danube floods also obstruct human activities much less information is available on material damages, and only exceptionally anything (general) on casualties (an those are preserved in Austrian narratives, referring to Hungary).
4. In fact, reported Austrian Danube flood events fit most the category of a disaster (as also Rohr defined). In contrast, medieval Hungarian Danube flood evidence, and the information preserved about their consequences rather fit the category of natural hazards.

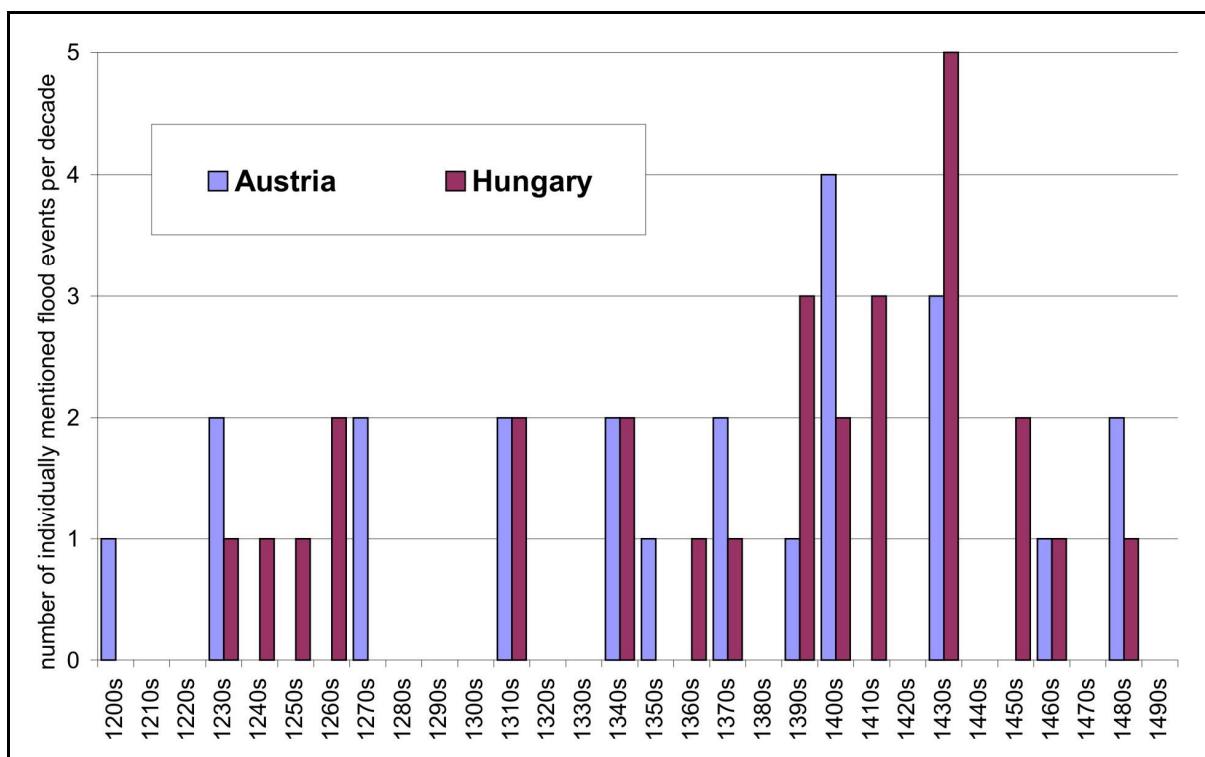
However, there are important similarities which, to some extent, allow us to compare the two databases:

1. In both cases it is possible to follow the rather proper dating of flood events, and due this fact in most cases seasonality can be detected, both in Austria and Hungary (see Fig. 35 below).
2. If a Danube flood occurred in Austria, most probably the same flood wave also reached Hungary. Differences can occur more on the level of magnitude and destructivity. This is also true vice versa: if a Danube flood event occurred in Hungary, there was quite a good chance for a flood event (of unknown magnitude) in Austria.

Floods and high flood-frequency periods in the two Danube databases

As we could see in the previous chapter, the flood peak of the 1330s-1350s (see Fig. 31 before), which is so pronounced in the Tisza catchment and in the medieval Hungarian flood

material in general, is not so marked in the known Austro-Hungarian Danube database. In general, as it appeared in the flood data of the 1330s-1350s, compared to the Tisza catchment the Danube catchment was not very active at that time.



34. Fig. Danube floods in Austria and Hungary: decadal distribution of individual flood reports (based on Rohr 2007a, b, and the present work)

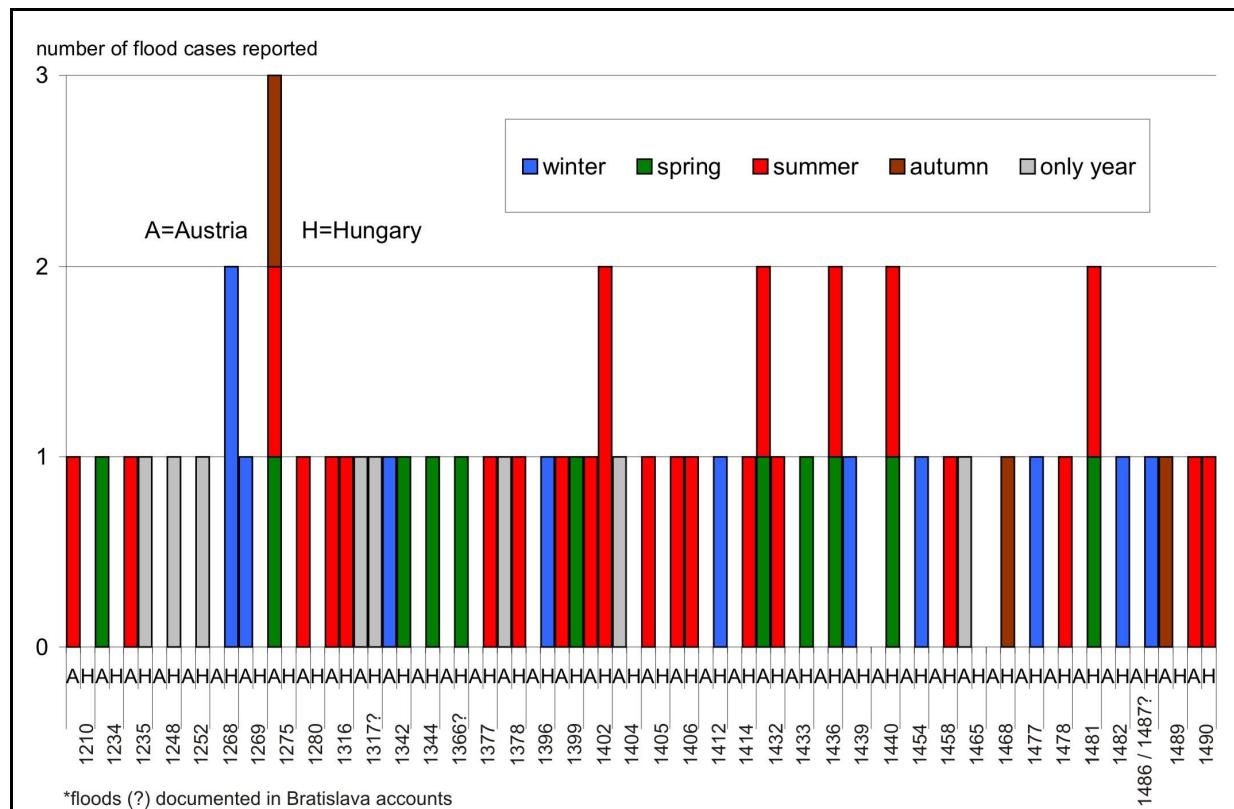
On the other hand, opposite was the case in the 1390s-1430s. It is also visible on *Fig. 34* that the early 15th-century Danube flood peak is more detectable at both the Austrian and the Hungarian Danube sections than in any other periods in the Middle Ages when Danube floods were documented. Based on some mentioned floods of the 1400s in Austria and with reference to the increased activity of some German rivers in the early 15th century, the larger number of Danube floods and the increased activity of the river at this period was blamed for major 15th-century hydromorphological/hydrological changes Žitný ostrov area.⁶⁶⁹

On the basis of the Austrian and Hungarian joint medieval Danube database (*Figs. 34, 35*) we can conclude that, according to our present knowledge, the turn of the 14th-15th centuries and in the first decades of the 15th century a clear peak of documented Danube floods occurred. This peak, however, appears in the direct flood evidence not only in the decade of the 1400s, but to some extent also in the 1390s. Moreover, in Hungary it is quite pronounced in the 1410s, but the 1430s have at least the same importance than the decade of the 1400s. Naturally, in case of the 1430s and the following decades, we already have to account with the fact that more evidence on Danube is available because of the information preserved in the Bratislava account books.

As we could see it earlier, almost all medieval Danube floods mentioned in the Austrian narratives are great ones. Caused by the different character of the Hungarian documentation (charters and accounts; see *Fig. 33*), floods without any specification on the magnitude are also mentioned in many cases (thus, less destructive floods may be as well included). However,

⁶⁶⁹ Pišút-Tímár 2009, p. 58.

almost half of the reported Danube floods in Hungary were great in magnitude; especially in the peak flood period of 1390s-1430 (*Fig. 32*).



35. Fig. Presently known medieval floods: Austria (Rohr 2007a,b) and Hungary (based on the present work)⁶⁷⁰

If not merely ongoing (individual) flood reports, but also information on consequences of preceding flood events are considered, then the picture changes a bit. For example, the reference of previous floods in 1393 might suggest that in case of the Danube not only the 1390s, but probably also years before (i.e. in the 1380s) there were higher intensity flood events.⁶⁷¹ Although no significant Danube flood event is yet known from the Carpathian Basin which occurred in the 1420s, the fact of a royal order in 1426 on possible Danube regulation and flood protection issues of the Žitný ostrov area,⁶⁷² urgently needed because of the great damages and threatening of flood events, suggests that – despite the lack of evidence – flood problems did not avoid the Danube area in this decade either.

Another very important charter concerning floods of the Danube is issued in 1439. In this case (preceding) floods and fluctuations of the Danube not only destroyed the bridge, but caused increased sedimentation, and carried on much wood and sand which, by 1439, obstructed the proper use of the waterway at Bratislava (see App. 3d). This last evidence was reported in the second richest decade richest in direct flood references (see *Fig. 29*, for Danube: *Fig. 34*).

Based on both the above-mentioned individual flood cases and the references on preceding flood events we can state that all decades of the second medieval flood peak,

⁶⁷⁰ Only the flood reports with an ongoing flood event were included here, in which cases it was possible to detect at least exact year and month of the observation.

⁶⁷¹ See Section 9.4.10.1.

⁶⁷² Section 9.5.3.6.

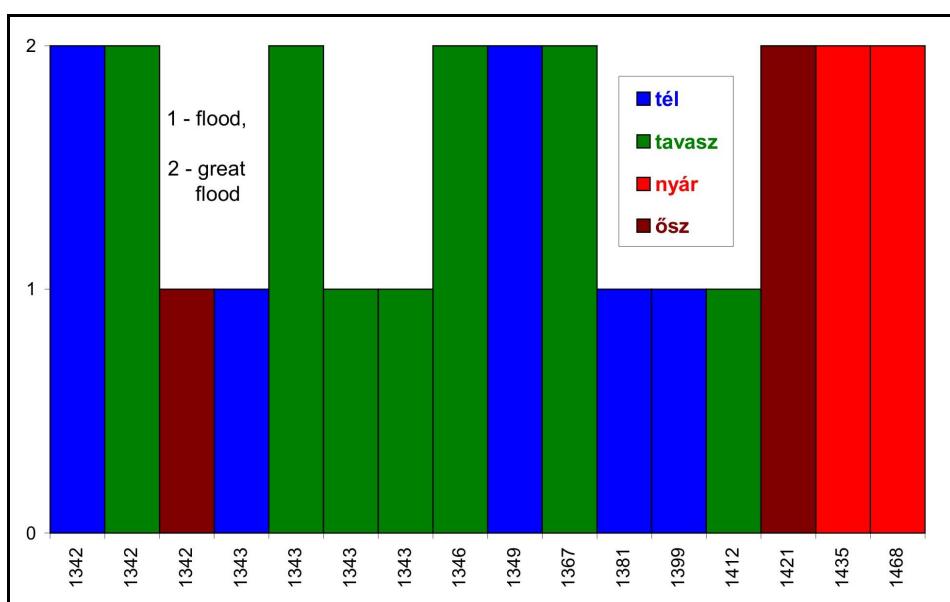
occurred in the Carpathian Basin, coincide with the main (early 15th-century) medieval high flood-frequency period of the Danube.

5.3.2 Floods of the Tisza river

Although at the moment only sixteen cases are listed clearly as Tisza floods, there is a high probability that a large number of other flood events of the Tisza catchment area (especially those reported close to the inundation area of the Tisza) might not merely occurred on some of the Tisza tributaries, but also on the main river itself. Most of the known Tisza floods are spring floods, but even two of other floods, listed in our present case as winter floods due to starting dates and possible origin, were in fact documented in the first days of spring (6 March 1342, 4 March 1381).⁶⁷³ The second most well-reported flood season is winter, with its five flood mentionings. Only two summer and two autumn floods can be directly connected to the Tisza river, despite the fact that the number of autumn floods reported in the Tisza catchment is relatively high.

Overall results show connections to modern data: based on the observations of the period 1950-1994 concerning the Upper-Tisza, floods in the second half of the 20th century occurred most frequently in the spring months (March: 16.8%, April: 15.8% and May 12.6% of the cases). The second most flood endangered 'season' was the three months of November (10.5%), December (12.6%) and January (10.5%).⁶⁷⁴

More than half of the known reported Tisza floods are marked as great ones: four of them are spring, two-two winter and summer, and one autumn floods, respectively. It is an important information since, as we could see earlier, – despite the great difference in the amount of the floods on the two rivers – the number of great flood events reported on the Tisza is not significantly less than those of the Danube.



36. Fig. Seasonal distribution of reported medieval Tisza floods (only 'clearly' Tisza floods are listed)⁶⁷⁵

⁶⁷³ Sections 9.4.5.2 and 9.4.9.1.

⁶⁷⁴ Konecsny 1999, p. 335.

⁶⁷⁵ Although information on a 3-scale level is provided in App. 3c, in the present case – similarly to the Danube – only 'simple' floods were separated from great flood events.

Clearly appears on *Fig. 36*, concerning Tisza floods one has to emphasise the importance of the years 1342, 1343 and 1399, when three, four and at least two of all Tisza floods occurred.⁶⁷⁶ Thus, in fact almost half of the known Tisza flood events come from the reports of three years! Three of the great Tisza floods occurred in 1342 and 1343, but more than half of all known great floods were still reported concerning the decade of the 1340s. Similarly, more than half of all known reported Tisza flood cases come from the 1340s.

Spatial distribution of reported Tisza floods show an even more distorted picture than that of the Danube: practically all Tisza floods are known from the upper and upper-middle sections of the river, which makes the present-day northeastern Hungary, northwestern Romania, and southwestern borders of Ukraine (SW-Transcarpathian region). So, unlike the Danube, in which case flood reports are relatively evenly distributed between the upper and the lower sections (even if middle sections are almost completely unrepresented), in the case of the Tisza there is practically no flood evidence available concerning the most of its middle section, and the entire lower section.

Nevertheless, it has to be noted that while floods of the Danube catchment play a somewhat marginal role compared to the number of Danube flood events, in case of the Tisza not only the number of floods of the river itself, but also the number of floods reported on its tributaries is significant. And once a significant tributary of the Tisza river was in flood, it could easily happen that not one but more tributaries were in flood, in which case – even if not directly reported – there could be an increased chance for a Tisza flood event, too. Thus, the considerably large number of floods reported on the Tisza tributaries might suggest that the real number of obstructing Tisza floods was (at least) comparable to that of the Danube.

⁶⁷⁶ See sections 9.4.5.2.3 and 9.4.10.3. The 1399 flood events on the Tisza river (number of events unknown) were reported to be particularly destructive.

5.4 Medium- and long-term information, and hydromorphological impacts reported

5.4.1 Medium- and long-term flood-related information

Besides the annual/seasonal or in many cases daily reports of individual, ongoing flood events, some of the records hold information of longer-term variabilities and changes in hydrological conditions, such as flood frequency or groundwater table. In this section an attempt is made to group the possible longer-term signs documented in the available (mainly) charter evidence. Concerning reference period, some of them may only refer to (several) months of increased water cover, but some of them may as well hold decadal or multi-decadal signal.

5.4.1.1 Frequent floods of preceding periods: a high-frequency sign?

In some cases the problems caused by frequent floods of waters in the previous period (of undefined length) and their (later) consequences are mentioned in the charters, without providing information when these destructive flood events occurred. Thus, only a *terminus ante quem* dating is possible, and usually no data is available on the number of flood events occurred. Even if in most of such cases it seems to be rather likely that a major flood event of the recent past induced problems, this situation was typical enough that inhabitants in many cases decided to change certain practices or to invest into changes in their circumstances (e.g. applied for their own parish church etc).

Year of report	Month, day of report	Problems caused by preceding or prevailing frequent floods	Section	Location	Waterflow (catchment)
1248*		land previously flooded (destroyed) by flood-water	9.3.3.2	Kračany area? (Žitný ostrov)	Danube
1252		land previously flooded by flood-water	9.3.3.3	Dvorníky (Žitný ostrov)	Danube
1309	9 April	problems with reaching the parish church	9.4.1	Horná Mičiná, Radvaň nad Hronom	Hron
1339	31 August	changed watercourse (previous floods)	9.4.4.5	Čoltovo, Bohuňovo	Halboka-pataka (Sajó)
1346	29 November	landmark taken by previous flood	9.4.5.5	Žitný ostrov	Danube
1349	14 September	change of riverbed	9.4.5.8	Orlov, L'ubotín	Poprad
ca. 1355	(1395)	landslide: the whole village disappeared together with church	9.4.6.1	Chminany	Svina (Hornád)
1358	24 February	problems with reaching the parish church	9.4.6.4	(Szarvad) Tăşnad	(Tăşnad–Ér / Tisza upper catchment)
1393	27 November	the island 'moved closer' to the other side (mainland)	9.4.10.1	(Püspöki)-Rusovce (Žitný ostrov)	Danube
1400	6 December	problems with reaching the parish church	9.4.10.4	(Bikal) Huedin (Transylvania)	Crișul Alba
1405**	17 March	increased sedimentation due to floods (natural/human?)	9.5.1.2	Sármelléke, Gerse	Sárvize
1413	24 August	landmarks destroyed were destroyed by preceding floods	9.5.2.3	Jenő (Baranya c., close to Mohács)	Danube
1416	13 June	main landmarks destroyed by a preceding great flood event	9.5.2.5	Šamorín (Žitný ostrov)	Danube
1416	11 November	landmarks destroyed by preceding great flood event	9.5.2.5	Blaj area (Transylvania)	Târnava Mare

1417	24 February	problems with reaching the legal centre of the county – frequent floods caused by much rainfall	9.5.2.6	Vaja (-Szatmárnémeti)	Szamos-Kraszna
1421	21 February	Flooded mines	9.5.3.1	(Smolník)	-
1421	10 August	caused by preceding flood event, river changed bed (debated land)	9.5.3.1	Sučány, Turany (Turóc c.)	Váh
1422	27 February	problems with reaching the parish church; or the village from the parish church on time	9.5.3.2	Vyšné/Ninžé Nemecké	Uh
1422	(1424)	mill previously destroyed by the vehement flux of the river	9.5.3.2	Lefantovce	Nitra
1424	27 October	land, subject to frequent floods (in upper valley position), is donated	9.5.3.4	area north of Lehnic	Dunajec
1426	16 September	landmarks destroyed by constant flooding	9.5.3.5	Mihályi, Kisfalud	Rába
1426	12 March	frequent destructive floods destroyed lands (also arable)	9.5.3.5	Šamorín area and Žitný ostrov	Danube
1439	11 July	increased sedimentation, woods in riverbed, broken bridge (pontoon?)	9.5.5.7	Bratislava	Danube
1473	31 August	road destroyed by frequent floods and snow	9.5.9.1	Turnu Roșu	Olt

6. Table *Previous (frequent) floods reported (* only a potential case; ** discluded from Fig. 28 (see below) due to possible (strong) human influence)*

Although there is a possibility of higher flood frequency around the late 1240s, it is not directly mentioned in the text. Nevertheless, problems caused by previous floods were as well mentioned concerning the first decade of the 14th century. Apart from this information, the reported higher flood-frequency cases were mentioned possibly already in the late 1330s, more clearly in the 1340s and 1350s (see App. 3d;⁶⁷⁷ based on Table 6). The most evidence is available at the moment concerning the period 1390s to 1430s, with special emphasis on the 1410s-1420s (in both main catchment areas). This is in good agreement with the flood peaks determined by individual flood events, described in more detail in the previous chapter. One additional item on the previous destructive flood events destroying main road in the southern Transylvanian Verestorony-pass (Turnu Roșu-Ro) can also be found for the early 1470s.

Naturally, due to the low number of evidence firm conclusions cannot be drawn, but it is interesting to mention that, at least in the 14th-15th centuries, we can follow some faint signs of a 40-50-year periodicity (see App. 3d). The only clear exception is the period of the 1390s to 1430s, when it seems as if problems caused by floods show a longer-term, multidecadal crisis-sign, unlike in the other cases, which seem to be more referring to some years or a decade, and with much less frequent reports.

Another significant point is spatial distribution of information according to main catchment areas. In this question again it is true that we cannot draw substantial general conclusions due to the low number of (probably randomly available) evidence, but still, it is interesting to note that when there is more than one mentioning of problems, this usually (even if always in the same time) appear in both main (Danube and Tisza) catchment areas.

⁶⁷⁷ On App. 3d the right, well-defined end of the blue stripe determines the year when the problem of preceding flood events were mentioned, while the other, faint left end of the blue stripe presents the uncertainty about the number of reference period when the preceding flood events occurred. In general, the preceding flood events presumably did not occur many years before, so at least one or two events it is reasonable to date for the preceding decade or so. Only in one case, namely the mentioning of mines under water, seemed to be reasonable (based on the Austrian parallel) to provide a significantly longer potential period when the water inbreak(s) might have occurred.

As a conclusion, one cannot surely say that such type of evidence clearly holds a longer-term high flood-frequency signal in all mentioned cases, in its natural scientific sense. However, the previous flood events that the reports referred to, are mentioned by human population as a (frequent or usual) source of problems, which seemed to be a constant problem enough to cause changes in human behaviour and general legal or economic practices.⁶⁷⁸

5.4.1.2 Long-lasting water cover; how long term is long-term?

Another group of sources do not even actively refer to flood events – either occurring in the present or the past –, but still holds such signs of water-level information, which probably more connected to long-term variabilities or differences between a past and the actual (wetland/waterlogged) environment. Naturally, in these cases we have to be very careful with general conclusions in detecting causes and consequences, since landscape management, human intervention might take a significant role in these processes. This group of evidence sometimes consists of some overlapping elements (and, of course, periods), but essentially it can be distinguished quite well from the previous group of 'caused-by-previous-frequent-floods' information. Therefore, in the following section those cases are counted where problems with water abundance, likely to be a longer-term problem (e.g. large part of a year, annual, decadal or possible multi-decadal), appeared (*Table 7*).

Year of report	Month, day of report	Long-lasting water cover or repeated inundation problems	Section	Location	Waterflow (catchment)
1248		land (for longer period) occupied by water	9.3.3.2	Kračany area?	Danube
1252		lands deteriorated (for longer period) by water	9.3.3.3	Dvorníky	Danube
1342	11 April	'multitudo aquarum' – abundance of waters	9.4.5.2	(Aranyan) Apatin area	Lower Danube
1342	3 May	Due to the large amount of water, lands are out of use (<i>paludes et terras inhabitabiles</i>)	9.4.5.2	Mezőladány	Tisza
1343	11 February, 2 April	flood and then great flood obstructed perambulation or even reaching the area	9.4.5.3	Endes	Tisza
1344*	9 October	(unhealthy) stagnant body of waters, waterlogged due to decline of management	9.4.5.4	Kalocsa area (Sárköz)	Danube
1342/ 1346	15 September/ before 3 May	repeated water-cover problems – flood and swappiness	9.4.5.2, 9.4.5.5	Vajszló-Hirics-Luzsok	(Drava)
1349	20 March	the area of the earlier chapel, with cemetery was too wet to build the new chapel there	9.4.5.8	Gemerská Panica	(Sajó)
1357	1 May/ 22 August	no perambulation either in spring or summer	9.4.6.3	Beregdaróc	Tibériás stream (Tisza)
1421	21 February	reopening flooded mines	9.5.3.1	Smolník	
1424	12 February	constant wetness ruined a chapel	9.5.3.4	Körösszeg	Sebes-Körös
1436	13 May/ 7 August	perambulation could take place in the same area neither in spring nor in summer	9.5.5.4	Felszékcső, Lak, Palipart	Danube

7. Table *Long-lasting water covers mentioned (*not a clear long-term groundwater-table change sign; floods were reported there in 1342 and 1344 – potentially showing multiannual problems)*

⁶⁷⁸ As we could see earlier (e.g. in chapter 3), for these changes often permissions of authorities were needed, and therefore remained in documented form in charters. That is to say, the time when the petition is made is roughly the time when people finally 'get fed up' with the situation (which is usually multi-reasonal, and not merely floods are responsible) and decide to (make efforts to) change. It is also important to mention that, when documented, petitions (after examination) were in all cases found to be reasonable and thus accepted, and the desired changes were allowed to be made.

These longer-term effects or signs can be grouped in the following way:

1. Months of flood problems; and during this period lands, normally under agricultural use, are out of use (and this fact clearly comes out of the text): 1248, 1342 (Tisza), 1342 (Danube)?, 1357, 1421.⁶⁷⁹
2. Even repeated perambulations were unsuccessful due to repeated flood events which caused constant or nearly-constant problems in reaching or using lands: 1343, 1342-1346, 1357, 1436.⁶⁸⁰
3. Water-cover (or higher groundwater-table) possibly caused long-term change in the utilisation of a certain land/area: 1248, 1252, 1338, 1349.⁶⁸¹
4. Other environmental problems, possibly combined by repeated high water-level problems cause increased wetness in an area: 1358, (1344).⁶⁸²

On the one hand, in the case of the first two groups we have information only concerning a problematic year or several months of (extraordinary) water cover. On the other hand, the last two (small) groups are clearly connected to multi-annual (decadal, multi-decadal) problems, and this is probably why human response also seeks for long-term solutions: for example, with building the new chapel not to the place of the old one,⁶⁸³ but to a drier area in 1349, or a separation and establishment of a new parish in 1358 (for related information, see: *App. 3d,f*).

5.4.2 Increased precipitation/flood events and their impacts on hydro/geomorphology

A very important and interesting, complex indicator of hydrological changes, both on short- and long-term, is the group of irreversible hydro- or geomorphological changes. In the following section the presently available cases are grouped and listed, and their causes and consequences described. Consequently, change of riverbed, signs of increased sedimentation and data on landslide are available concerning such periods which are showing higher flood frequencies – at least this is what seems to be the case based on the presently available database. As such, the most marked period is the 1330s-1350s, but data as well can be found for the 1390s-1430s (see *App. 3e*).

5.4.2.1 Precipitation, flood and landslide: mere coincidence or main reason(s) found?

A late 11th-century example of the fall of a loess wall?

Concerning the year 1092, the possible fall of a loess wall (a specific type of landslide) along the Danube in Hungary is described by the contemporary (Swiss) German author *Bernoldus monachus*. Even if he was not an eye-witness, the description contains elements which directly provide an description rather similar to how the fall of loess wall occurs in modern times. The fall of a loess wall requires specific pre-conditions, among others precipitation surplus of the preceding year and months in the broader area (Mezőföld), and the high water level of the Danube. Thus, it seems likely that *Bernoldus* described a specific type of landslide, occurred along the Danube in Hungary in the early 1090s. If we accept this theory, this data refers back to a wet year and months as well as to a high water-level occurrence of the Danube at its middle section.⁶⁸⁴

⁶⁷⁹ See sections 9.3.2.2, 9.4.5.2, 9.4.6.3 and 9.5.3.1.

⁶⁸⁰ Sections 9.4.5.3, 9.4.5.5, 9.4.6.3. and 9.5.5.4.

⁶⁸¹ Sections 9.3.2.2, 9.4.4.4 and 9.4.5.8.

⁶⁸² Section 9.4.5.4.

⁶⁸³ Where, actually, there was also a cemetery, accompanying the old chapel.

⁶⁸⁴ For detailed analysis and modern parallels, see Section 9.1.4.

When an entire village with parish church was swept away by floods: the mid-1350s

In terms of intensified precipitation events and the increase in the amount of precipitation resulting mass soil erosion clear, well-studied parallels can be found in German mountain areas.⁶⁸⁵ Nevertheless, landslides are as well mentioned in the 1340s in the eastern alpine region of Austria, and thus, in the neighbourhood of the Carpathian Basin.⁶⁸⁶ Some studies, related to historical land erosion, were as well published referring to the Carpathian Basin. Whereas, however, Stankoviansky suggested that mass erosion also occurred in the western Carpathians in historical periods,⁶⁸⁷ concerning the lower, more inner (but still hilly) parts of the Carpathian Basin up to now historical periods (of the last millennium) with more significant erosion patterns could not be detected by natural scientific research.⁶⁸⁸

The up to now only known documented case which, based on the destruction and changes occurred, seemed to be an example of mass erosion event was reported in 1395: around 1355 an entire village with its stone church was swept away. Its main cause was also mentioned: preceding great floods.⁶⁸⁹ The legal debate itself (provided earlier in detail), occurred in and around 1395, highlighted the fact that the floods not only washed away the village of Mohnya (Chminany-Sk) in Sáros county (in hilly area of former forest clearance) with its houses, but made it impossible for the inhabitants of the village (and the valley) to return. This later information suggests a mass erosion event with irreparable damages, also concerning soil (and vegetation) properties and basic morphological changes in the valley.⁶⁹⁰

5.4.2.2 Change in watercourse/riverbed, hydromorphological changes

Although landslides are probably the most obvious signs of changed/intensified precipitation (and flood) conditions (especially combined with preceding human activities e.g. forest clearance), other morphological, especially hydromorphological changes can as well refer back to floods or years/shorter periods of intensified river activity (i.e. flux, power, sediment carrying capacity, discharge). Such indicators (and hydromorphological consequences) of previous flood events can be, for example the cases when a waterflow – due to natural causes – changes its waterbed, or an increased sedimentation (due to floods) cause problems (for temporal distribution, see App. 3e).

⁶⁸⁵ See, for example, Bork et al. 1998.

⁶⁸⁶ See, for example, Rohr 2007a, pp. 183-190.

⁶⁸⁷ Stankoviansky 2003, pp. 89-107.

⁶⁸⁸ See, for example: Gábris et al. 2003, pp. 151-164. Szilassi et al. 2006, pp. 96-108.

⁶⁸⁹ See Section 9.4.6.1. As we could see it earlier, exceptionally high flood frequencies were witnessed in the 1340s (especially in 1342 and 1343). Even if most of the information refers to lowland areas, river catchments definitely had their water supply from the (northern) Carpathians. This wet tendency of the 1340s, at least on the level of great flood events, probably also continued in the 1350s. Thus, the 1350s is characterised by the relatively high number of documented great flood events. Moreover, most of these great floods occurred in the northern/northeastern mountain areas or on rivers coming from these areas (e.g. 1357, 1359).

⁶⁹⁰ In this case, we need to take into consideration further circumstances, mainly connected to landscape conditions and human activity: preceding and contemporary landscape management of the area, which information provides us with more evidence on what possible occurred with the village, the stone church and the valley around the mid-1350s. This montaneous area of the northern Carpathians was originally forested. Witnessed by, amongst others, topographic and settlement names (....vágása-H – meaning: clearing; *extirpationes* etc.) of the broader surroundings, in the later part of the high medieval period this was an area of forest clearings. Intensified effects of human impact (forest clearings) evidently had impact in this formerly forested area. The removal of original forest vegetation, and the possible agricultural use of the valley made soil (and thus, general morphological) conditions instable. These are important background conditions, but a preceding period with intensive (and also higher amount of) precipitations, combined with (the mentioned) flood events, were needed to result the complete disappearance of a village with its stone church.

Lands occupied by water – possible sign of change/alteration of riverbed?

In the Žitný ostrov area a land, flooded for a long while, was mentioned in 1248, then in 1249 and twice in 1252. In 1248 only the word '*occupata*' was mentioned, from 1249 already '*occupata et annullata*' appeared. This additional information, and also the later corroborations of the land exchange, may suggest that the water-cover was not just an occasional one, but became constant (or at least the land was out of use). Thus, due to the fact that seemingly an 'unrepairable' change occurred, it might have connection to a change of hydromorphology, and since the most possible location of the land is somewhere around the Kis-Duna (Malý Dunaj-Sk), there is a possibility that due to a flood event the river-branch changed its bed and swept away the land. Nevertheless, another possibility is that the the floodwater simply stayed in a lower-lying area with impermeable layer underneath (even for years or so).⁶⁹¹

Perhaps same kind of problems are mentioned some years later, in 1252 when lands were completely deteriorated by flood in Udvarnok (Dvorníky-Sk in the same Žitný ostrov area), in the close neighbourhood of the above-mentioned flooded lands.⁶⁹² In this case, the application of the word '*deteriorata*' similarly suggests longer term changes.

Complete change of riverbed?

In 1339 it is stated in two charters (event occurred before 31 August) that the stream called Halbokapataka (near to the Sajó river), at Csoltó and Leklenye landed possessions changed its watercourse due to natural reasons, namely due to previous floods.⁶⁹³

Some time before 5 July 1349 the Poprad river changed its bed in the area of Orlov and L'ubotín (Slovakia). Although in this case no flood event is mentioned, there is clear evidence for the fact the Poprad completely changed its course and instead of flowing between the two above-mentioned lands, the new course was located only in the second landed possession.⁶⁹⁴

Documented on 18 January 1411, due to the accumulation(s) of ice the Rába river (in Vas county) left its old riverbed (probably even before 1406) and during the field survey it was already flowing in the bed of the *Stremen/Yztrermen* river. In this case ice-jam(s) would have caused the complete change of the riverbed and the Raba river completely left its riverbed which therefore soon silted up.⁶⁹⁵ This information, however, was not proved by the legal authorities, and thus, we have no clear statement whether or not this event happened at all, or such an event happened in this way.

Another such case occurred on the Váh river before 10 August 1421, between Turany and Sučany (Slovakia) landed possessions. According to the description, before the flood event there was an island in the Váh river, which island belonged to the landed possession of Sučany. During the flood event the Váh left its riverbed and formed a new one afterwards. Since there was no watercourse at the original riverbed any more, Turany-people started to use the land of the former island. In this case there is a possibility that the Váh simply left one branch, and continued in the other branch and thus, only partly changed its bed.⁶⁹⁶

Change of main course (from one branch to another)

In 1347, in connection with a perambulation process, at Hídvég and Ónod neither land measurements nor estimations could be carried out due to the great flood event of the Sajó river. Still, in the charter, a rather detailed description about the current hydromorphological

⁶⁹¹ Section 9.3.2.2.

⁶⁹² Section 9.3.2.3.

⁶⁹³ Section 9.4.4.5.

⁶⁹⁴ Section 9.4.5.8.

⁶⁹⁵ Section 9.5.2.1.

⁶⁹⁶ Section 9.5.3.1.

conditions and circumstances can be found: due to the development of islands in its bed, the river changed its main course from one branch to another.⁶⁹⁷

Reported in November 1393, one of the many forested islands at the southwestern side of the Žitný ostrov area at the main branch of the Danube, 'moved closer' to the other, Rusovce side (mainland), due to previous flood events. This means that at least one branch of the Danube changed its bed here: either completely ceased to exist or stopped to be the main course of the river, but still existed as a less significant branch. In both cases it meant to be a clear change in riverbed hydromorphology.⁶⁹⁸

5.4.2.3 Increased sedimentation – caused by flood(s)?⁶⁹⁹

Change of main course – combined with the sign of increased sedimentation?

The Sajó river, acting in the past as a boundary between the two landed possessions of Ónod and Hídvég, in its current built two (alluvial) fans (*circulatio*) called *Zygeth* (island) from the side of Ónod, and thus, the main riverbed was in early 1347 already located in the area of Hídvég landed possession.⁷⁰⁰ This situation is more a general result of river-development and sedimentation, but the information itself appeared in connection to a flood event. It is interesting to note (especially because we are talking about the 1340s) that – although we do not know how long the alluvial fans developed – intensified sedimentation is usually the result of more intensive erosion and thus, increased flux of the river (e.g. due to higher high water/flood frequency). Especially, if we talk about the lower, slowest sections of the river (like in our present case) – see also the later 1439-case of the Danube.

Increased sedimentation – natural or human?

Due to the creation of a new mill-canal, by 1405 the Sárvize waterflow at Gerse and Sármelléke settlements, the main course of the Sárvize (West-Hungary) changed from the earlier to a new, artificial one.⁷⁰¹ Due to (continuous) floods, the riverbed silted up. Here we either face with the floods caused by the mill – in this case we talk about artificially induced increased sedimentation. However, if a higher flood frequency of natural origin occurred, this would show clear connection with increased sedimentation – in this case artificial management only increased problems, but the reason of changed sedimentation is partly natural and refers back to a higher frequency of natural flood events.⁷⁰²

Danube floods and increased sedimentation at Bratislava: the 1430s

Issued in 1439, the charter of King Albert contains precious information over the problems prevailed at the Pozsony Danube-section at that time. Due to the floods and (water-level) fluctuations of the Danube not only the bridge was damaged, but also the woods and sediments in the riverbed disturbed travel on the Danube.⁷⁰³ Beside the fact that on the Danube these problems still (generally) exist even today, we can get several information, and in this case also about the background and impacts of floods:

1. Before 1439 there were destructive floods and water-level fluctuations on the Danube (probably of high frequency)

⁶⁹⁷ Section 9.4.5.6.

⁶⁹⁸ Section 9.4.10.1.

⁶⁹⁹ For temporal distribution of events mentioned in this section, see App. 3e.

⁷⁰⁰ See the previous section and Section 9.4.5.6.

⁷⁰¹ Section 9.5.1.2.

⁷⁰² 1402, 1404 are years when major floods on the Danube occurred in Austria. See Rohr 2007a, p. 232.

⁷⁰³ Section 9.5.5.4.

2. These destructive events destroyed the bridge and caused sedimentation problems.

3. Increased sedimentation on the one hand surely means wood, partly maybe from the bridge, but most probably even more from the woods taken by the river in larger number, mainly from Austria (borderline). On the other hand, at this section of the Danube increased sedimentation means partly gravel, but mainly sand and sediments of fine components (clay fraction).

This later information definitely refers back to the generally increased flux and power/energy of the river concerning its capacity of carrying sediments. Thus, increase in the number of floods and that of the power of the river might have resulted the increased sedimentation at such slow sections as the one in the Bratislava-area. This case, rather well-explained in the charter, may also provide supporting evidence to the sedimentation problems, described in the case of the Sajó river, concerning the 1340s (see above).

5.5 Floods, climate and weather

Floods, especially if some background information is available, can provide us additional data on the prevailing weather conditions which resulted the flood event itself. Floods, their type, timing and characteristics of the waterflow and location can together refer to preceding precipitation surplus, and/or in some other cases to temperature conditions/variabilities. Moreover, high flood-frequency periods as well as flood events of exceptionally great magnitude might be connected to intensified atmospheric circulation patterns over Europe and the northern hemisphere.

5.5.1 Medieval floods as possible precipitation indicators

Among the climatic and weather parameters, precipitation (surplus) conditions are perhaps the easiest to connect to flood events. This is especially true on the short term, but to some extent can be as well applied for long-term conditions. This part of the flood analyses can be applied, partly as a direct, partly as an indirect indicator of monthly/seasonal precipitation surplus, at least referring to the actual parts of the Carpathian Basin. This means that the present analysis can be later used as an important additional set of information while providing precipitation indices (mainly concerning the late Middle Ages) of the Carpathian Basin.

In general, the greatest amount of evidence is available concerning winter. Moreover, winter floods are, under the climatic conditions of the study area, clear indicators of temperature and/or precipitation variabilities and extremes. While most of the autumn floods provide us rather obvious evidence on precipitation conditions (i.e. wet air masses from the Mediterraneum), spring and early summer are a bit more complex.

Especially great flood events are the cases when it is possible to draw some conclusions concerning preceding weather conditions. While we are in a somewhat easier situation with the floods occurred in the Tisza catchment since the water of the flood only and exclusively comes from Carpathian-Basin precipitation, water of Danube floods mainly comes from the precipitation occurred west of the Carpathian Basin. In this section attempts are made to collect some flood-related evidence which may be applied later as an additional precipitation indicator of detecting precipitation surplus of preceding weeks/months. As such, this is not a 'fixed' collection of events, rather a potential of flood-related sources raised for utilisation of further investigations (related to contemporary weather conditions).

5.5.1.1 Winter precipitation signal

Winters rich in precipitation in some cases can be characterised either by winter or early spring flood events. It is especially true in the case of floods of greater magnitude. In many cases spring floods are the results of complex development: flood coming from snowmelt accompanied by (surplus) water coming from winter or (early) spring rainfall. Nevertheless, in several cases it is possible to say with a high or moderately high probability that at least partly the winter rich in precipitation (and sudden melting) was responsible for a later flood event.

Year	Month, day of flood reported	Magnitude	Origin of flood	Section	Location	Waterflow (catchment)
1325	prior to 21 February	great		9.4.3.1	Vetiş, Vaja	Szamos
1334	mid-April	great		9.4.4.1	Tasol'a, Pavlovce nad Uhom	(Uh)
1335	29 March	extraordinary		9.4.4.2	Slemence	Latorica
1338	between 16 January and 8 March			9.4.4.4	Resighea	(Ér)
1338	25 February		great snow	9.4.4.4	Tročany area	(Topl'a, Krupinica rivers)
1342	9 February	great		9.4.5.2	Déta (Ónod area)	Hejő, Szinva, Ér (Sajó)
1342	6 March	great		9.4.5.2	Berkesz, Bodony	Tisza
1342	11 April			9.4.5.2	Aranyan (Apatin area)	Danube
1343	11 February			9.4.5.3	Endes	Tisza
1343	30 March-2 April	great		9.4.5.3	Gelénes	Tisza
1344	9 February	(floods)		9.4.5.4	Tibava-Jasenov area	(Uh)
1344	23 March	Great	(flood fast passing by)	9.4.5.4	Szeremle, Bátonostor	Danube
1347	22 February	great (in those areas)		9.4.5.6	Hídvég-Ónod area	Sajó
1349	13 January	great (in those areas)		9.4.5.8	Szamoskér-Bodolovo	Tisza-Szamos
1361	11 April	(watercover, mud)	(great snow)	9.4.7.1	Sarród-Pomogy	Fertő-Hanság (basin)
1367	13 January			9.4.7.3	Igrış, Cluj (Transylvania)	(Mureş and other rivers?)
1374	between early Dec. and 12 March			9.4.8.2	(unknown several places in the country)	unknown (also Danube cm.?)
1374	12 April	great		9.4.8.2	Nagymihály	Laborec
1381	4 March		(bad weather conditions)	9.4.9.1	Rozvág-Cigánd	Tisza-Bodrog
1396	16 February	(no travel possible)		9.4.10.2	Kračany-Esztergom	Danube
1396	23 February	(no travel possible)		9.4.10.2	Gabčíkovo-Győr	Danube
1396	23 February	great		9.4.10.2	Sväty Jur, Ohrady	Danube
1399	12 March	(great)		9.4.10.3	Szeremle, Bátonostor	Danube
1399	winter	(repeated, damaging)		9.4.10.3	Rof, Süly	Tisza
1412	between 21 January and 12 February	great		9.5.2.2	(Lokasziget), (Jazewren) Žitný ostrov area	Danube
1419?	4 April	(travel problems)		9.5.2.7	Baia Sprie – Vinogradiv	Someş, Sasar (?)
1433	11 April	greatest		9.5.5.1	Belgrade	Danube
1437	(mid/late winter)	great		9.5.5.5	N-Great Plain	(Tisza?)
1447	29 December			9.5.6.2	Mihalovce area	Laborec/Ondava
1454	1 January	(great)	(ice)	9.5.7.1	Bratislava	Danube
1476	(late January-early February)		(snowmelt)	9.5.9.2	Sabač	Sava
1481	prior to late March			9.5.10.1	Bratislava	Danube
1485			(ice jam)	9.5.10.3	Bratislava	Danube
1499	24 February		<i>ex impetu pluviarum</i>	9.5.11.4	Fakó Vozokany	(Hron)
1499	21 March	very great		9.5.11.4	Žabokreky, Rudno	Diviak(?)

8. Table Flood data probably holding some signals of winter precipitation conditions

The cases when quite probable evidence are available that at least part of the winter was rich in precipitation (see *Table 8*): 1325, 1335, 1338, 1342, 1343, 1347, 1349, 1361, 1367, 1374, 1381, 1396, 1399, 1433, 1440, 1437, 1447(December), 1453(December), 1476, 1485, 1499. Possibly also with winters rich in precipitation: 1334, 1344, 1412, 1419, 1481 (also due to additional information).

5.5.1.2 Any spring precipitation signal?

More difficult to decided in the case of spring (especially early spring) precipitation signals: in this case the flood caused by snowmelt after winters rich in precipitation can happen until May (especially on the Danube) or water may stay on the ground (especially if winter lasts long) and thus, spring does not necessarily have to be above average to 'produce' the same prolonged-flood cases.

Still in some cases, due to prevailing morphological and/or weather conditions (e.g. low elevations) of the catchment and late date of the flood report help us in identifying some relatively clear rich-precipitation cases with higher probability. Moreover, in many of the cases, even if snowmelt might casued a flood earlier, water could have stayed long because it had water supply also in spring (some parts of spring could be as well more rainy). In the present section the potentials and possible cases, maybe used in understanding some aspects of spring weather patterns in certain years, are listed.

Year	Month, day of report	Magnitude (and/or reason)	Section	Location	Waterflow (catchment)
1285	(spring)	(rainfall, thaw?)	9.3.7	Rimetea	(Arieş-Mureş)
1300	between 2-30 April	(<i>ex inundacione pluvialis</i>)	9.3.8.2	Korođ	Korođ, Vulka
1335	26 April		9.4.4.2	Pinkovce area	Ung
1342	25 April		9.4.5.2	Bešeňov, Lovce, Ohaj	Žitava
1342	5 May	multitudine aquarum	9.4.5.2	(Mező)Ladány	Tisza
1343	1 May	floods in plural	9.4.5.3	Solovka, Esen	Zomaua/Tisza
1343	8 May	(+several problems)	9.4.5.3	Kömlő	Tisza
1346	20 April	great	9.4.5.5	Poroszló, Megyer	Tisza
1346	3 May		9.4.5.5	Vajszló, Hirics, Luzsok	(Drava)
1357	1 May	great	9.4.6.3	Beregaróc	(Tibériás stream)
1367	1 May	great	9.4.6.3	Hosszúmező	(Tisza?)
1383	before 10 May	(prolonged rainfall)	9.4.9.2	Košice area	(Hornád?)
1396	28 April and days after		9.4.10.2	Tomašica (Slavonia)	Slyuch (Sava)
1399	1 May		9.4.10.3	Belcs-Kölesd-Kajdacs-Borjád	Sár
1410	6 April		9.5.1.6	Tápe, Vajta	Sió (and others)
1432	before 2 May	great	9.5.5.1	Lefantovce	Nitra river
1435	19 June		9.5.5.3	Tiszaeszlárváros, Tiszalök	Tisza
1436	13 May		9.5.5.4	Felszekcső, Lak, Paliport	Danube
1440	late May-early June	(rainy weather+torrential rain?)	9.5.5.8	Sopron(-Bratislava?)	(Ikva; Danube?)
1443	prior to 14 April	(torrential waters)	9.5.6.1	(Cseri castle)	(Timiș)
1494	April or May	(caused by prolonged rainfall)	9.5.11.1	Levoča area	(Hornád)
1495	prior to 11 April		9.5.11.2	Gyulavári area	Fehér-Körös
1495	28 May		9.5.11.2	Beudiu	(Someş)

9. Table *Probable flood-related signals of spring precipitation conditions*

Relatively clear cases for (early) springs with rich precipitation (*Table 9*): 1300, 1342(also winter), 1343(also winter), 1357(also winter?), 1367, 1383, 1432, 1443, 1440, 1494, 1495. Not sure, but quite probable cases: 1285 (and/or winter?), 1335 (and/or winter signal? – together with the other, 1335 case), 1346 (also winter?), 1396, 1399, 1410, 1436. Although the date is earlier than in the other cases, the 1410 flood event might be also connected to wet early spring (or winter meltwater stayed).

5.5.1.3 Increased (late spring-)summer precipitation causes flood event

Although not so much as winter, summer again provides a signal relatively 'easier' to detect. Summer floods can as well be a sign of late spring (especially of May precipitation) conditions. Nevertheless, in many (especially of late summer) cases we can say with rather high probability that at least parts (most probably the first part) of the summer were richer in precipitation than usual.

Year	Month, day of report	Magnitude (origin of flood)	Section	Location	Waterflow (catchment)
1051	(august)	(rainy summer)	9.1.3	W-Hungary	(Zala, Rába?)
1316	summer	(unusual rainfall)	9.4.2.1	Austria, Poland, Moravia and Hungary	(Danube)
1336	31 July		9.4.4.3	(Sárréte) Žitný ostrov	Danube
1342	15 September		9.4.5.2	Vajszló, Hirics, Luzsok	(Drava)
1343	13 July		9.4.5.3	Szentalbert-Gerencs	Sajó
1357	22 August	great	9.4.6.3	Beregdaróc	(Tibériás stream)
1372	2 July		9.4.8.1	Sárszabadi	Sár (Sárrét)
1377	8 July		9.4.8.3	Halász, Kalocsa area	Danube
1378	23 June		9.4.8.4	Csele, Szekcső	Danube
1402	29 June	great	9.5.1.1	Bavaria, Austria and Hungary	Danube
1402	27 June		9.5.1.1	Szeremle, Bátmonestora	Danube + others
1402	11 August		9.5.1.1	Kopács area	Rába
1406	between 1 July and 15 September		9.5.1.3	Žitný ostrov	Danube
1409	8 August		9.5.1.5	Dobuz-Ghertenmiş	(Pogoniş-Berzava)
1413	29 June		9.5.2.3	Mezőzombor area	Nymeghpataka (Tisza/Takta/Szerencs?)
1414	13 July and days around	great	9.5.2.4	Pentele, Szigetfő, Süld, Szalk	Danube
1421	20 September	very great	9.5.3.1	Tiszasüly, Kürt	Tisza
1422	prior to 1422		9.5.3.2	Lastovce	Ronva
1432	21 July	great	9.5.5.1	Bohemia, Moravia, Austria, Hungary	(Danube)
1435	19 June		9.5.5.3	Tiszalök, Tiszaeszlár	Tisza
1436	7 August		9.5.5.4	Felszekcső, Lak, Paliport	Danube
1454	9 August	(torrential rain)	9.5.7.1	(Kis)Várda	(Tisza)
1458	23 July		9.5.7.2	Partmadocs-Bölcse	Danube
1466	21 August	great	9.5.8.1	Ecség-Csudabala area	Körös(-Berettyó)
1478	prior to 2 September		9.5.9.3	Bratislava	Danube
1490	summer(?)		9.5.10.5	(Hungary)	Danube
1496	summer?	(wet conditions +torrential rain?)	9.5.11.3	Buda	(Danube)

10. Table *Probable flood-related signals of summer precipitation conditions*

Quite probable evidence that either the summer or at least part of the summer was rich in precipitation at least in some areas of the country (Carpathian Basin; *Table 10*): 1051, 1343, 1357, 1402 (probably also with May), 1409, 1413 (probably with May), 1435 (probably with May), 1440 (probably with May), 1466. Possible cases are: 1342, 1372, 1414, 1421, 1454. Less clear, but still quite possible cases: 1316, 1336, 1377, 1432, 1436 (partly remained from spring), 1458.

Clearly wet summer parts for the catchment areas west of the Carpathian Basin: 1051, 1316, 1342, 1377, 1402, 1406, 1414, 1432, 1440, 1458, 1490. Looking through *Table 10*, it seems rather clear that summer floods can be predominantly detected in the Danube catchment. Summer flood is much less frequent in the more continental Tisza catchment.

Moreover, due to the fact that summer floods are as well caused increased rainfall, in many of the cases the report on summer flood might be connected to rainier and cooler prevailing condition in late spring and (early, mid) summer. Since practically the same summer flood cases can be used, possible general temperature consequences are nor discussed separate.

5.5.1.4 Autumn precipitation?

If there was a clearly autumn flood event, then it is the easiest to provide the main reason, namely the sub-Mediterranean influence in the area. This is especially true in the southwestern and northeastern regions of the Carpathian Basin, namely in Slavonia (N-Croatia) and the Transcarpathian region (SW-Ukraine). In general, an autumn flood in Hungary is an important signal, because it clearly means Mediterranean influence and an (increased) activity of Mediterranean cyclones.

Year	Month, day of report	Magnitude (and origin of flood)	Section	Location	Waterflow (catchment)
1341	8 November		9.4.5.1	Chramec	Rima
1342	11 November	(bad weather conditions)	9.4.5.2	Maráza	Tisza + others
1343	6 October		9.4.5.3	Holmok, Rozivka	(Už)
1348	19 October		9.4.5.7	Dâmbău	Târnava Mică
1356	2 December	(<i>aquositas temporis</i>)	9.4.6.2	Krog	Mura
1356	7 December	great (in those areas)	9.4.6.2	Sislivci area	Noska (Už)
1359	22 November	great (great rains and fog)	9.4.6.5	Gölnicbánya, Torna, Idabánya, Mecenzév	(Bodva)
1374	15 October	Great	9.4.8.2	Mihalovce	Laborec
1399	5 December + following days		9.4.10.3	Garešnica area (Slavonia)	Lonja (Sava)
1411	13 October		9.5.2.1	Fülesd, Oroszi, Kölcsé	(Túr)
1421	20 September	very great	9.5.3.1	Tiszaüly, Kurt	Tisza
1421	12 October		9.5.3.1	Középnovaj area	Hernád/Tisza + others
1424	25 November		9.5.3.4	Výčapy-Opatovce	Nitra
1468	late October?	great (prolonged rainfall)	9.5.8.2	Hungary	main rivers
1480	(autumn)		9.5.9.4		Drava, Sava

11. Table Probable flood-related signals of autumn precipitation conditions

Quite probable evidence that either the whole autumn or at least part of the autumn was rich in precipitation at least in some areas of the country (Carpathian Basin; *Table 11*): 1341, 1342, 1348, 1356, 1359, 1374, 1424, 1399, 1468, 1480. Not sure, but still possible cases: 1343, 1411, 1421 (summer; but probably also autumn).

5.5.2 Medieval floods as possible indicators of temperature conditions/variations

Merely by the simple appearance of floods, the time and location of their occurrence can tell us a lot about not only the precipitation but also about the temperature conditions of the preceding period. In the case of temperature, ice flood as an indicator of cold winter conditions of the preceding weeks should be especially considered, due to the fact that an ice (jam) flood develops only after massive freezing in the Carpathian Basin.

5.5.2.1 Flood as a winter severity indicator

Concerning winter floods, ice and great speed/magnitude mentioned together are the most likely signals of preceding severe winter conditions. Although in most cases it is not possible to tell for sure that an ice flood occurred (which would be a clear and unambiguous sign of a severe winter), the speed and magnitude of flood event (sometimes also the consequences) make it very likely (see *Table 12*). From the viewpoint of winter temperatures it is important, since the development of an ice flood requires firm ice cover on the river, developing in winter temperatures lower than usual for some weeks of the preceding period. Since the ice pieces, carried by the river from its upper section, play an important role in the development of an ice jam, the information of an ice flood may refer back to the winter conditions of the upper catchment as well.

Year	Month, day of report	Magnitude	Origin of flood	Section	Location	Waterflow
1267 (or 1266)	late December (after Christmas)		(ice flood?)	9.3.5.1	Margit island (Budapest)	Danube
1268 (or 1267)	in mid-January	(great)	(ice flood?)	9.3.5.1	Margit island (Budapest)	Danube
1344	23 March	great + fast		9.4.5.4	Szeremle, Bátmonostor	Danube
1396	16 February	great		9.4.10.2	Kračany	Danube
1396	23 February	great		9.4.10.2	Vrakúň-Győr, Ohrady	Danube
1399	(winter)	destructive		9.4.10.3	Tiszarof, Tiszasüly	Tisza
1399	12 March	very great	(ice?)	9.4.10.3	Szeremle, Bátmonostor	Danube
1412	between 21 January and 12 February	great		9.5.2.2	(Lokasziget), (Jazewren) Žitný ostrov area	Danube
1440	early spring		ice(?)	9.5.5.8	Bratislava	Danube
1454	1 January	two-sided (great)	ice(?)	9.5.7.1	Bratislava	Danube
1476	late January		(melting of snow)	9.5.9.2	Sabač	Sava
1477	(winter)		(ice)	9.5.9.3	Bratislava	Danube
1482	(winter)		ice(?)	9.5.10.2	Bratislava	Danube
1485	(winter)		Ice (jam) flood	9.5.10.3	Bratislava	Danube
1496	winter/early spring	(great)	ice + great accumulation of waters	9.5.11.3	Jibou (Transylvania)	Szamos/ Someş + streams

12. Table Late medieval floods indicating severe winter conditions

Due to the locations and positions of the (main) rivers in the Carpathian Basin, on the Tisza less, while on the Danube the occurrence of an ice flood is much more likely. Nevertheless, in the Tisza catchment there is even more possibility for an ice flood on the tributaries predominantly flowing from east to west. This is due to the fact that rapid melting

causes sudden flash of meltwater coming from the (not too high) mountains of the eastern parts of the Carpathians, while firm ice cover at the lowland might react for melting a bit slower (e.g. in 1783 December on the Maros river).⁷⁰⁴ Whereas most of the floods, likely to be connected to severe winter conditions developed on the Danube (e.g. 1267, 1268, 1344, 1399, 1412, 1440, 1454, 1482, 1485), a smaller group can be connected to the Tisza catchment (e.g. 1399, 1496).

5.5.2.2 The occurrence of winter mild spells

Winter mild air masses, either arriving from the west or from the south-southwest (especially with rainfall), can often cause floods. While all ice-floods are, among other circumstances, caused by the arrival of mild (and often wet) air masses from the west, there are several other cases when no ice flood occurred (or remained unreported), but still, floods caused by (rapid) snowmelt did occur. Thus, whereas all cases of the previous section are included in this section, much more evidence belongs to this second group. Moreover, winter months with mild spells, causing floods, often happen during severe winters.

Month	Year	Month, day of event	Magnitude	Section	Location	Waterflow (catchment)
December	1267 (or 1266)	short after Christmas	(great)	9.3.5.1	Margit island (Budapest)	Danube
	1446	29 December		9.5.6.2	Mihalovce area	Laborec, Ondava
	1453	1 January 1454	two-sided (great)	9.5.7.1	Bratislava	Danube
January	1268 (or 1267)	mid-January	(great)	9.3.5.1	Margit island (Budapest)	Danube
	1349	13 January	great (in those areas)	9.4.5.8	Szamoskér-Bodolovo area	Tisza-Szamos
	1412	between 21 January and 12 February	great	9.5.2.2	Rhová Hradská, Ohrady, Topol'níky, Dolný/Horný Štál	Danube
	1416	20 January	(flood of waters)	9.5.2.5	Mala Dobron	Latorica + others
	1476	late January		9.5.9.2	Sabač	Sava
February	1338	25 February	(much water + snow)	9.4.4.4	Tročany area	(Topl'ou, Koprovnica)
	1338	before 25 February		9.4.4.4	Resighea	(Ér)
	1342	9 February	great	9.4.5.2	(Déta) Ónod area	Hejő, Szinva, Ér
	1343	11 February		9.4.5.3	Endes	Tisza
	1344	9 February	(floods)	9.4.5.4	Tibava, Vel'ké/ Blatné Revišťia, Zalužice, Jasenov	waters of Vihorlat mountains (Uh/Už)
	1347	22 February	great (in those areas)	9.4.5.6	Hídvég-Ónod	Sajó
	1396	16 February		9.4.10.2	Kračany	Danube
	1396	23 February	great	9.4.10.2	Vrakúň-Györ, Ohrady	Danube
	1482	before 23 February		9.5.10.2	Bratislava	Danube
Winter	1499	24 February	(<i>ex impetu pluviarum</i>)	9.5.11.4	Fakó Vozokany	(Hron)
	1399	winter floods	(destructive)	9.4.10.3	Tiszaroff, Tiszastüly	Tisza

13. Table Late medieval floods indicating occurrences of winter mild spells

Most of the winter-flood cases related to mild spells, reported are connected to February, while January is on the second, and December is on the third place (see Table 13).

⁷⁰⁴ See Kiss et al. 2006, pp. 353-362.

This generally agrees with 'usual' climatological processes, namely that mild spells with floods are most likely to occur closer to the end of the winter, and less in December when the amount of solid precipitation is often not yet enough for flood supplied by melted snow.

No analysis of summer and autumn temperature is presented here. Cooler summers are often related to prevailing wet conditions and thus, summer floods may refer to cooler conditions based on the same database as to possible precipitation surplus. On the other hand, autumn is probably the most difficult season to work with, at least concerning temperature, and only very weak conclusions could be drawn in few cases, again based on the same flood database.

5.6 'People and Nature' – Floods, consequences and attitudes

In most of the sources listed in the Catalogue of flood events (chapter 9) we could meet up with evidence in which people had the practical-general attitude towards floods: flood was basically part of everyday life. Maybe a bit of an 'annoying thing' which made life a bit more complicated – and nothing really more appears: neither in charters nor in contemporary domestic economic or narrative evidence. There are only some exceptional cases when, in fact, we can have a somewhat more complicated picture: these are the very few sources in which flood appears as a phenomenon due to some sort of divine intervention. In those cases, on the one hand it means God's support, on the other hand flood can appear as God's approaching punishment and thus, the meaning, so popular in western medieval description, of an Apocalyptic sign also appeared in Hungary.

5.6.1 Floods: good and bad sides

5.6.1.1 When flood is normal and/or good/useful

In its spiritual sense:

1. In Margit's canonisation trial (1276) the provost of Esztergom mentioned flood as a usual event, occurring in April every year: thus, flood is a normal phenomenon.⁷⁰⁵
2. In the same canonisation trial Margit and other nuns claimed that God sent flood as a proof of the chosen one: thus, flood is a holy, 'good thing'.
3. Similarly, concerning 1490 Bonfini mentioned flood protecting the country against the Turks after the death of King Matthias. Thus, the (animated) river protected the country: flood is protective.⁷⁰⁶

In its practical sense:

4. Floodplain management: the hydrological management term 'fok' (chiefly connected to fishery) clearly can only work when floodwaters reach the inundation area, but especially the fishponds (e.g. Fertő: 1434-1435, Tisza: 1469?): flood provides profit (from fishing).⁷⁰⁷
5. Meadows/pastures along the river: living together with the annual flood circle, when flood fertilises the meadow, but should be protected while wet (e.g. 1423).⁷⁰⁸
6. Flood is a normal, usual phenomenon in the case of a river; however, with bad human intervention (damming+ mills) this neutral event can be harmful (see later): flood is a normal, usual matter (e.g. 1454, 1495).⁷⁰⁹
7. Crossing the river (and the inundation area) during floods: provides extra-profit to the owner of the ferry (e.g. 1399).⁷¹⁰

⁷⁰⁵ See Section 9.3.4.1. Even if he actually did not really believe Margit (at least according to the nuns) that the flood event at the Margit Island had occurred so fast (e.g. he got used to slower floods and this rapid rise of water level, presumably caused by ice flood, sounded unusual for him).

⁷⁰⁶ Section 9.5.10.

⁷⁰⁷ Sections 9.5.5.2 and 5.5.8.3. See also Kiss-Piti 2005.

⁷⁰⁸ See, for example: 1423, 2-6 April: Ipolyság/Šahi: Korpona/Krupinica folyó – Section 9.5.3.3.

⁷⁰⁹ Sections 9.5.7.1 and 9.5.11.2.

⁷¹⁰ See, for example, Section 9.4.10.3. However, it has to be mentioned that this case – mentioned in general – very frequently appears in charters more generally discussing the (regulations over the) incomes of ferries and toll places.

5.6.1.2 Negative effects of floods documented

Coming from the nature of Hungarian documentary evidence, not many aspects were documented, and especially not the same types as in the western, mainly narrative-based documentary evidence. Not or very rarely reported in Hungarian documentary evidence: losses of human life, financial/economic consequences of greater magnitude. Nevertheless, in many cases some information on damages or further (negative) impacts on local community or the broader society can be detected. Some of the most important, destructive types are provided on graph (see App. 3f).

Flood obstructs legal procedures and official/private travel (less financial or more technical)

1. The most frequent and simplest case documented, when the *in situ* legal process disturbed due to flood in the area (so they could not reach lands covered by water): one part or the entire in-field legal procedure had to be repeated/launched again (money, energy, time, parchment-increased paperwork; e.g. 1458)⁷¹¹
2. Court hearing or trial were postponed, since travel was obstructed or delayed by flood(s):
 - a. can be a single event: someone(s) cannot come, and therefore others had to wait – usually in this case the whole legal trial/procedure had to be postponed: for example perambulation (1343)⁷¹² or an actual court hearing/trial (e.g. 1396)⁷¹³
 - b. or series of events with further consequences (e.g. resulting ecclesiastical and/or administrative changes) – can be connected to preceding period with higher flood-frequencies (e.g. 1417).⁷¹⁴
3. Flood obstructed the use of waterways (directly mentioned as a problem): in this case specifically the use of rivers for travel (both crossing and shipping) was mentioned (e.g. 1432, 1439).⁷¹⁵ This his can also refer to private travels as well (e.g. family or friends' meeting wer obstructed by floods (e.g. 1419?).⁷¹⁶
4. Great flood obstructed (Bratislava) town delegates to take part of the parliament meeting (in Buda) in winter 1453/1454.⁷¹⁷
5. Flood destroyed landmarks, which had to be later resettled (and thus, new perambulations to be launched; e.g. 1413, 1416, 1426).⁷¹⁸

Floods with (greater) negative financial/human consequences: material/economic damages

1. Floods caused life danger reported: documented in her canonisation trial (1276), Margit warned the provost's attention to the high flood-risk of the nunnery and the island due to which fact they had been in (constant) life danger there.
2. Greater short-term material damages in the built-up environment (e.g. 1496):⁷¹⁹
 - a. flood swept away entire villages – except for one known domestic case (around 1355),⁷²⁰ only appeared in western narratives (e.g. 1316)⁷²¹
 - b. castle destroyed by waters (e.g. Cseri castle: 1443)⁷²²

⁷¹¹ See, for example, Section 9.5.7.2.

⁷¹² Section 9.4.5.3.

⁷¹³ Section 9.4.10.2.

⁷¹⁴ Section 9.5.2.6.

⁷¹⁵ Sections 9.5.5.1 and 9.5.5.4.

⁷¹⁶ Section 9.5.2.7.

⁷¹⁷ Section 9.5.7.1.

⁷¹⁸ Sections 9.5.2.3, 9.5.2.5 and 9.5.3.5.

⁷¹⁹ Section 9.5.11.3.

⁷²⁰ Section 9.4.6.1.

⁷²¹ Section 9.4.2.1.

- c. floodwater inundated a cellar in 1440⁷²³
 - d. flood destroyed bridge (e.g. 1439, 1440, 1485)⁷²⁴
 - e. flood broke destroyed a mill (e.g. 1338, 1422).⁷²⁵
3. Significant material damage (with financial consequences) on waterways:
- a. flood destroyed bridge and thus, obstructed salt transport (sometimes with long-lasting consequences – see later; e.g. 1496)⁷²⁶
 - b. obstructs waterways with sediments (and wood; e.g. 1439)⁷²⁷
 - c. direct information on floods destroyed ferry and roads (e.g. 1399 winter).⁷²⁸
6. Greater (immediate) agricultural damages (lands+animals):
- a. floodwater occupied lands and thus, lands became temporarily out of use (e.g. 1252)⁷²⁹
 - b. flood took harvest away / destroyed harvest (e.g. 1468)⁷³⁰
 - c. meadows flooded/destroyed, typically caused by torrential rain and their consequences (flash floods and/or inland excess waters; e.g. 1454)⁷³¹
 - d. the strong flux of the Körös river (usually occurs during high water level or flood) swept away cows (part of the herd; e.g. 1500)⁷³²
 - e. flood destroyed fishpond (e.g. 1495, 1499).⁷³³
7. Floods induced long-term economic consequences (usually combined with other problems):
- a. land completely deteriorated and annihilated by water: either by floodwater stayed at the land (e.g. 1248), floods swept away lands (possibly with soil; 1248, ca. 1355)⁷³⁴
 - b. flood obstructed salt transport (combined with plague), causing great problems in the country due to the basic importance of regular salt supply (mainly coming from Transylvania: resulted a decline of salt transport (e.g. 1440)⁷³⁵
 - c. series of flood events resulted hydromorphological changes causing long-term problems (1439)⁷³⁶
 - d. mining is stopped for years or decades (or forever) due to inbreaking waters (1421).⁷³⁷

Human misuse/mismanagement causes harm during (natural) flood event

1. Flood as a normal case (without human intervention) would not cause problems, but together with mismanagement, for example, artificial riverbed with mill-canal, diverted

⁷²² Section 9.5.6.1.

⁷²³ Section 9.5.5.5.

⁷²⁴ Sections 9.5.5.4-5, 9.5.10.3.

⁷²⁵ Sections 9.4.4.4 and 9.5.3.2.

⁷²⁶ Section 9.5.11.3.

⁷²⁷ Section 9.5.5.4: previous Danube floods destroyed the bridge and made travel/transport on the Danube, due to sunken wood and increased sediments, difficult.

⁷²⁸ Section 9.4.10.3.

⁷²⁹ Section 9.3.3.1.

⁷³⁰ Section 9.5.8.2.

⁷³¹ Section 9.5.7.1.

⁷³² Section 9.5.11.5.

⁷³³ Sections 9.5.11.2 and 9.5.11.4.

⁷³⁴ Sections 9.3.2.2 and 9.4.6.1.

⁷³⁵ Section 9.5.5.5.

⁷³⁶ Section 9.5.5.4.

⁷³⁷ Although the years of these flooding problems might be a sign of surplus water in general, in the 15th century (and later), such problems could be more and more frequent also due to the fact that mining reached deeper and deeper layers. For the (first) documented example known, see: Section 9.5.3.1.

- water from the original riverbed, caused the decrease of the natural riverbed (e.g. 1405).⁷³⁸
2. Fish swam away from the fishpond (and/or fish were taken from the broken fishpond; e.g. 1434, 1495, 1499).⁷³⁹
 3. Fok-s (temporary waterflows leading water from the river to the floodplain) were closed down by the neighbours which resulted that no floodwater could fill up the fishponds in the floodplain (e.g. 1469).⁷⁴⁰
 4. During the flood event badly/mismanaged mill-dams got broken or too high dams caused large inundation, which destroyed fields of the neighbours (e.g. 1454, 1495).⁷⁴¹
 5. Without permission, animals were sent to the meadow which was at that time wet and muddy because of the flood of the river, and with this the meadow was destroyed (e.g. 1423).⁷⁴²

Obstructive flood events and human dwelling: which parts of lands were flooded?

As we could see it earlier, the *locus sessionalis* was the central part of the average unit of a serf's land. Apart from the arable land, the *locus sessionalis*, where the people actually lived, was usually located in an area less (or least) exposed/prone to flood events or other risks. Thus, those cases when proofs are available that *loca sessionalia* were affected by flood event(s) have special importance.

Up to now, two clear cases are known when the housing area of a village was primarily affected by a flood event, which caused the partial or complete desertion of the actual place of a village:

1. a complete village was deserted (in fact, moved to another place): around the mid-1350s, the village of Mohnya was destroyed by floods and village people moved to another (higher) location.⁷⁴³
2. one part of a village was deserted because of flood(s): eight loca sessionalia, half of Tiszaeszlár village, were reported to be deserted along the Tisza river in 1435.⁷⁴⁴

Other, 'tentative' cases when housing areas must have been affected:

3. 1267/1268: the probable ice (jam) flood(s) affected the whole monastery bulding complex on the Margit island (Danube; Budapest).
4. the icy flood of the Danube at the turn of 1453 and 1454 clearly affected both sides of the Danube at around the Bratislava-area (two-sided) which means that not only the lower, but the higher elevation banks (housing areas) were as well affected to some extent.

5.6.1.3 Floods, problems, solutions: classifying practical human response documented

1. Caused by flood-destruction, village inhabitants moved to another, more protected place (mound) to settle their village (e.g. 1495),⁷⁴⁵ or the archbishop (because of general water-problems) change the location of his seat (e.g. 1344).⁷⁴⁶

⁷³⁸ Section 9.5.1.2.

⁷³⁹ Sections 9.5.5.2, 9.5.11.2 and 9.5.11.4.

⁷⁴⁰ Section 9.5.8.3.

⁷⁴¹ Sections 9.5.7.1 and 9.5.11.2.

⁷⁴² Section 9.5.3.3.

⁷⁴³ Section 9.4.6.1.

⁷⁴⁴ Section 9.5.5.3.

⁷⁴⁵ Section 9.5.11.2.

⁷⁴⁶ Section 9.4.5.4.

2. New, separate parishes, parish churches and chapels were settled, some villages became ecclesiastically independent from other villages or towns (e.g. 1309, 1349, 1422).⁷⁴⁷
3. Legal/administrative status (affiliation) of a settlement is changed because flood obstructed travel too much towards the legal centre of the county (e.g. 1417).⁷⁴⁸
4. Floods sometimes cause or acted as a catalyst of hydrological, hydromorphological changes (e.g. natural change/alteration of riverbed), which might cause more legal debates over the lands with waterflow/riverbed as boundary (e.g. 1347, 1349, 1411, 1421, 1439).⁷⁴⁹
5. Ferry place had to be changed because floods destroyed ferry place and road (e.g. 1399).⁷⁵⁰
6. Some legal debates are postponed due to flood to winter time: longer-term water cover may cause more winter perambulation/measurements (e.g. 1402).⁷⁵¹
7. If a land becomes waterlogged, sometimes it was possible to exchange for a non-waterlogged one (e.g. 1248).⁷⁵²
8. New chapel placed at another location due to constant wetness of the old chapel area (e.g. 1349).⁷⁵³

We cannot yet define the significance of these events (e.g. how many settlements were affected, magnitude of changes concerning larger areas etc. – and anyway, social and economic changes are multi-reasonal). For example, based on the present information available, we cannot write such movements as the process of settlement-desertation on the expense of increase in the number of (destructive) flood events or (long-term) increase in general groundwater-table. It is because essentially these processes are multi-reasonal, but also because we have no direct information yet to connect these processes (even not as one reason). So, apart from stating the probability that there was an increase in certain periods in the frequency of (destructive) flood events, and it might have some connection with social and economic processes, we cannot really say more.

5.6.2 Attitudes towards flood events: 13th-15th century examples

Whereas in some other parts of Europe great amount of information is available on the perception of floods and attitudes towards flood events, in Hungary relatively little can be found in contemporary sources concerning this question. This evidence in Hungary is mainly available in non-legal contemporary evidence, namely in the documentation of a canonisation trial, a poem, as well as in narrative sources such as legends and a chronicle.

5.6.2.1 When flood is (not) due to divine intervention: God and flood in a 13th-century canonisation trial⁷⁵⁴

Due to the type of sources which are mainly connected to practical every day life and less to high spiritual and intellectual matters, only in very few cases we can trace information about spiritual 'connotations' to a flood event. There are two examples, however, which provide

⁷⁴⁷ Sections 9.4.1.1, 9.4.5.8 and 9.5.3.2.

⁷⁴⁸ Section 9.5.2.6.

⁷⁴⁹ Sections 9.5.2.1, 9.5.3.1 and 9.5.5.4.

⁷⁵⁰ Section 9.4.10.3.

⁷⁵¹ Section 9.5.1.1.

⁷⁵² Section 9.3.2.2.

⁷⁵³ Section 9.4.5.8.

⁷⁵⁴ For detailed information on the flood-testimonies, see Section 9.3.4.1.

rather detailed information about the side of possibly spiritual connections appearing in medieval thinking. Similar to the rest of the Middle Ages, concerning the Danube almost exclusively the practical side appears due to source types: legal processes and economic evidence. We can learn more about mentality and spirituality from princess Margit's canonisation trial and legends. Margit's flood 'miracule' gained special interest and has central position both in the canonisation trial and in the most reliable, oldest legends.

The monastery was originally settled at its place on the Rabbit island (today Margit island in Budapest) due to defence reasons: this area was designed approximately 10 years after the Mongol invasion, chiefly for the royal family, and the monastery itself was ordered to be built by the King for princess Margit (and others). Either Mongols seemed to be a greater danger at that time or the frequency of destructive (ice-)flood events increased by the late 1260s (or both).

What can we learn about the attitude of Margit and the sisters of the same friary towards flood environment?

1. Margit is originally the thanksgiving 'sacrifice' of the royal family for God – for the fact that the royal family and the country (at least partly) survived the great invasion of the Tatars in 1241-1242, during which time the princess was born, and two of her sisters died (this is not an environmental information, but a very important, basic information. Margit is the 'chosen one' – whose life is sacrificed to God).
2. Margit has a rather practical opinion towards the (first, sudden) flood event, water environment and flood events on the island in general: she attracts the provost's attention towards the danger, caused by nature. Warns to the 'magnitude and frequency' of the natural phenomenon/hazard, by which the nuns (thus, also she herself) are endangered – without any special connotations.
3. Thus, the first flood was natural and nobody connected any supernatural to that: i.e. nobody took it as a 'sign'. Only in its practical sense: the island is rather flood-endangered, and both the monastery and people in the monastery are in constant danger of a destructive flood event.
4. Unlike the first one, the second flood event is ordered and made by God and thus, completely supernatural. While in the first case nature is going on its own way, in the second case God's role is to support Margit, in order to prove her truth concerning the reality of the danger, and to warn attention to the fact that Margit should be trusted because she is especially favoured by God.

Interesting to mention is that in the (great) Garinus legend the author already directly used the flood to prove as if God made the flood(s) in order to give the greatest 'publicity' to Margit's sainthood.⁷⁵⁵

5. Nuns share Margit's practical opinion about the nature and understanding of the first flood event and flood events in general. Flood is part of nature and everyday life. Natural 'things' anyway happen, but God can direct it if his favoured (Margit 'the saint') asks for. Similarly, the second flood is entirely supernatural, and as soon as it occurs it disappears.
6. The more practical provost (Margit's confessor), however, seemingly keeps in his mind even the second flood event as a (partly) nature-related phenomenon: 'when floods usually occur, namely in April'.⁷⁵⁶ But, due to practical reasons – namely sudden occurrence, and exactly 'on time' (in fact it was January) – he clearly accepts the supernatural origin of the second flood event. Nevertheless, unlike the nuns who simply think and talk about the supernatural (thus, 'unnatural') origin, the provost more declares

⁷⁵⁵ Deák 2005, p. 355.

⁷⁵⁶ In the greater, Garinus legend already end of May is mentioned. See: Deák 2005, p. 355.

that this second flood event (similar to the first one) is also in accordance with nature, even if God intervenes.

As a conclusion, while the 'girls' proved the second flood as coming completely from 'outside' and being 'unnatural', the 'man', namely the provost did not. He, unlike the nuns, most probably had – due to his office, the nature and obligations of a Dominican provost – usually quite daily contact with everyday/lay matters, and treated God's intervention as part of the flow of natural matters: it is 'supernatural', but not 'unnatural'.

Why all these points are important for us? Because it warns us for the fact that, merely based on the words given into Margit's mouth and based on the nuns' confessions, we cannot (over)generalise a high medieval 'image' of flood. In our case, although based on only one counter-example (the provost), it still seems likely that the somewhat different (but important) opinions might come from differences in everyday environments, life experiences or even differences in gender('s logic, nature).⁷⁵⁷

5.6.2.2 Apocalyptic vision and animated rivers: humanists' attitudes towards flood

The realistic nature of medieval Hungarian source evidence?

In the 14th and early 15th centuries, due to source types – while dealing with floods – again a practical attitude can be traced. 14th century floods are almost entirely represented in charters, but even those few narratives (Austrian and domestic) only mention floods due to their destruction, without having any sort of 'connotations' to it. Even if a variety of source types is available in the first half and middle of the 15th century, but especially from the 1430s onwards, charters, letters, account books (e.g. Pozsony/Bratislava), memoires and diaries (e.g. Kottaner, Broquière—as a foreigner) provide only a rather lively and truly practical view of flood events (e.g. without mentioning divine intercourse). Flood, even a larger flood is a natural uncertainty, but an 'usual' phenomenon which is by no means treated in these sources as any sort of punishment.

Domestic (and foreign referring to Hungary) documentary evidence (e.g. charters, narratives, economic evidence, letters) continue on with a practical view towards natural disasters (and thus, flood events): events which happen and pass away, or events which help or obstruct certain political events (see e.g. Thuróczy, the Dubnic chronicle, Bonfini). In this sense, some of the Italian humanists, writing about Hungary, also follow this tradition or fashion (e.g. main emphasis on political events, wars and victory and much less on everyday life or supernatural phenomena). In general, natural disasters play marginal role in domestic narratives; however, a clear tendency can be traced towards documenting some events which had effects on a more regional and less on local level (e.g. locust invasions in Dubnic chronicle).

The 'flood of the world' apocalyptic vision: Janus Pannonius' flood poem

In contrast, a different opinion also appears in high-intellectual, humanistic writings from the mid-15th century onwards: from this viewpoint, the poems of Janus Pannonius play an important role.⁷⁵⁸ This is the only domestic medieval source evidence which clearly connects a contemporary flood event to the Biblical seven signs, rather frequently referred in Europe west to us, in connection with flood events.⁷⁵⁹

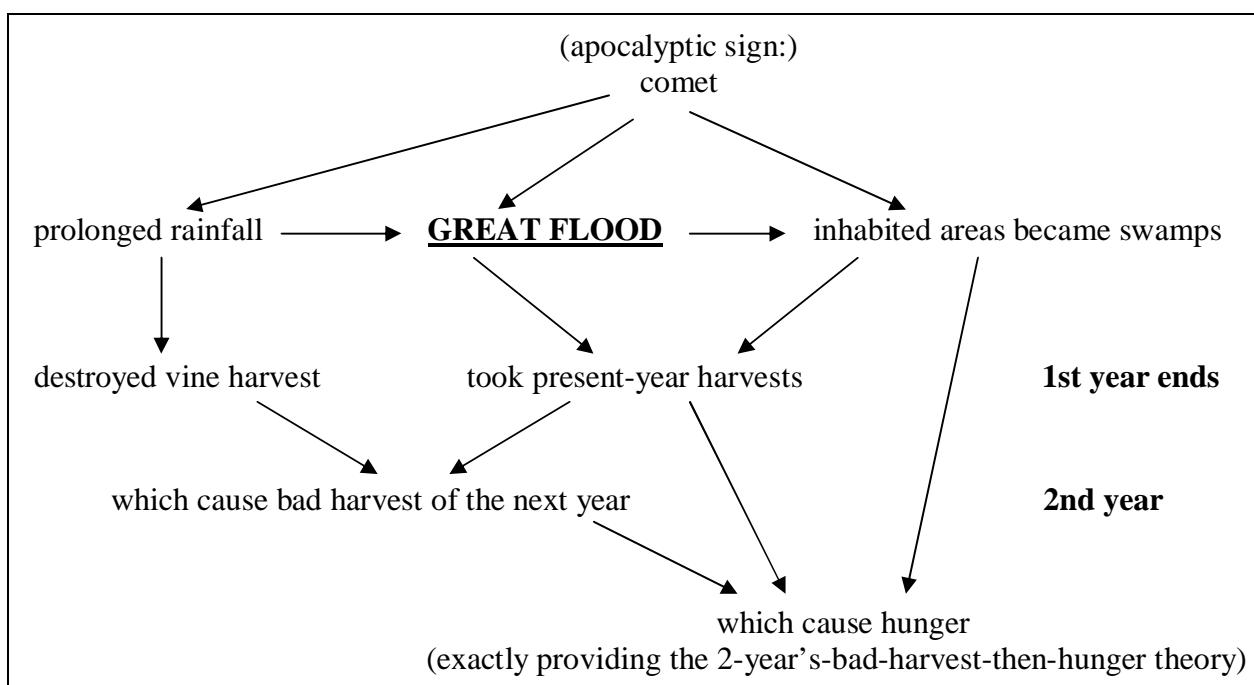
⁷⁵⁷ It is also important to note that there are changes and evolutions in attitudes (especially compared to the original protocols applied in the present investigations) in the legends where the stories and their interpretations often change with time, and most probably also with the aims of those writing/compiling the legends.

⁷⁵⁸ For background and source evidence, see Section 9.5.8.2.

⁷⁵⁹ See, for example: Rohr 2007a, pp. 62-63, 92-93.

In his poem, referring to a great flood event occurred in 1468, he not only provided information about the origin, type and impacts of flood, but also settled it into a symbolic-spiritual context: as a sign of approaching apocalyps for Hungary, also predicted by other signs, for example, by the appearance of a comet. Since referring to medieval Hungary no other such apocalyptic understanding and description of flood remained, it is quite a precious source of information. Nevertheless, we have to count with the fact that Janus was a highly educated bishop who studied (and was an outstanding student, a talent) in the most appreciated Italian schools and thus, his perception might more reflect the fashionable taste of an Italian high intellectual than would provide a picture on perception in Hungary, even on the perception of the (high) clergy. It is also interesting that in his description hunger is a result of natural reasons: heavy rainfalls, flood and no direct heavenly intervention are described, even if the final reasoning is clearly spiritual.

In this poem, flood of all large waterflows in Hungary arrived at once as a penalty, sign of a later catastrophe⁷⁶⁰ of the whole Hungarian/Pannonian nation (fearing for a successful Turkish attack), or even more, the catastrophe of the whole world, similar to the sign of the comete which appeared short before.⁷⁶¹ Some researchers treat this poem as an apocalyptic vision, presumably based on real facts, but applying some poetic generalisation (on flooded landscape) using Petrarca's poetry as an analogue.⁷⁶² It is, however, also interesting how *Janus* described the process of flood and its possible consequences: inhabited areas became swamps, rains demolished and destroyed vine harvest. Moreover, the flood not only took the harvest of the present year, but with taking this harvest, as well took the next year sowing and thus might be responsible of a hunger in the next year (see Fig. 37).



37. Fig. Janus Pannonius' mid-15th-century flood-related 'environmental-domino' (crisis) model

⁷⁶⁰ In her latest paper on the environmental crisis of the 18th-century Hungary, Ágnes R. Várkonyi also raised attention to the importance of this poem (using it as an example for catastrophe-vision, comparing to another, late 18th-century catastrophe-poem). See: R. Várkonyi 2009, p. 53.

⁷⁶¹ The comet was observed on 22 September in 1468, and caused great panic. Predictions connected to the appearance of the comet were presented by Martinus archidiaconus de Zagrab in his work, entitled 'Ivdicivm de cometa A. M. CCCC. LXVIII.' The work of Martinus was edited on 6 October 1468. For more analysis, see: Kardos 1972, p. 313: he dated the arrival of the comet to 28 September 1467.

⁷⁶² Kardos 1975, pp. 61, 64.

Thus, flood is not merely a sign, but also a reason, an origin of further problems. Sign is the comet, but flood is already part of direct causes and consequences. Janus takes the general vision into a present day environment: 'materialises' the apocalyptic vision. His metaphors are rather typical as well for late medieval Hungary, and not only simple metaphors. It seems that we can make some direct parallels with situations described in flood-charters and thus, seemingly not only in other areas of life, but also in his 'environmental vision' he reflects real-life situations and makes broad conclusions.

A rather 'tempting' comparison can be found with the non-flood cases and high flood-frequency references of the 1340s, 1350s (but most probably occurred in other times as well). Rather direct, practical parallels can be, for example, drawn with the descriptions of the 1340s: in 1342, as we could already see, both along the Tisza and the Danube the great amount of water in the area (floodplain) is mentioned. Moreover, in the case of the Tisza in the description this was accompanied by the information about the great amount of lands (of usually agricultural use) uninhabited due to the extensive water cover.⁷⁶³ Similar problems, although in a more complex sense and with more complex consequences, appear around Kalocsa, in the higher floodplain of Danube where again the great extent of waterlogged areas and lack/decrease of human management is mentioned.⁷⁶⁴

How much Janus' humanistic 'environmental' view can be generalised for the attitudes of the 1460s' Hungary? As we could see it earlier, Janus was educated in the best-quality Italian schools where he was always an eminent student. However, despite the powerful relatives (János Vitéz, bishop of Várad), he himself was born and spent his first years in a relatively simple environment (i.e. lower nobility with almost no private property) with his mother, close to the Drava river, most probably in medieval Slavonia, in the town of Varasd, today Varaždin in Croatia.⁷⁶⁵ Moreover, to some extent he could be also influenced by his immediate surroundings in Hungary (bishop of Pécs), and also by at least some parts of the high ecclesiastical circles (e.g. his uncle, János Vitéz, who sent him to Italy and was a humanist himself) as well as the royal court (with a young energetic King – Matthias).

Thus, his humanistic poems and 'world view' largely reflect on the view of his schools and that of the places where he grew up and lived his everyday life. His works were appreciated not only in Italy, but also in the higher intellectual circles of Hungary (even if he did not feel this too much – and complained enough about the lack of understanding). Thus, his view could be a mixed reflexion of practical environmental (everyday) knowledge and humanist generalisation (including the application of Italian and ancient parallels), with a deeper (and clearly emphasised) understanding of actual (high-)political situation in (and around) Hungary and its possible future outcomes. As such, his (negative, apocalyptic) view most probably shows strong connections to the opinion of one specific part of the intellectual/economic elite (the Vitéz-group) in Hungary, whose members were not particularly optimistic about the positive logic of actual political decisions (i.e. the King's politics).

When (Lord) Protector dies, Danube protects us: Bonfini and the Danube flood⁷⁶⁶

The rather talkative, highly-qualified Italian professor, Antonio Bonfini, usually described the story of Hungary, political circumstances, wars, victories, every day matters (of

⁷⁶³ See Section 9.4.5.2.

⁷⁶⁴ See Section 9.4.5.4.

⁷⁶⁵ Although his educational background is rather clear, there are still debates on the exact location of his birthplace and the place where he spent his childhood in medieval Slavonia. For more details see, for example: Tóth 2000, pp. 7-26. Recent investigations, however, suggests Varaždin as his most likely birthplace. See: Szentmártoni Szabó 2007, pp. 225-235.

⁷⁶⁶ For background and source, see Section 9.5.10.

high classes), natural phenomena (locust invasions, floods, droughts) in a very realistic practical way – without connecting them to direct divine intervention. There is only one clear exception when he fell out of his usual manner: when his beloved Great Lord, King Matthias died. As we could see it earlier, Bonfini describes a Danube flood which occurred around or short after the King's death in Vienna. In this case the Danube as a living entity decided to extend its banks and become large and broad enough to protect the kingdom against the Turks, with obstructing them in crossing the river and invade Hungary. In the previous decades, Turks were usually well-informed and organised enough to start an immediate action against Hungary when, mainly due to internal affairs or western wars, the King and his army had other problems to deal with, so that they could not immediately move to protect the southern territories.

Bonfini was an Italian who (apart from his last years) spent most of his (life)time in Italy. Thus, even if he had several friends in the Hungarian royal court and spent the last years of his life in Hungary, his environmental perspective most probably mainly reflects the view of contemporary Italian humanists. Especially because the list of supernatural phenomena, occurred around and short after Matthias' death, shows some clear parallels to the ones described after the death of the great Medici, Lorenzo (died similarly in April, but two years later).⁷⁶⁷ However, the natural phenomena, described after the death of the two great politicians, did happen – questions rather arose around the interpretations.

Similar to the fragmented information available concerning the high medieval period, only exceptional cases are available in the late Middle Ages when conclusions, other than that of the practical attitude of legal evidence, can be drawn concerning how flood was treated by contemporaries in spiritual or supernatural sense. Even in these cases, especially related to the late medieval period, writers clearly followed, while writing about flood, international fashions, accompanied by simple-practical approaches, which might however have closer connection to the approach of a contemporary logic of broader circles.

⁷⁶⁷ Reumont-Harrison 1876 Vol. 2, pp. 461-463.

6 Conclusions, discussion and outlook

6.1 General conclusions

While studying medieval, especially late medieval floods and water-level conditions, it is possible to distinguish among short-, medium- and long-term fluctuations and changes. Whereas archaeological and natural scientific evidence can provide some information on medium, but especially on long term, based on documentary evidence mainly short-, and partly also medium-term changes can be detected, predominantly for the late medieval period. According to our present knowledge, only sporadic information is remained to us from the 11th and 12th centuries, some more information can be detected referring to the 13th century, but most of the evidence is available concerning the 14th and 15th centuries.

Concerning documentary evidence, majority of sources are charters, connected to legal procedures. These circumstances partly determine reconstruction possibilities, due to the fact that legal documentation is mainly connected to certain dates and locations from which group of sources high-quality evidence can be gained. Nevertheless, spatial extension and duration (beginning and end) of actual flood events often cannot be detected. On the other hand, in the form of 'cummulative information', reference on previous flood events or constant high groundwater-table or water-level information, data is also available on medium-term fluctuations and changes. The extensive database of contemporary documentary evidence provides the possibility for a wide range of reconstruction directions, including flood frequencies and seasonal distribution, flood magnitudes, analysis on floods of great rivers as well as the detection of periods with higher flood frequencies and great magnitudes, combined with further consequences both in terms of hydro- and geomorphological changes, material damages or information on human reponse.

Related to natural processes, at present the most difficult question is the direct application of flood-related documentary evidence reconstructing long-term processes of centennial, thus over multi-decadal level. Archaeological and natural scientific evidence, primarily providing low-frequency, long-term signal, give information on a general water-level rise in the high and late Middle Ages; therefore, with an essentially drier high medieval and a more and more wet late medieval period. Still, some long-term documentary-based information might be detected in the higher frequencies of floods and increased wet conditions, in which case some signs of a 40-50-year periodicity can be presumably followed in the 14th-15th centuries.

Based on documentary evidence, with reference to medium-term (decadal, multi-decadal) information, two main periods of higher flood frequencies are reconstructed: the (late) 1330s-1350s and the other, less pronounced but longer one, the 1390s-1430s. Moreover, a third, forming high-intensity flood period may start with the end of the 15th century, and probably continuing in the early 16th century. However, without any doubt the decade of greatest flood frequencies, at least in the late medieval period, is the 1340s, culminating around the years of 1342 and 1343.

With regards to the annually resolved, short-term information, the most important flood years of the (late) medieval period are 1342 and 1343. In 1342 in both main catchment areas altogether seven, while in the following year exclusively in the Tisza catchment five or six (two are clearly connected) floods were reported. Moreover, some other important flood years can be as well determined, such as 1357, 1367, 1396, 1399, 1421, 1440, 1454, and possibly also 1496 and 1499.

Beyond detecting contemporary hydrological conditions, another outcome of flood investigations is related to short- and long-term consequences in human environment and the

different types of human response on such environmental hazards as floods and other hydrological changes. Among the environmental consequences, important natural consequences are the flood-related geo- and hydromorphological hazards and impacts such as landslides, change of river's watercourse or possible signs of increased sedimentation (e.g. in 1340s-1350s and 1410s-1430s).

The largest group of evidence, however, refers to the direct consequences obstructing legal processes – in this case mainly short-term consequences can be followed, but in some exceptional cases also long-term changes (e.g. changes in legal, administrative status) can be traced. Very important short- and long-term consequences are connected to material damages (e.g. bridges, fishponds etc) and the damages in agriculture (e.g. fields flooded, harvest destroyed): similar to legal processes, in most cases short-term, but sometimes long-term consequences (e.g. land lost for agriculture) can as well be detected. These circumstances, both on long and medium as well as on short term, can influence agriculture, economy, settlement system and thus, the society.

As a consequence, another significant group of evidence is related to human response, in which case the main focus is on how humans react on and what is their attitude towards floods, flood events as well as on their consequences. Even if in many cases flood is a bad thing, there are several other cases, situations when flood is an usual or even useful phenomenon. In most of the documents one can especially find examples for the practical side of human response: individual flood events on the short term, and higher flood frequencies on the long term induced short- and long-term responses, in which cases especially long-term response (e.g. new parishes and churches, new place of ferry and toll-place) provide the most interesting information. Human response (and attitudes) can be followed not only in practical, but also in its spiritual and symbolic sense: in this case, although rather few but still some examples are as well available, either discussing 13th-century divine intervention or a 15th-century humanistic-apocalyptic vision of a disaster or the good, protective side of a flood event (provided by an 'animated' river).

The present investigation and all analyses are based on a significant size of medieval database, consisting of data coming mainly from charters and partly narratives, (private) letters and economic evidence. Most probably the great majority of the available, contemporary evidence (related to flood events) is already collected and thus the database is large and representative enough to state that the main processes (at least those occurred in the last two centuries of the Middle Ages) are detected in this work. However, the extension of this database is still possible and should be an important future task. Moreover, the vast amount of medieval economic evidence, especially those of urban origin, should be investigated in their original form in more detail, since in the present investigation (exactly because of the immense extension/amount of original texts) predominantly the ones available in published form were included. Thus, with the help of exploring the medieval documentary heritage in its entirety, an even more complete picture could be presented.

6.2 Discussion

After general conclusions, in the Discussion part some of the important points, as approached, in order to draw further conclusions on some specific flood-related groups of information. These further conclusions mean on the one hand temporal distribution, on the other hand specific problems (e.g. MCA-LIA transition, flood as a stress on agriculture etc). The questions, listed below, are discussed separate and in a prominent position due to their fundamental importance and due to the overall conclusions drawn. These important further conclusions, mainly based on temporal distribution of flood events (and related impacts), are divided according to two main subject areas. In the first subchapter flood-related long-term physical/natural changes are discussed with broader comparisons, whereas in the second subchapter long-term conclusions related to impacts on human society are discussed.

6.2.1 Floods and long-term effects: most problematic periods of the first LIA centuries

6.2.1.1 Flood peaks of the 14th and 15th centuries in a broader documentary context

From the first third of the 14th century we can clearly face a great change in Hungarian flood documentation. The question arises whether the increased number of flood events is the result of changing documentation practices or the sign of climate variability/change (i.e. the MCA–LIA transition). Or, alternatively, the sign of the environmental change caused by rapidly increasing human impact and changes in land management in the hilly and lowland areas. Based on the available evidence, we cannot draw firm conclusions in this question; nevertheless, it is clear that lacking documentation had to play a role of basic importance, and also human management modified the environments in which floods occurred.

As we could see earlier, based on a mass analysis of all flood events known, the main flood peaks detectable are as follows:

- (- early 14th century?)
- 1330s-1350s
- 1390s-1430s
- (1480s-)1490s-

Nevertheless, there are spatial and temporal differences concerning the importance and documentation of flood peaks. The mid-14th century peak is mainly related to the Tisza and its catchment area which means the eastern parts of the Carpathian Basin, even if some major flood events clearly also appear along the Danube. On the level of individual events, 15th century floods are more documented in the Danube catchment (west Carpathian Basin), with special emphasis on the Danube itself, even if flood problems on the long run clearly appear in the Tisza catchment in several cases.

Documented hydromorphological changes follow the main flood peak patterns: around the mid-14th century change of riverbed, signs of increased precipitation and destruction of a complete settlement with its land were reported in the Tisza catchment (1339, 1347, ca. 1355) or that of the Poprad (1349). Similar type of events mainly were reported concerning the Danube catchment in the 1390s-1430s (1393, 1405?, 1439; Tisza catchment: 1421).

These flood peaks quite coincide with other, commonly known Central European flood processes.⁷⁶⁸ It is interesting, however, that while flood peak(s) of the 15th century (both in the

⁷⁶⁸ See, for example: Rohr 2007a, Glaser 2008, Pišút-Tímár 2009 etc.

early 15th and the turn of the 15th-16th centuries) show connections to the areas west and north to the Carpathian Basin, the probable early 14th-century flood problems are also well-connected to the Czech and Austrians conditions, the mid-14th century great peak is not so pronounced as in (eastern) Hungary.⁷⁶⁹

Even if not all flood types are directly associated with an overall significant precipitation surplus and the potential impact of human activity (e.g. forest clearance, mill- and fishpond-damming and related mismanagement etc.) also have to be considered, high flood-frequency periods in the Carpathian Basin, in general, presumably can be associated with periods of a medium- or long-term precipitation surplus.

6.2.1.2 Decades with only a few flood reports: less floods or weak documentation?

It is not possible to tell too much in this question concerning the 11th-13th centuries, or the first two decades of the early 14th century, due to the underrepresentation of charter evidence. However, this is already not true from the 1320s: while the amount of charter production shows no significant difference from the following years and decade, in the 1320s and early 1330s there is almost no flood reference available. Due to the large number of charters published in those years, underrepresentation of documentary evidence cannot be blamed for lacking flood signal.

The flood peak from the mid-1330s to the late 1350s (with some years gap in the early 1350s) characterised by great number of individual flood reports, some long-term information as well as some hydromorphological changes. While the 1360s and even the 1370s are decades with a reasonable amount of floods reported, a clear depression can be detected in the 1380s. One reason can be that, despite the richness of documentary evidence remained, this decade (similar to the 1360s and 1370s) is clearly underrepresented in published resources. This fact alone, however, cannot be blamed for the low number of known flood records.

Despite the richness of published resources, the second great flood peak of the late 1390s-1430s is characterised by some great flood years (mainly of the Danube catchment and the Danube itself) on the one hand, and several years of lacking individual floods on the other. Moreover, long-term information on increased flood frequencies and constant water-level rise are available in rather many cases (see App. 3d-f). Still, very few individual flood reports (almost all on the Danube and its catchment) remained from the 1400s and 1420s, even if very important references on previous flood events and their long-term impacts (from both main catchments) are available from the 1420s.

The flood year of 1440 is followed by a clear depression in the 1440s, which – probably also caused by the clear underrepresentation of published documentary evidence – continues in the 1450s-1460 and 1470s, with the only exception of 1454. Greatly due to information related to the Danube (town accounts), floods reappear from the 1470s and 1480s. Nevertheless, a rise of flood reports can be detected in the 1490s. The relatively high number of floods recorded is an interesting fact, since – being part of the Jagellonian period – this is one of the most unpublished and least studied decades of the late medieval period (at least concerning charter evidence) in Hungary. Thus, a flood peak, or the beginning of a flood peak does appear even in a, from documentary resources, relatively weakly presented period.

⁷⁶⁹ Brázdil-Kotyza 1995; Rohr 2007a.

6.2.1.3 Palaeoenvironmental versus documentary: any possibilities for comparison?

According to all existing reconstructions the water level of Lake Balaton increased in the 14th and 15th centuries. According to the Sági-Füzes reconstruction, a water-level rise can be followed throughout the whole Middle Ages (with slightly decreased speed from 1335). In the case of Lake Nádas (N-Hungary), after the lowest water levels occurred in the 11th and 13th centuries, higher (but still low) water-level conditions prevailed in the 14th, and an already relatively high water level in the 15th century. In parallel, long-term water-level rise in the 14th-15th centuries (and onwards) was detected along the Danube at Visegrád. Concerning decadal level information of the study period, the available stalagmite reconstruction (Bükk Mts., N-Hungary) detected shorter or longer wet phases in the second half of the 12th, mid-13th, beginning of the 14th, at the turn of the 14th-15th and that of the 15th-16th centuries.

Due to the very low resolution of palaeoenvironmental evidence, we cannot detect or state clear connection (or lack of connection) between lake- or river-related sedimentary-based reconstructions and annually resolved (or decadal) documentary-based flood information. However, the comparison of flood information and stalagmite-based decadal reconstruction provides some promising results. Although rather faintly, but both the mid-13th and early 14th century possible wet period might as well appear in the documentary evidence. Furthermore, there is clear overlap between the two late medieval flood peaks at the turn of the 14th-15th, and the 15th-16th centuries. Interestingly enough, the mid-14th century flood peak is missing from the stalagmite record (characterised as rock-based, prevailing dry period).

6.2.2 Impacts on society – temporal (and spatial) distribution

In this subchapter some important aspects on impacts and human response, with special emphasis on temporal distribution, is discussed. For better understanding and basic overview of main event categories, see *App. 3f*.

6.2.2.1 Impacts on mining, travel and transportation, public administration, material loss

The first known evidence concerning water inbreak in ore mines, referring to the 'Lower-Hungarian' mining district (in present-day Central Slovakia), is preserved from 1421. Nevertheless, in 1421 the source already mentioned re-opening of mines flooded by water. As the documentary evidence witnessed, the problem and solutions (with further investments) were recalled later in the 15th (and 16th) century. Although combined with transportation problems, possibly similar problems were mentioned (in general) concerning salt mining in 1440, referring to Central Transylvania.

Transportation problems and travel threatened or completely obstructed by floods were mentioned in many of the sources either talking about actual events or long-term problems in general. Whereas actual travel problems usually caused a delay and some change in legal processes (1335, 1343, 1396), obstructed official or private meetings (1419, 1454), sometimes floods (and related damages) caused major (salt) transportation problems (1440, 1496). Alternatively, taxation place was moved (1399). Long-term travel problems due to floods (and other reasons), if related to the reachability of a settlement, resulted long-term administrative (either ecclesiastical or jurisdictional) changes (1309, 1349, 1358, 1400, 1411, 1417, 1424) or required substantial further investments (cleaning the Danube bed: 1439). In some more 'extreme' cases, systematic flood protection works were needed for the defence of settlements and especially their agricultural lands (1426). While early 14th and early 15th-century cases are

connected to the (upper) Danube catchment, mid-14th and early 15th-century cases are related to the upper and middle Tisza catchment. These dates coincide with the mid-14th- and early 15th-century, and the potential early 14th-century high flood-frequency periods. Previous flood events, blamed for road destruction, appear only in one case outside of the main flood peaks (1473).

Although similarly to the earlier cases, most damages, either destruction of a mill (1408, 1422), buildings (1424) or that of the harvest (1454, 1468) occurred during the main flood peaks, great/extraordinary flood events causing considerable damages (e.g. destruction of a castle: 1443) were also mentioned outside of main flood peaks. A specific group of damages is related damages and reparation of bridge(s), appearing sometimes in charters but mainly in town accounts (1439, 1440, 1477, 1482, 1485, 1496). Due to the available source evidence, a more detailed picture and much information can be detected concerning the mid- and second half of the 15th century.

In general, a growing number of evidence is available concerning material damages from the mid-14th century onwards (e.g. damage of castle, mill, bridge, harvest etc). The increase of documentary evidence, and of (population and) economic growth, but also the increased utilisation of watermills, fishponds and related damming clearly play a very important role in the fact that the most and greatest damages, caused by floods and flash floods, are known from the 15th century. These mentioned damages culminated at the end of the 14th and the first half of the 15th centuries, with a smaller secondary peak at the end of the 15th century.

Apart from material damages, predominantly related to building constructions or those of the built-up environment, probably even more important are those obstructing agricultural production. Agricultural lands were threatened by frequent floods or covered by water for a longer period of time (e.g. for months: 1248, 1252, 1342, 1343, 1342-1346, 1357, 1424, 1435, 1436, 1438). These events in some cases clearly resulted the deterioration/desertion of lands (e.g. 1248, 1252, ca. 1355, 1435). Among these cases, probably the ones when the term of 'uninhabitable' lands appear, can be of special importance, providing a signal of greater, long-term groundwater/inland excess water problems (e.g. 1342, 1438).

Although individual great floods could cause sometime significant occasional damages, most of the documented damages again culminated around the main flood peaks, especially those of the mid-14th century and the one in the 1390s-1430s.

6.2.2.2 General discussion: any impact on settlement and land desertion?

A well-studied subject in Europe is settlement desertion occurred in the (late) Middle Ages. As discussed before, a similar process took place in medieval Hungary. Nevertheless, information on settlement desertion as a direct result of floods is rather rare. Up to the present we know only one clear example (ca. 1355) when an entire village was swept away by strong floods, and inhabitants moved to another area, where they built up their village under the same name. If no legal controversy (would have) occurred around this move, perhaps the whole event would have remained unreported and undetectable. Another, important data concerns the desertion of one part of a village (with *loca sessionalia*) due to flood problems on lands (in 1435). Moreover, some data are available on land desertion directly caused by floodwater, and it leads us back to the mid-13th century, and reference on uninhabitable lands (being perhaps the same category) is also available in 1342, (1344), 1438. Even if it is clear that this problem easily occurred and caused desertion also in other places, no much direct data is available at present.

Searching for connections between climate change and settlement desertion is a rather interesting and fashionable, but in the meantime dangerous subject: it is very tempting to be 'deterministic' in this question. There are many uncertainties around dating and the exact understanding of the process and causes of settlement desertion. Medieval settlement desertion in general was clearly multicausal, and in each case the predominant reasons of final (or even temporary) desertion could be different. Due to the approximate dating possibilities of archaeological science, and the fact that settlements might have existed even if they were not mentioned in documentary evidence for a long while (e.g. no legal process took place there), makes it complicated to draw firm conclusions. Generally, in 15th century documentary evidence the words '*deserta*' or '*vacua*' can describe either the desertion of a serf-land portion or one part of a village or a complete village.

It is clear that environmental changes (climate and human impact), with special emphasis on hydrological questions could and did play an important role in settlement desertion, especially in those areas which are sensitive for environmental changes. The most flood-endangered areas, mentioned in medieval documentation, are all of lowland location. Moreover, during the times of settlement system expansion, clearance and land reclamation took place in Hungary not only in the mountain areas, but also in lands earlier deserted and wetland areas, latest from the late 13th century throughout the late Middle Ages. An increase of flood frequencies and long-term (ground)water-level rise (perhaps) might have had an indirect impact on the conditions and quality of lands on the long run.

Settlements in low-lying (most of the study sites) or wetland reclamation areas (e.g. Lake Fertő and the Hanság wetlands), subject to the deterioration of (potentially) cultivated lands, presumably suffered more in periods of high flood frequencies and long-term high water-level conditions: this can be clearly detected, for example at the upper, upper middle sections (and catchment) of the Tisza river (e.g. 1340s, 1410s-1420s), and along the (upper) Danube (e.g. 1240s-1250s, 1420s, and probably also in the 1340s – lower Danube).

Nevertheless, in this case economic and social processes have to be strongly considered; for instance, areas with bad transportation possibilities and with limited market availability (high risk, low potential profit) had clear disadvantages compared to areas located, for example, along main travel routes.

What do we know, and what conclusions can be drawn?

1. In the Carpathian Basin, unlike in western and west-central Europe, settlement desertion was not typical in the newly (13th-15th centuries) occupied, mountain-hilly areas.
2. In late medieval times land desertion, sometimes combined with settlement desertion, took place mainly in the relatively densely populated, central parts of Carpathian Basin, which were more and more intensively used in the Middle Ages.
3. In case of some sensitive, low-lying areas, however, there is a possibility that – among others – during higher flood-frequency periods and after multiannual flood or inland excess water problems (caused by natural climate variability process, combined with possible human impact such as removal of forest vegetation in hilly and mountain catchments), inhabitants gave up their lands and thus, in these cases abundance of water can be blamed for a decreased value of lands and as a result, for a greater number of land desertions.
4. A possible area where high waters could be an important reason for land desertion is clearly along the the Tisza river (regardless of section), and also the lower sections of its tributaries. Nevertheless, one has to raise attention to the fact that such changes are rarely monocausal, even if usually there is a dominant or final reason which makes people (or part of the population) move.

5. If happened, when such a process most likely could take place? The most chance for hydrological problems to become a leading factor in desertion could be, of course, those periods when the most water-related problems were mentioned, namely the mid-14th, late 14th-early 15th and possibly also the end of the 15th (early 16th) centuries. In this question, however, it also has great importance for how long a hydrologically problematic period lasted, and when and what other problems might have occurred in the same time, which might have led towards land (and settlement) desertion. Accounting with all this information, the most likely time period (when hydrological problems could have played an important role) is the first half of the 15th century. Long-term problems, however, also clearly appear along the Danube in the same period, which might have led to the same results in the Danube floodplains. Another threatened type of landscape is the wetland areas subject to wetland reclamation (e.g. Southeast-Fertő and West-Hanság).

What would help in further understanding and clarification of this question? Systematic collection of data and catalogue of deserted lands and settlements (with last known mentionings) could play the most vital role on the one hand, and more high- and low-resolution climate data on the other hand.

6.2.2.3 Concluding short-, medium-, long-term impacts and human response

The temporal distribution of the most significant, documented short- and long-term flood impacts (either on hydromorphology or society) and human response, shows almost completely the same patterns as the distribution of the number of flood events on the long term. This means that the main flood peaks, first characterised by the simple number of flood events, almost 100%-ly coincide with reports on short- or long-term problems and changes – either we talk about hydromorphological consequences, damages as well as administrative changes, caused by floods (see App. 3a-f). Although most of the great flood years happened in one of the major flood peak periods, some individual ones are also known (e.g. 1454 – maybe another developing flood peak?).

As we could see these periods are the 1330s-1350s, the 1390s-1430s. Taking also the coincidences of stalagmite records into consideration, secondary and/or potential flood peaks, sometimes with long-term signs, might be around the mid-13th century, early 14th century, and the end of the 15th century(-early 16th century). With the further development of the database, however, any of the secondary flood peaks can become one of the main flood peaks. Although there is not enough evidenced available to prove, but on a theoretical level some signs of a 40-50-year periodicity might be suggested.

6.3 Outlook

It is important to emphasise that all listed results are based on the presently available evidence. More data and further investigations in archaeology and natural sciences as well as more documentary evidence might change these conclusions. A significant next step of documentary data collection should be the systematic elaboration and analysis of the Bratislava account books. Another direction is the systematic checking process of unpublished charters and other documentation, with special emphasis on those without any (published) *regesta* available.

A vital task is an even more detailed and elaborated comparison with the flood (and) weather events occurred in the neighbouring areas. Moreover, it is important to discuss these results in a broader, European context, which requires some changes in methods applied (e.g. to change from a 3-scaled to a 4-scaled or 5-scaled magnitude index analysis). Another task could be the deeper analyses of extreme years, decades; and further detailed investigations are needed on long-term changes. However, this later task cannot be fulfilled without an even deeper understanding of (hydrology-related) environmental conditions and landscape dynamics of selected areas.

Due to its geographical conditions, floods and long-term water-level conditions of the Carpathian Basin are of utmost importance in understanding physical-environmental and social processes taken place in the Middle Ages. It is especially true for lowland and (low elevation) hilly areas, sensitive to long-term hydrological changes.

Moreover, caused by the same geographical conditions, periods with (very) high or (very) low flood frequencies can as well be treated as a precipitation signal, while – especially in case of winter and early spring floods – some conclusions on prevailing winter temperatures can be as well drawn. This direction, namely steps towards a climate reconstruction (temperature and precipitation patterns), and place flood information into broader climatic context is perhaps the most important task of further investigations.

7 Bibliography

- A kalocsai főegyházmegyei levéltár térképtára 1749-1945 (Map collection in the archives of the Kalocsa archbishopric). Budapest: Arcanum, 2009. (DVD-ROM)
- AO = Nagy, Imre, Tasnádi, Gyula. Anjoukori okmánytár / Codex Diplomaticus Hungaricus Andegavensis. 7 Vols. Budapest: Magyar Tudományos Akadémia, 1878-1920
- AOKt = Kristó, Gyula (chief ed.). Anjou-kori oklevél tár / Documenta res Hungaricas tempore regum Andegavensium illustrantia. 24 Vols. Szeged: Szegedi Középkorász Műhely, 1990-
- Alexandre, Pierre. Le climat en Europe au Moyen Age. Contribution à l'histoire des variations climatiques de 1000 à 1425, d'après les sources narratives de l'Europe occidentale. Paris: Ecole des hautes études en sciences sociales, 1987. 827 p
- Almási, Tibor. A tizenharmadik század története. Budapest: Pannonica Kiadó, 2000. 222 p
- Ambrózy, Pál. A Felső-Rába vízgyűjtőjének éghajlati jellegzetességei (Climatic conditions of the upper Rába catchment). *Vízügyi Közlemények* 79/4 (1997): 498-517
- Andó, Mihály. Hydrogeography of the Szamos/Someş-Kraszna/Crasna river system. In: Sárkány-Kiss, Andrei and Hamar, József (eds.). The Szamos/Someş River Valley. Tisza monograph series. Szolnok-Szeged-Târgu Mureş: Tisza Klub&Liga Pro Europa, 1999. pp. 13-61
- Andó, Mihály. A Tisza vízrendszer hidrogeografiája (Hydrogeography of the Tisza hydrological system). Szeged: SZTE Természeti Földrajzi Tanszék, 2002. 168 p
- Andrásfalvy, Bertalan. A Duna mente népének ártéri gazdálkodása. Ártéri gazdálkodás Tolna és Baranya megyében az ármentesítési munkák befejezése előtt (Floodplain management of along the Danube. Floodplain management in Tolna and Baranya county before the beginning of water regulation works). Budapest: Ekvilibrium, 2007. 438 p
- AS = Wagner, Carolus. Annalecta Scepusii sacri et profani. Vol. 3, Vienna: n.p., 1773. pp. 185-186
- Aventinus = Cisnerus, Nicolaus. Ioannis Aventini Annalium Boiorum, sive veteris Germaniae libri VII Francofurti [Frankfurt]: impensis Ludovici Regis, 1627. 800 p
- ÁUO = Wenzel, Gusztáv. Árpád-kori új okmánytár / Codex Diplomaticus Arpadianus Continuatus. 12 Vols. Pest [Budapest]: Magyar Tudományos Akadémia, 1860-1874
- Bak, János, Bányó, Péter and Rady, Martin (eds.). Stephan Werbőczy: The customary law of the renowned kingdom of Hungary in three parts (1517) / Tripartitum opus iuris consuetudinarii incliti regni Hungari. The laws of Hungary, Series 1 Vol. 5. Budapest: Charls Schlacks Jr. Pub., 2006. 474 p
- Bakay, Kornél, Kalicz, Nándor and Sági, Károly. Magyarország régészeti topográfiája. Vol. 1. Veszprém megye régészeti topográfiája. A keszhelyi és tapolcai járás (Archaeological topography of Hungary. Archaeological topography of Veszprém county. The Keszhely and Tapolca districts). Budapest: Akadémiai Kiadó, 1966. p. 185
- Bányó, Péter. Birtokörökös és leálynegyed. Kísérlet egy középkori jogintézmény értelmezésére (Inheritance of Landed Property and Filial Quarter: An Attampz for Interpretation of a Medieval Hungarian Legal Institution). *Aetas* 3 (2000): 76-92.
- Barriendos, Mariano and Rodrigo, Fernando S. Study of historical flood events of Spanish rivers using documentary data. *Hydrological Sciences Journal* 51/5 (2006): 765-783
- Bartha, Lajos. Janus Pannonius két csillagászati verse (Two astronomy poems of Janus Pannonius). *Irodalomtörténeti Közlemények* 82/3 (1978): 340-345
- Bariska, István. A kőszegi bor (The wine of Kőszeg). Kőszeg: ESCORT-96 Kft, 2001. 48 p

- Bártfa Szabó, László. Oklevéltár a gróf Csáky család történetéhez. 1. kötet 1. rész. Oklevelek 1229-1499-ig (Chartulary to the history of the county Csáky family. Vol. 1, Part 1. Charters from 1229 to 1499). Budapest: Stephaneum Nyomda R. T., 1919. 496 p
- Bárth, János. Szeremlei vallomások (Confessions from Szeremle). *Cumania* 11 (1989): 335-422
- Bede, Ádám and Szarka, József. Egy középkori határjárás nyomában (Tracing back a medieval perambulation). In: Erdélyi, Péter and Szűcs, Judit (eds.). Múzeumi Kutatások Csongrád megyében 2002 (Museum Research in Csongrád county). Szeged: Móra Ferenc Múzeum, 2003. pp. 51-72
- Belényesy, Márta. Magyarország halászata a 14. században (Fishing in Hungary in the 14th century). *Ethnographia* 64/1-4 (1953): 148-164
- Belényesy, Márta. A földművelés fejlődésének alapvető kérdései a XIV. században I: Az agrártechnikai kutatás eddigi eredményeinek, módszerének rövid összefoglalása. A föld feltörésének módjai. A föld művelési rendszere (Basic questions of the development of land management in the 14th century. 1s part: A conclusion over the results and methods of agrotechnological research. Methods of opening the ground. System of land exploitation). *Ethnographia* 65/3-4 (1954): 387-415
- Belényesy, Márta. A földművelés fejlődésének alapvető kérdései a XIV. században II (Fundamental questions of the development of land management in the 14th century. 2nd part). *Ethnographia* 66/1-2 (1955a): 57-98
- Belényesy, Márta. Szőlő és gyümölcstermesztésünk a XIV. században (Vine and fruit cultivation in the 14th century). *Néprajzi értesítő* 37 (1955b): 11-28
- Belényesy, Márta. Angaben zur Verbreitung der Zwei- und Dreifeldwirtschaft im mittelalterlichen Ungarn. *Acta Ethnographica* 5/1-2 (1956a): 183-188
- Belényesy, Márta. Az állattartás a XIV. században Magyarországon (Animal husbandry in Hungary in the 14th century). *Néprajzi értesítő* 38 (1956b): 23-57
- Belényesy, Márta. A földművelés Magyarországon a XIV. században (Land management in Hungary in the 14th century). *Századok* 90/4-6 (1956c): 517-555
- Belényesy, Márta. Talajmegmunkálás Szolnok-Doboka, Kolozs, Torda és Alsó-Fehér megyékben a XV. században (Land management in historical Szolnok-Doboka, Kolozs, Torda and Alsó-Fehér counties (Transylvania) in the 15th century). *Ethnographia* 68/4 (1957): 599-607
- Belényesy, Márta. Kerített település és gazdálkodás az 1460-as zalai határjárás alapján (The enclosed settlement and its management on the example of a perambulation in Zala, dated to 1460). *Ethnographia* 69/1 (1958): 117-126
- Belényesy, Márta. A parlagrendszer XV. századi terjedése Magyarországon (The 15th-century expansion of). *Ethnographia* 75/3 (1964): 321-349
- Bellus, Ibolya, Szabó, Zsuzsanna and Klaniczay, Gábor. Árpád-házi Szent Margit legrégebbi legendája és szentté avatási pere (The oldest legend and the canonisation trial of Saint Margit from the Arpadian Dynasty). Budapest: Balassi Kiadó, 1999. 326 p
- Bendefy, László. Gyula Icce-dombi középkori határkö (Medieval boundary stone at Gyula, Icce-mound). A Gyulai Erkel Ferenc Múzeum jubileumi évkönyve. Gyula, 1960. pp. 47-51
- Bendefy, László. A juti gátak és a Balaton török kori magas vízállása (Dykes at Jut and the high water-level conditions of Lake Balaton in the Turkish Period). *Somogy megye múltjából* 4 (1973a): 113-128
- Bendefy, László. A Máriaasszony-szigeti templom és a Balaton középkori vízállása (The church of Máriaasszony-sziget and the medieval water level of Lake Balaton). *Földrajzi Értesítő* 22/1 (1973b): 143-151

- Bendefy, László. Természeti és antropogén tényezők hatása a balaton vízállására (The influence of natural and anthropogenic factors on the water-level changes of Lake Balaton). *Földrajzi Értesítő* 22/3 (1972): 335-358
- Bendefy, László and V. Nagy, Imre. A Balaton évszázados partvonalváltozásai (Millennial shoreline changes of Lake Balaton). Budapest: Műszaki Kiadó, 1969. 215 p
- Benedek, Gyula. Oklevelek Jász-Nagykun-Szolnok megye volt hevesi részeinek 15. századi történetéből (Charters from the 15th-century history of Heves parts in Jász-Nagykun-Szolnok): 1401-1500. *Zounuk* 12 (1997): 269-352
- Benedictow, Ole J. The Black Death 1346-1353. The Complete History. Woodbridge: Boydell, 2004. 433 p
- Benito, Gerardo, Díez-Herrero, Andrés and Fernández de Villalta, María. Magnitude and frequency of flooding in the Tagus Basin (Central Spain) over the last Millennium. *Climatic Change* 58 (2003): 171-192
- Benke, István. Telkibánya bányászatának története (History of mining in Telkibánya). Közlemények a magyarországi ásványi nyersanyagok történetéből 11. Miskolc-Rudabánya: Miskolci Egyetem-Erc- és Ásványbányászati Múzeum, 2001. 172 p
- Bertalan, Vilmosné. Óbuda 1355-ös és 1437-es határjárásának régészeti leg meghatározott határpontjai (Archaeologically-identified landmarks of the perambulations of Óbuda for 1355 and 1437). *Budapest régiségei* 25 (1984): 419-429
- Blazovich, László. Déli szlávok Magyarországon és a Körös-Maros közben a 15-16. században (Southern Slavs in Hungary and in the Körös-Maros Interfluve in the 15th-16th century). In: Kovacsics, József. Magyarország történeti demográfiaja 896-1995 (Historical demography of Hungary 896-1995). Budapest: Központi Statisztikai Hivatal, 1997. pp. 117-124
- Bodolainé Jakus, Emma. Árhullámok szinoptikai feltételei a Duna és a Tisza vízgyűjtő területén / Synoptic conditions of flood-waves on the basin of the Danube and the Tisza. Az Országos Meteorológiai Szolgálat hivatalos kiadványai 56. Budapest: Országos Meteorológiai Szolgálat, 1983. 126 p
- Bodorné Nagy, Elvira and Cserny, Tibor. A Szigligeti-öböl vízzel borítottságának fejlődéstörténete a palinológiai visszalatók eredményei alapján (History of water cover in the Szigliget-bay, based on palinological analyses). *Hidrológiai Közlöny* 78/5-6 (1998): 364-366
- Bodrogközy, György. Szikes puszták és növénytakarójuk (Alkaline 'puszta'-s and their vegetation cover). *A Békés Megyei Múzeumok Közleményei* 6 (1980): 29-50
- Bogdán, István. Magyarországi hossz- és földmértékek a XVI. század végéig (Length and land measures in Hungary until the end of the 16th century). Magyar Országos Levéltr kiadványai 4. sorozat: Levéltártan és történeti forrástudományok 3. Budapest: Magyar Országos Levéltár, 1978. 385 p
- Bogdánfy, Ödön. Az Alföld hidrológiája. Vízi munkálatok az Alföldön (Hydrology of the Great Hungarian Plain. Waterworks in the Great Hungarian Plain). Debrecen: Tisza István Tudományegyetemi nyomda, 1925. 72 p
- Bonfini = Antonius de Bonfinis: Rerum Ungaricarum Decades. 4 Vols. Eds. Fógel, József, Iványi, Béla, Juhász, László. Leipzig-Budapest: B. G. Teubner-Budapest K. M. Egyetemi Nyomda, 1936-1941. For the original (OSZK Cod. Lat. 434): <http://corvina.oszk.hu/corvinas-html/hub1codlat434.htm>
- Bork, Hans-Rudolf, Bork, Helga, Dalchow, Claus, Faust, Berno, Piorr, Hans-Peter and Schatz, Thomas. Landschaftsentwicklung in Mitteleuropa. Wirkungen des Menschen auf die Landschaften. Gotha: Klett-Perthes, 1998. 328 p
- Borosy, András and Laszlovszky, József. Magyarország, a Szentföld és a korai keresztes hadjáratok (Hungary, the Holy Land and the early Crusades). In: Laszlovszky, József,

- Majorossy, Judit and Zsengellér, József (eds.). Magyarország és a keresztes háborúk. Lovagrendek és emlékeik (Hungary and the Crusades. Military orders and their memory). pp. 75-90
- Boronkai, Pál. Árvizek Sopronban (Floods in Sopron). *Soproni Szemle* 19 (1965): 339-346
- Borsa, Iván. A Justh család levéltára 1274-1525 (Chartulary of the Justh family 1274-1525). Magyar Országos Levéltár kiadványai 2, Forráskiadvánok 20. Budapest: Magyar Országos Levéltár, 1991. 320 p
- Borsa, Iván. A somogyi konvent oklevelei az Országos Levéltárban (Charters of the Somogy convent in the National Archives). *Somogy megye múltjából* 30 (1999): 3-18
- Bossányi, Árpád. Regesta supplicationum: a pápai kérvénykönyvek magyar vonatkozású okmányai: Avignoni időszak. Vols. 1-2. (Regesta supplicationum: Hungary-related documents of the papal petition protocols: the Angevin period). Budapest: Stephaneum nyomda R.T., 1916, 1918. 330, 532 p
- Bónis, György. Szentszéki regeszták. Iratok az egyházi bíráskodás történetéhez a középkori Magyarországon (Regesta-collection of the holy seat. Documents to the history of ecclesiastical jurisdiction in medieval Hungary). Budapest: Püske Kiadó, 1997. 662 p
- Brázdil, Rudolf and Kotyza, Oldrich. History of Weather and Climate in the Czech Lands I (Period 1000-1500). Zürcher Geographische Schriften 62, Zürich, 1995. 260 p
- Brázdil, Rudolf, Glaser, Rüdiger, Pfister, Christian, Dobrovolný, Petr, Antoine, Jean-Marc, Barriendos, Mariano, Camuffo, Dario, Deutsch, Mathias, Enzi, Silvia, Guidoboni, Emanuela, Kotyza, Oldřich and Rodrigo, Fernando Sanchez. Flood events of selected European rivers in the sixteenth century. *Climatic Change* 43 (1999): 239-285
- Brázdil Rudolf, Glaser, Rüdiger, Pfister, Christian and Stangl, Heiko. Floods in Europe. A look into the Past. *Pages News* 10/3 (2002): 21-23
- Brázdil, Rudolf, Pfister, Christian, Wanner, Heinz, von Storch, Hans and Luterbacher, Jürg. Historical climatology in Europe – the state of the art. *Climatic Change* 70 (2005): 363-430
- Brázdil, Rudolf, Dobrovolný, Petr, Elleder, Libor, Kakos, Vilibald, Kotyza, Oldřich, Květoň, Vít, Macková, Jarmila, Müller, Miloslav, Štekl, Josef, Tolasz, Radim and Valášek, Hubert. Historické a současné povodně v České Republice / Historical and recent floods in the Czech Republic. Brno-Prague: Masaryk University-Czech Hydrometeorological Institute, 2005. 369 p
- Brázdil, Rudolf, Kotyza, Oldřich and Dobrovolný, Petr. July 1432 and August 2002 – two millennial floods in Bohemia? *Hydrological Sciences Journal* 51/5 (2006a): 848-863
- Brázdil, Rudolf, Kundzewicz, Zbigniew W. and Benito, Gerardo. Historical hydrology for studying flood risk in Europe. *Hydrological Science Journal* 51/5 (2006b): 739-764
- Brázdil, Rudolf, Glaser, Rüdiger, Pfister, Christian, Dobrovolny, Petr, Antoine, Jean-Marc, Barriendos, Mariano, Camuffo, Dario, Deutsch, Matthias, Enzi, Silvia, Guidoboni, Emanuela, Kotyza, Oldřich and Rodrigo, Fernando S. Flood Events of Selected European Rivers in the Sixteenth Century. *Climatic Change* 43 (1999): 239-285
- Brázdil, Rudolf, Demarée, Gaston R., Deutsch, Matthias, Garnier, Emmanuel, Kiss, Andrea, Luterbacher, Jürg, MacDonald, Niel, Rohr, Christian, Dobrovolný, Petr, Kolář, Petr and Chromá, Katherina. European floods during the winter 1783/1784: scenarios of an extreme during the 'Little Ice Age'. *Theoretical and Applied Climatology* 100/1-2 (2010): 163-189
- C. Tóth, Norbert. Szabolcs megye hatóságának oklevelei (Charters of the county administration of Szabolcs county). Vol. 2. A nyíregyházi Jósa András Múzeum Kiadványai 35. Budapest-Nyíregyháza: Szabolcs-Szatmár-Bereg Megyei Múzeumok Igazgatósága, 2003. pp. 240-342

- C. Tóth, Norbert. A leleszi konvent országos levéltárában lévő Acta anni sorozatának oklevelei. I. közlemény 1387-1399. Pótłás a Zsigmondkori oklevélőr I. kötetéhez. A Nyíregyházi Jósa András Múzeum évkönyve 47. Nyíregyháza 2005. pp. 235-343
- CDT = Jakó, Zsigmond Pál, Hegyi, Géza and Kovács, András. Erdélyi okmánytár/Codex diplomaticus Transylvaniae. Vol. 3, Budapest: Magyar Országos Levéltár, 2008. 640 p
- Camuffo, Dario. Analysis of the Sea Surges at Venice from AD 782 to 1990. *Theoretical and Applied Climatology* 47 (1993): 1-14
- Collectio Diplomatica Hungarica. A középkori Magyarország digitális levéltára / Digital Archives of medieval Hungary. Budapest: Arcanum, 2008. (DVD-ROM)
- Csánki, Dezső. Magyarország történelmi földrajza a Hunyadiak korában (Historical geography of Hungary in the Hunyadi-period). 5 Vols. Budapest: Magyar Tudományos Akadémia, 1890-1913
- Csoma, Lajos. Volt e Egeresen apátság? (Was there an abbey in Egeres?) *Erdélyi Múzeum* 28/4 (1911): 223-232
- Database of Archival Documents of Medieval Hungary (DL, DF). Magyar Országos Levéltár – Arcanum Adatbázis Kft (online):
<http://mol.arcanum.hu/dldf/opt/a101127htm?v=pdf&a=start>
- Dávid, Zoltán and T. Polónyi, Nóra: Az első magyar nyelvű leíró statisztika 1736-1739: A méltóságos esztergomi érsekséget illető jáoszágoknak Geographico Topographica descriptioja mell végen vitettetett Anno 1736., 1737., 1738. és 1739. Győri Kovács János által (The first descriptive statistics 1736-1739: The Geographico Topographica description of the properties belonging to the archbishopric of Esztergom in the years of 1736, 1737, 1738 and 1739, carried out by János Győri Kovács). Budapest: Magyar Országos Levéltár, 1980. 112 p
- De Kraker, Aryan M. J. Flood events in the southwestern Netherlands and coastal Belgium, 1400-1953. *Hydrological Science Journal* 51/5 (2006): 913-929
- Deák, Viktória Hedvig OP. Árpád-házi Szent Margit és a domonkos hagiográfia (Saint Margaret from the House of Árpád and the Dominican hagiography). Budapest: Kairosz Kiadó, 2005. 500 p
- Déri, József. A Duna jeges árvizei évezredünkben (Ice floods of the Danube in the last Millennium). *Hidrológiai Közlöny* 69/3 (1989): 151-158
- DH = Kubinyi, Ferenc. Diplomatarium Hontense. Vol. 1, Monumenta Hungariae Historica Vol 2, Budapest: Pfeiffer Feridánd bizománya, 1888. 400 p
- Diaconescu, Marius. Arhiva istorică a României. Serie nouă, Vol. 1, nr. 1. Bucarest: Scriptorium, 2004. 272 p
- DL, DF = Database of Medieval Documents (Collection of documents dated to the period before the battle of Mohács 1526) in the Hungarian National Archives
- Dóka, Klára. A Körös és Berettyó vízrendszer szabályozása a 18-19. században. Egy táj átalakulása (Water regulation of the Körös and Berettyó in the 18th and 19th centuries. The transformation of a landscape). Gyula: Békés Megyei Levéltár, 1997. 345 p
- Dóka Klára, Farkas, Gyöngyi, Kenéz, Győző. Latin forrásszöveg olvasási és fordítási gyakorlatok 1 (Practical on reading and translating latin source texts). *Levéltári Módszertani Füzetek* 7/1 (1988): 179 p
- Draskóczy, István. Szászföldi összeírások és a Szászföld lélekszáma a 15-16. század fordulóján (Population conscriptions and the population of the Saxon area at the turn of the 15th and 16th centuries). In: Kovacsics, József. Magyarország történeti demográfiája 896-1995 (Historical demography of Hungary 896-1995). Budapest: Központi Statisztikai Hivatal, 1997. pp. 125-139
- Draskóczy, István. Szempontok az erdélyi sóbányászat 15-16. századi történetéhez (Additions to the 15th-16th-century history of the Transylvanian salt mining). In: Almási, Tibor,

- Draskóczy, István and Jancsó, Éva (eds.). Tanulmányok Érszegi Géza hatvanadik születésnapjára (Studies for the 60th birthday of Géza Érszegi). Budapest: Magyar Országos Levéltár, 2005. pp. 83-117
- Dudar, Tibor (chief ed.). Történelmi világatlasz (Atlas of world history). Budapest: Kartográfiai Vállalat, 1991. 237 p
- Dümmerth, Dezső. Árpád-házi Szent Margit halála éve és a legendák (Year of Saint Margit of Arpad and the legends). *Irodalomtörténeti Közlemények* 76 (1972): 617-620
- Engel, Pál. Ung megye településviszonyai és népessége a Zsigmond korban (Settlements and population of Ung county in the Sigismund period). *Századok* 119/4 (1985): 942-1005
- Engel, Pál. A középkori Dunántúl, mint történeti táj (The medieval Transdanubia as a historical region). In: Mikó, Árpád and Takács, Imre (eds.). *Pannonia Regia. Művészet a Dunántúlon 1000-1541*. Budapest: Magyar Nem zeti Galéria, 1994. pp. 13-20
- Engel, Pál. Magyarország világi archontológiája 1301-1457 (Archontology of Hungary 1301-1457). Vol. 1. Budapest: História-MTA Történettudományi Intézete, 1996. 565 p
- Engel, Pál. Az Anjou- és Zsigmond-kori Magyarország történeti demografijának problémái (Problems of the historical demography of Hungary in the Angevin and Sigismund period). In: Kovacsics, József. Magyarország történeti demografijája 896-1995 (Historical demography of Hungary 896-1995). Budapest: Központi Statisztikai Hivatal, 1997. pp. 111-116
- Engel, Pál. Beilleszkedés Európába a kezdetektől 1440-ig (Integration to Europe from the beginnings to 1440). Budapest: História/Holnap Kiadó, 2003. 312 p
- Engel, Pál. A középkori Dunántúl, mint történeti táj (The medieval Transdanubia as a historical region). In: Csukovits, Enikő (ed.). Engel Pál: Honor, vár, ispánság. Válogatott tanulmányok (Pál Engel: Honor, castle and county. Selected studies). Budapest: Osiris, 2003. pp. 433-450
- Engel, Pál, Kristó, Gyula and Kubini, András. Magyarország története (History of Hungary) 1301-1526. Budapest: Osiris Kiadó, 2002. 419 p
- Faller, Gusztáv. Jó szerencsét – Bányászat Magyarországon (Good luck – Mining in Hungary). Budapest: Műszaki Könyvkiadó, 1997. 170 p
<http://www.scitech.mtesz.hu/04faller/faller1.htm>
- Farkas, Csilla and Kiss, Andrea. Egy mezősségi település, Szék (Sic) történeti tájhasználata (Historical land use of a settlement in the Mezőség area: Szék/Sic - Romania). In: Füleky, György (ed.). A táj változásai a Kárpát-medencében. Az erdélyi táj változásai (Landscape changes in the Carpathian Basin. Changes of the Transylvanian landscape). Gödöllő: Szent István Egyetem, 2008. pp. 62-67
- Fedeles, Tamás and K. Németh, András. A tolnai és a regölyi főesperesség. Régészeti és prosopográfiai adatok Tolna megye középkori egyházigazgatásának történetéhez (The archdeaconry of Tolna and Regöly. Archaeological and prosopographical data to the history of the medieval church administration of Tolna county). *Századok* 140/2 (2006): 397-433
- Fejér = Fejér, Georgius. Codex diplomaticus Hungariae ecclesiasticus ac civiles. 40 Vols. Budae [Budapest]: Typis Typogr. Regiae Vniversitatis Vngariae, 1829-1844
- Fekete Nagy, Antal. Településtörténet és egyháztörténet (Settlement history and church history). *Századok* 71/9-10 (1937): 417-431
- First and Second Military Survey / Az Első és Második Katonai Felmérés (1763-1787, 1806-1869): Grossfürstenthum Siebenbürgen. Series: Digitized Maps of the Habsburg Empire. Budapest: Arcanum, 2007. (DVD-ROM)
- Földes, Gyula. Felső-Csallóköz árvédekezésének története (History of flood protection in the Upper-Žitný ostrov area). In: Koncsol, László (ed.). Földes Gyula – Rudnay Béla: Két könyv a csallóközi árvédekezés történetéről (Two books on the history of flood protection

- in the Žitný ostrov area). Csallóközi Kiskönyvtár. Pozsony [Bratislava]: Kalligram, 1999. 231 p
- FRA SS Vol. 1/1 = Karajan, Georg (ed.). *Fontes Rerum Austriacarum. Österreichische Geschichtsquellen. Erste Abtheilung, Scriptores 1/1.* Johannes Tichtel's Tagebuch 1477-1495, Sigmunds von Herberstein Selbstbiographie 1486-1553, Johannes Cuspinian's Tagebuch 1502-1525, Georg Kirchmairs's Denkwürdigkeiten 1519-1553. Wien: Aus der Kaiserl. Königl. Hof- und Staatsdruckerei, 1855. 584 p
- FRA SS Vol. 6 = *Fontes rerum Austriacarum. Österreichische Geschichtsquellen. Erste Abtheilung, Scriptores 6. Geschichtschreiber der Husitischen bewegung in Böhmen.* Wien: Aus der Kaiserl. Königl. Hof- und Staatsdruckerei, 1865. 843 p
- FRA SS Vol. 8 = Loserth, Johann (ed.). *Fontes rerum Austriacarum. Erste Abtheilung, Scriptores 8.* Domherz Franz von Prag. Wien: Karl Gerold's sohn, 1875. 626 p
- Fraknói = Fraknói, Vilmos. Mátyás király levelei. Külügyi osztály (Letters of king Matthias. Foreign section) Vol. 1, 1458-1479. Budapest: Magyar Tudományos Akadémia, 1893. p
- Frisnyák, Sándor. Magyarország történeti földrajza. 2nd edition. Budapest: Tankönyvkiadó, 1992. 195 p
- Fügedi, Erik. A középkori Magyarország történeti demográfiája (Historical demography of Hungary). *Történeti Demografikai Füzetek* 10 (1992): 10-60
- Fügedi, Erik. Elephányt. The Hungarian Nobleman and his Kindred. English edition: Budapest: Central European University Press, 1998. 181 p
- Füköh, Levente. A Fertő-tó negyedidőszaki üledékeinek malakosztratigráfiai vizsgálata (Malakostratigraphical analysis of the Quaternary sediments of Lake Fertő). *Savaria* 20/2 (1991): 65-67
- Füzes, Miklós and Horváth, László. A vörsi Máriaasszony-szigeti templomrom és a Balaton hajdani vízszintje (Church ruins on Vörs-Máriaasszony-sziget and the past water level of Lake Balaton). *Földrajzi Értesíő* 20/2 (1971): 491-497
- Gábris, Gyula, Kertész, Ádám, and Zámbó, László. Land use change and gully formation over the last 200 years in a hilly catchment. *Catena* 50 (2003): 151-164
- Gerevich, László (ed.). Budapest története az őskortól az Árpád-kor végéig (History of Budapest from the Neolithic period until the end of the Arpadian period). Budapest története (History of Budapest) Vol. 1. Budapest: Budapest Főváros Tanácsa, 1973. 429 p
- Gerevich, László and Kosáry, Domonkos (eds. in chief). Budapest története a későbbi középkorban és a török hódoltság idején (History of Budapest in the late Middle Ages and the Turkish period). Budapest története (History of Budapest) Vol. 2. Budapest: Budapest Főváros Tanácsa, 1973. 469 p
- Glaser, Rüdiger. Klimgeschichte Mitteleuropas: 1000 Jahre Wetter, Klima, Katastrophen. Wiss. Darmstadt: Buchgesellschaft, 2001. 227 p
- Glaser, Rüdiger. Klimgeschichte Mitteleuropas: 1200 Jahre Wetter, Klima, Katastrophen. Darmstadt: Primus Verlag, 2008. 264 p
- Glaser, Rüdiger and Stangl, Heiko. Historical floods in the Dutch Rhine Delta. *Natural Hazards and Earth System Sciences* 3 (2003): 605-613
- Glaser, Rüdiger and Stangl, Heiko. Floods in Central Europe since 1300. Proceedings of the PHEFRA Workshop, 2004. pp. 93-98
http://www.ccma.csic.es/dpts/suelos/hidro/images/chapter_14_phefra.pdf
- Glaser, Rüdiger and Stangl, Heiko. Climate and floods in Central Europe since AD 1000: Data, Methods, Results and Consequences. *Survey in Geophysics* 25/5-6 (2005): 485-510
- Glaser, Rüdiger, Stangl, Heiko and Stang, Michael. Floods in Central Europe since AD 1300 and their regional context. *La Houille Blanche* 5 (2004): 43-49
- Glaser, Rüdiger, Riemann, Dirk, Schönbein, Johannes, Barriendos, Mariano, Brázdil, Rudolf, Bertolin, Chiara, Camuffo, Dario, Deutscher, Matthias, Dobrovolný, Petr and van Engelen,

- Aryan. The variability of European floods since AD 1500. *Climatic Change* 101 (2010): 235-256
- Goda, László and Vasvári, Vilmos. A Felső-Rába víz járásának statisztikai jellemzése (Statistical analysis of the upper Rába water course). *Vízügyi Közlemények* 79/4 (1997): 518-538
- Gombos, F. Albin. Catalogus Fontium Historiae Hungaricae. Aevum ducum et regum ex stirpe Arpad descendantium ab anno Christi DCCC usque ad annum MCCC. 3 Vols. Budapest: Stephaneum, 1937-1938
- Google earth (Europe Technologies / US Dept. of State Geographer / MapLink/Tele Atlas 2010-2011)
- Gusztáv, Jakab and Sümegi, Pál. The macrobotanical remains from Baláta-tó. In: Zatykó, Csilla, Juhász, Imola and Sümegi, Pál (eds.). Environmental archaeology in Transdanubia. *Varia Archaeologica Hungarica* 20. Budapest: Archaeological Institute of the Hungarian Academy of Sciences, 2007. p. 249
- Gusztáv, Jakab and Sümegi, Pál. The vegetation history of Baláta-tó. In: Zatykó, Csilla, Juhász, Imola and Sümegi, Pál (eds.). Environmental archaeology in Transdanubia. *Varia Archaeologica Hungarica* 20. Budapest: Archaeological Institute of the Hungarian Academy of Sciences, 2007. pp. 251-252
- Grynaeus, András. A szécsényi 92-5. számú XIII. századi kút faszerkezetének dendrokronológiai vissgalata (Dendrochronological analysis of the wooden structure of a 13th-century well No. 92-5 in Szécsény). Budapest, 1993. Unpublished MA thesis in the Eötvös Loránd University Library
- Grynaeus, András. Dendrológiai kutatások Magyarországon (Dendrological research in Hungary). Budapest, 1997. Unpublished PhD dissertation in the Eötvös Loránd University Library
- Gyárfás = Gyárfás, István. A jász-kunok története (History of Iaso-Cumans). Vols. 2-3. Kecskemét, Szolnok: Szilárd Károly fia, Bakos István, 1873, 1883. 487, 795 p
- Györffy, György. Magyarország népessége a XIV. század közepéig (Population of Hungary until the mid-14th century). In: Kovacsics, József (ed.). Magyarország történeti demográfiája. Magyarország népessége a honfoglalástól 1949-ig (Historical demography of Hungary. Population of Hungary from the conquest period to 1949). Budapest: Közgazdasági és jogi könyvkiadó, 1963. pp. 45-62
- Györffy, György. A honfoglalók száma és az Árpád-kor népessége (Number of conquerors and the population of the Arpadian period). In: Kovacsics, József. Magyarország történeti demográfiája 896-1995 (Historical demography of Hungary 896-1995). Budapest: Központi Statisztikai Hivatal, 1997. pp. 31-33
- Györffy, György. Az Árpád-kori Magyarország történeti földrajza (Historical geography of Hungary in the Arpadian Period). 4 Vols. Budapest: Akadémiai Kiadó, 1987-1998. 907, 646, 568, 714 p
- Györffy, György. Diplomata Hungariae Antiquissima. Budapest: Akadémiai Kiadó, 1992. 544 p
- Györffy, György and Zólyomi, Bálint. A Kárpát-medence és Etelköz képe egy évezred előtt (The Carpathian Basin and the 'Etelköz' a thousand years ago). In: Kovács, László. Honfoglalás és régészeti (Conquest and archaeology). Budapest: Balassi Kiadó, 1994. pp. 13-37
- Gyulai, Ferenc. A növénytermesztés emléke Fonyód-Bélátelep Árpád-kori településéről (Remains of plant cultivation in the Arpadian-period settlement, Fonyód-Bélátelep). *Veszprém Megyei Múzeumok Közleményei* 18 (1986): 135-158
- Gyulai, Ferenc. Honfoglalás és Árpád-kori növénytermesztés az archaeobotanika szemszögéből (Conquest- and Arpadian-period plant cultivation from the viewpoint of the

- archaeobotanical research). In: A középkori agrárium (The medieval agricultural regime). Ópusztaszer: Nemzeti Történeti Emlékpark Kht., 2000. pp. 45-70
- Gyuró, György and Tóth, Tamás. Blokkoló anticiklonok szerepe nagy csapadékmennyiséggel járó időjárási helyzetek kialakulásában (The significance of blocking anticyclones). *Léhkör* 53/3 (2008): 14-18
- Haan = Haan, Lajos. Békés vármegye hajdانا / Diplomatarium Békessiense. 2 Vols. Pest [Budapest]: Lauffer Vilmos, 1870. 309 p
- Haan, Lajos and Zsilinszky, Mihály. Békés megyei Oklevélár számos hazánk belterületére vonatkozó adatokkal / Monumenta Diplomatica Comitatus Békésiensis. Budapest: Tettey Nándor, 1877. 275 p
- Hajós, Ferenc. Adatok a Tisza vízgyűjtőjének csapadékvisszonyaihoz (Data on the precipitation conditions of the Tisza catchment). Az Országos Meteorológiai Intézet Kisebb Kiadványai 29. Budapest: Akadémiai Kiadó, 1954. 56 p.
- Hamar, József and Sárkány-Kiss, Andrei. The Maros/Mureş River Valley. A study of the geography, hydrobiology and ecology of the river and its environment. Szolnok-Szeged-Tîrgu Mureş: Tisza Klub, 1995. 257 p
- Havassy, Péter. Határjárások és határjelek a középkori Békés vármegyében (Perambulations and landmarks in medieval Békés county). *A Békés Megyei Múzeumok Közleményei* 23 (2002): 459-480
- Hazai = Nagy, Imre, Páur, Iván, Ráth, Károly and Véghely, Dezső. Hazai okmánytár/Codex Diplomaticus Patrius. Győr: Sauervein Géza betűivel, 1865. Vol. 1. 447 p
- Házi, Jenő. Pozsony vármegye középkori földrajza (Medieval geography of Pozsony county). Pozsony [Bratislava]: Kalligram, 2000. 614 p
- Henson, Robert. The rough guide to Climate Change. The Symptoms, The Science. The Solutions. London-New York: Penguin Books, 2006. pp. 210-216
- Héjj, Miklós. Település földrajzi megfigyelések. Visegrád a 14-16. százaban (Observations concerning settlement geography. Visegrád in the 14th-16th centuries). In: Köblös, József (ed.). Visegrád 1335. Tudományos tanácskozás a viségrádi királytalálkozó 650. évfordulóján (Scientific workshop on the 650th anniversary of the Visegrád royal meeting). Budapest: Pest Megyei Levéltár, 1988. pp. 47-62
- Hodinka, Antal. Az orosz évkönyvek magyar vonatkozásai. „Az orosz évkönyvek teljes gyűjteménye” kötetéiből a M. Tud. Akadémiai történelmi bizottságának megbízásából (Hungarian references in the Russian annals. From the volumes of the full collection of Russian annals, on the behalf of the historical committee of the Hungarian National Academy). Budapest: Magyar Tudományos Akadémia, 1916. 510 p
- Horváth, Zoltán György and Gondos, Béla. A Balatontól a Bakonyig. Veszprém megye középkori templomai a teljesség igényével / In den Bergen nördlich vom Plattensee. Mittelalterliche Kirchen im Komitat Veszprém / Among the Hills to the North of Balaton. Medieval Churches of Veszprém County. Budapest: Romanika, 2005. pp. 147, 184-185, 202-203
- HP = Dlugossi, Ioannis [...]. Historiae Polonicae libri XII. Lipsiae [Leipzig]: sumptibus Ioannis Ludovici Gleditschii et Mauriti Georgii Weidmanni, 1711. Vol. 10, p. 80
- <http://nimbus.elte.hu/kutatas/sat/cs/2006/floods2006.html#>
- <http://webworld.unesco.org/water/ihp/db/glossary/glu/EN/GF0699EN.HTM>
- Hunyadi, Zsolt. Administering the Law: Hungary's *Loca credibilia*. In: Rady, Martyn (ed.). Custom and law in Central Europe. Central European Legal Studies Occasional Paper no 6. Cambridge: Faculty of Law, University of Cambridge, 2003. pp. 25-36
- Ihrig, Dénes. Az 1956. évi dunai jeges árvíz Magyarországon (Ice flood in Hungary in 1956). *Vízügyi Közlemények* 4 (1956): 400-418

- Ihrig, Dénes. A magyar vízszabályozás története (History of water regulations). Budapest: VITUKI, 1973. 398 p
- Ila, Bálint and Borsa, Iván. Az Abaffy-Dancs-Hanvay családok levéltárai (Chartulary of the Abaffy-Danch-Hanvay families). Budapest: Akadémiai Kiadó, 1993. 240 p
- Imrédi-Molnár, László. Adatok a XVII. századi és a korábbi idők magyar térképtörténetéhez (Data to the Hungarian map history of the 17th century and before). *Földrajzi Értesítő* 15/2 (1966): 263-273
- Jackson, Peter. The Mongols and the West 1221-1410. Harlow-London-New York: Pearson, 2005. 414 p
- Jakab, Gusztáv and Sümegi, Pál. The macrobotanical remains from Baláta-tó. In: Zatykó, Csilla, Juhász, Imola and Sümegi, Pál (eds.). Environmental archaeology in Transdanubia. Varia Archaeologica Hungarica 20. Budapest: Archaeological Institute of the Hungarian Academy of Sciences, 2007a. pp. 247-250
- Jakab, Gusztáv and Sümegi, Pál. The vegetation history of Baláta-tó. In: Zatykó, Csilla, Juhász, Imola and Sümegi, Pál (eds.). Environmental archaeology in Transdanubia. Varia Archaeologica Hungarica 20. Budapest: Archaeological Institute of the Hungarian Academy of Sciences, 2007b. pp. 251-253
- Jacobeit, Jucundus, Glaser, Rüdiger, Luterbacher, Jürg and Wanner, Heinz. Links between flood events in central Europe since AD 1500 and large-scale atmospheric circulation modes. *Geophysical Research Letters* 30/4 (2003): 1172, doi: 10.1029/2002GL016433. 4 p
- Jakó, Zsigmond. A kolozsmonostori konvent jegyzőkönyvei (Protocols of the Kolozsmonostor convent). 2 Vols. Budapest: Akadémiai kiadó, 1990. 1082 p
- Jakó, Zsigmond. Erdélyi okmánytár (Transylvanian chartulary). Vol. 3. Magyar Országos Levéltár Kiadványai 2, Forráskiadványok 47. Budapest: Magyar Országos Levéltár, 2008. 640 p
- Jakubwski-Tiessen, Manfred. Erschreckliche und unerhörte Wasserflut. Wahrnehmung und Deutung der Flutkatastrophe von 1634. In: Jakubwski-Tiessen, Manfred and Lehmann, Hartmut (eds.). Um Himmels Willen. Religion in Katastrophenzeiten. Göttingen: Vandenhoeck&Ruprecht, 2003, pp. 179-200
- Jankovich, B. Dénes. Adatok a Körösvidék középkori vízrajzához és a vizek hasznosításához (Data to the medieval hydrography and utilisation of waters in the Körös area). *A Békés Megyei Múzeumok Közleményei* 16 (1996): 305-349
- Joó, István. A földfelszín magassági irányú mozgásai Magyarországon (Vertical movements of the ground surface in Hungary). *Geodézia és Kartográfia* 4 (1996): 6-12
- Jordan, William Chester. The Great Famine. Northern Europe in the early fourteenth century. Princeton: University Press, 1998. 317 p
- Juhász, Imola. The pollen sequence from Baláta-tó. In: Zatykó, Csilla, Juhász, Imola and Sümegi, Pál (eds.). Environmental archaeology in Transdanubia. Varia Archaeologica Hungarica 20. Budapest: Archaeological Institute of the Hungarian Academy of Sciences, 2007. pp. 246-247
- Kadlec, J., Grygar, T., Světlík, I., Ettler, V., Mihaljevič M., Diehl, J. F., Beske-Diehl, S. and Svitavská-Svobodá, H. Morava River floodplain development during the last millennium, Strážnické Pomoraví, Czech Republic. *The Holocene* 19/3 (2009): 499-509
- Karbić, Damir. Hungarian and Croatian Customary Law: Some Contrasts and Comparisons. In: Rady, Martyn (ed.). Custom and law in Central Europe. Central European Legal Studies Occasional Paper no 6. Cambridge: Faculty of Law, University of Cambridge, 2003. pp. 37-46
- Kardos, Tibor (ed.). Janus Pannonius versei (Poems of Janus Pannonius). Budapest: Szépirodalmi Könyvkiadó, 1972. 296 p

- Kardos, Tibor. Janus Pannonius hivatástudata és költészete (Profession and poetry of Janus Pannonius). In: Kardos, Tibor and V. Kovács, Sándor (eds.). *Janus Pannonius*. Budapest: Akadémiai Kiadó, 1975. pp. 11-64
- Katona, István. A kalocsai érseki egyház története (History of the Kalocsa archbishopric). Vol. 1. Kalocsa: Viski Károly Múzeum, 2001. 303 p
- Kállay = Szentpétery, Imre. A Nagykállói Kállay-család levéltára (Chartulary of the Kállay family of Nagykálló). 2 Vols. A magyar heraldikai társaság kiadványai 1. Budapest: Franklin-társulat nyomdája, 1943, 1883. 301, 578 p
- Károly, János. Fejér vármegye története (History of Fejér county). Vol. 1. Székesfehérvár: Csitári K. és Társa, 1898. 503 p
- Károlyi = Géresi, Kálmán. A Nagy-Károlyi gróf Károlyi család oklevéltára / Codex diplomaticus comitum Károlyi de Nagy-Károly. Budapest: Kocsi Ny., 1882. Vol. 1. 620 p
- Károlyi, Zoltán. A Fertő és Hanság vízügyi kérdéseinek mai állása (Present situation of the hydrological problems related to the Fertő and the Hanság). In: Stelczer, Károly (ed.). Beszámoló a Vízgazdálkodási Tudományos Kutató Intézet 1964. évi munkájából (Account on the work of the Hydrological Research Institute in 1964). Budapest: Vízgazdálkodási Tudományos Kutató Intézet, 1966. pp. 170-187
- Kirchstein, Bettina, Schulze, Ursula, Ohly, Sybille, Schmitt, Peter and Spengler, Nicole. Wörterbuch der Mittelhochdeutschen Urkundensprache. Vols. 1, 3. Berlin: Erich Schmidt Verlag, 1994, 2003. 864, 1728 p
- Kiss, Andrea. Some weather events from the fourteenth century (1338-1358). *Acta Climatologica Universitatis Szegediensis* 30 (1996): 61-69
- Kiss, Andrea. A 14. századi Magyar Királyság klímájának vizsgálata (Analysis on the 14th-century climate of Hungary). *Egyetemi Meteorológiai Füzetek* 10 (1997): 238-241
- Kiss, Andrea. Changing environmental conditions and the waterlevel of Lake Fertő (Neusiedlersee) before the drainage works (13th-18th centuries). In: Annual of Medieval Studies at CEU 1997-1998. Ed. Szende, Katalin. Budapest: Archaeolingua, 1998a. 241-248
- Kiss, Andrea. Historical study of the Changing Landscape of Lake Fertő/Neusiedl during the Late Middle Ages (12th-15th centuries). Budapest, 1998b. Unpublished MA thesis in the Central European University Library
- Kiss, Andrea. Some weather events in the fourteenth century II (Angevin period: 1301-1387). *Acta Climatologica Universitatis Szegediensis* 32-33 (1999a): 51-64
- Kiss, Andrea. A Fertő-tó partvidékének írott források alapján rekonstruálható tájviszonyai a késő-középkortól a szabályozások megkezdéséig (Landscape conditions of the Fertő-shoreline from the Late Middle Ages to the beginning of water regulation works, based on documentary evidence). In: Füleky, György (ed.). A táj változásai a Kárpát-medencében (Landscape changes in the Carpathian Basin). Gödöllő: GATE, 1999b. 215-221
- Kiss, Andrea. A Fertővel kapcsolatos vitás földrajzi kérdések középkori okleveleinkben (Geographical questions related to the Fertő in medieval charters). *Soproni Szemle* 53/1 (1999): 53-62
- Kiss, Andrea. Időjárási adatok a XI-XII. századi Magyarországról (Weather data from the 11th-12th-century Hungary). In: Piti, Ferenc and Szabados, György (eds.). "Magyaroknak eleiről" (About the ancestors of Hungarians). Szeged: Szegedi Középkorász Műhely, 2000. pp. 249-263
- Kiss, Andrea. Hydrology and environment in the southern basin of Lake Fertő/Neusiedl in the late Middle Ages. *Medium Aevum Quotidianum* 44 (2001): 61-77

- Kiss, Andrea. Study on the historical geography of the first extent perambulation sketch from the Carpathian Basin. *Zbornik Odsjeka za povijesne znanosti ZPDZ HAZU* 19 (2002): 127-141
- Kiss, Andrea. Utilisation of the inundation area at Lake Fertő before regulation works: Example of Sarród and its surroundings. *Acta Geographica Universitatis Szegediensis* 38 (2005a): 39-49
- Kiss, Andrea. Vízfolyások a nagy tavak medencéiben: Fertő és Balaton folyó? (Waterflows in the basins of the great lakes: Fertő and Balaton rivers?). In: Füley, György (ed.). *Víz a tájban* (Water in the landscape). Gödöllő: GATE, 2005b. pp. 325-331
- Kiss, Andrea. Fertő River – A low water level signal or something else? *Chronica* 6 (2006): 141-152
- Kiss, Andrea. 'Suburbia autem maxima in parte videntur esse deleta' – Danube ice floods and the pitfalls of urban planning: Pest and its suburbs in 1768-1799. In: Kovács, Csaba (ed.). *From villages to Cyberspace*. Szeged: University Press, 2007. pp. 271-282
- Kiss, Andrea. A 'Millennium' FP6 EU projekt – Magyarországi írott források az európai ezeréves klímarekonstrukcióban (The FP-6 Millennium EU project – Application possibilities of Hungarian documentary evidence in the millennial European climate reconstruction). In: *IV. Magyar Földrajzi Konferencia tanulmánykötet* (Scientific studies of the fourth Hungarian conference of Geography). Debrecen: Debreceni Egyetem, 2008. pp. 163-169. http://www.geo.u-szeged.hu/pdf/KissA_millenium.pdf
- Kiss, Andrea. Historical climatology in Hungary: Role of documentary evidence in the study of past climates and hydrometeorological extremes. *Időjárás* 113/4 (2009a): 315-339
- Kiss, Andrea. „*Rivulus namque, qui dicitur Fuk, fluens de prefatu lacu*” – Fok, Sár, Foksár. (*Rivulus namque, qui dicitur Fuk, fluens de prefatu lacu* – The river named Fok, Sár, Foksár at Lake Balaton). In: Andrásfalvy, Bertalan and Vargyas, Gábor (eds.). *Antropogén ökológiai változások a Kárpát-medencében* (Ecological changes of anthropogenic origin in the Carpathian Basin). Budapest: PTE Néprajz–Kulturális Antropológia Tanszék–L'Harmattan, 2009b. pp. 49-63
- Kiss, Andrea. Floods and weather in 1342 and 1343 in the Carpathian Basin. *Journal of Environmental Geography* 2/3-4 (2009c): 37-47
- Kiss, Andrea. Climate variability of the past millennium in Hungary (Editorial). *Időjárás* 113/4 (2009d): I-II
- Kiss, Andrea. Az 1340-es évek árvizei, vízállás-problémái és környezetük, különös tekintettel az 1342. és 1343. évekre (Floods and water-level problems of the 1340s and their environment, with special emphasis on the years 1342 and 1343). In: Almási, Tibor, Szabados, György and Révész, Éva (eds.). *Fons, skepsis, lex*. Szeged: SZTE Történeti Segédtudományok Tanszék–Szegedi Középkorász Műhely, 2010. 181-193
- Kiss, Andrea. Árvizek és magas vízsintek a 13-15. századi Magyarországon az egykorú írott források tükrében: Megfoghatók-e és mi alapján foghatók meg rövid, közép és hosszú távú változások? In: Kázmér, Miklós (ed.). *Környezettörténet* (Environmental history). Budapest, 2011. 15 p (in press)
- Kiss, Andrea and Paszternák, István. Hol volt Urkony? Történeti földrajzi és régészeti adalékok egy középkori falu topografiájához (Where was Urkony located? Historical geographical and archaeological data to the topography of a medieval village). *Soproni Szemle* 52/4 (2000): 402-419
- Kiss, Andrea and Piti, Ferenc. A fertői fok (The 'fok' of the Fertő). *Soproni Szemle* 59/2 (2005): 164-184
- Kiss, Andrea and Wolf, Berta. Az 1856. évi kataszteri felmérés és a Dél-Alföld tájhasználata a 19. század közepén. *Soproni Szemle* 63/2 (2009): 203-217

- Kiss, Andrea, Sümeghy, Zoltán and Danku, György. Az 1783-1784. évi szélőséges tél és a Maros jeges árvize (Severe winter of 1783-1784 and the ice flood on the Maros river). In: Kiss, Andrea, Mezősi, Gábor and Sümeghy, Zoltán (eds.). Táj, környezet és társadalom / Landscape, Environment and Society. Szeged: SzTE, 2006. pp. 353-362
- Kiss, Andrea, Wilson, Rob and Bariska, István. An experimental 392-year documentary-based multi proxy (vine and grain) reconstruction of May-July temperatures for Kőszeg, West-Hungary. *International Journal of Biometeorology* (2010) doi 10.1007/s00484-010-0367-4
- Kiss, Andrea, Barta, Károly, Sümeghy, Zoltán and Czinege, Anett. Historical land use and anthropogenic features: A case study from Nagymaros. *Acta Climatologica* 38-39 (2005): 111-124
- Klaniczay, Gábor. Holy Rulers and Blessed Princesses. Dynastic Cults in Medieval Central Europe. Cambridge: University Press, 2002. 400 p
- Klaniczay, Gábor. Raccolte di miracoli e loro certificazione nell'Europa centrale. In: Michetti, Raimondo (ed.). Notai, miracoli e culto dei santi. Milano: Dott. A Giuffrè editore, 2004. pp. 259-288
- Klaniczay, Gábor. Kísérletek Árpád-házi Szent Margit szentté avatására (Attempts for the beatification of Saint Margit of Arpad). *Századok* 140/2 (2006): 443-453
- Klaniczay, Tibor and Klaniczay, Gábor. Szent Margit legendái és stigmái (Legends and stigmas of Saint Margit). Budapest: Argumentum Kiadó, 1994. pp. 154-157
- Konecsny, Károly. Water developments and their impact on runoff in the Upper Tisa catchment. In: Hamar, József and Sárkány-Kiss, Andrei (eds.). The Upper Tisa Valley. Tischa monograph series. Szeged: Tisza Club&Liga Pro Europa, 1999. pp. 309-338.
- Kopf, Fritz. Wasserwirtschaftliche Probleme des Neusiedler Sees und des Seewinkels. *Österreichische Wasserwirtschaft* 15 (1963): 190-203
- Koszta, László. Püspöki székhely és városfejlődés (Episcopal seat and urban development). In: Koszta, László (ed.). Kelet és Nyugat között (Between East and West). Szeged: Szegedi Középkorász Múhely, 1995. pp. 233-271
- Koszta, László. A pécsi székeskáptalan hiteleshelyi tevékenysége 1214-1353 (The Pécs chapter as a place of authentication/loca credibilia 1214-1353). Tanulmányok Pécs történetéből 4, Pécs: Pécs története alapítvány, 1998. 324 p
- Königreich Ungarn. The First Military Survey / Die Erste Militärische Aufnahme / Az Első Katonai Felmérés 1763-1785. Series: Digitized Maps of the Habsburg Empire. Budapest: Arcanum, 2006. (DVD-ROM)
- Königreich Ungarn. The Second Military Survey / Die Zweite Militärische Aufnahme / A Második Katonai Felmérés 1806-1869. Series: Digitized Maps of the Habsburg Empire. Budapest: Arcanum, 2006. (DVD-ROM)
- Körmendy, Adrienne. Melioratio terrae. Vergleichende Untersuchungen über die Siedlungsbewegung im östlichen Mitteleuropa im 13.-14. Jahrhundert. Poznań: Wydawnictwo Poznańskiego Towarzystwa Przyjaciół Nauk, 1995. 274 p
- Kőfalvi, Tamás. A diplomatiakai források kiadásának kérdései és példái Magyarországon (Questions and examples of source edition in medieval diplomatics of Hungary). n.d., 20 p <http://www.staff.u-szeged.hu/~kofalvi/forraskiadas.pdf>
- Kőfalvi, Tamás. A hiteleshelyek egyháztörténeti tanulságai (Conclusions for church history based on loca credibilia information). *Egyháztörténeti Szemle* 1/1 (2000): 49-64
- Kőfalvi, Tamás. Places of Authenticaton (loca credibilia). *Chronica* 2 (2002): 27-38
- Kőfalvi, Tamás. A pécsváradi konvent hiteleshelyi levéltára 1254-1526 (Archives of the Pécsvárad convent 1254-1526). Szeged: SZTE, 2006. 450 p
- Kristó, Gyula. Az Árpád-kor háborúi (Wars of the Arpadian period). Budapest: Zrínyi Kiadó, 1986. 326 p

- Kristó, Gyula. Az Anjou-kor háborúi (Wars of the Angevin period). Budapest: Zrínyi Kiadó, 1988. 294 p
- Kristó, Gyula. Magyarország lélekszáma az Árpád-korban (Population of Hungary in the Arpadian period). In: Kovacsics, József (ed.). Magyarország történeti demográfiája 896-1995 (Historical demography of Hungary 896-1995). Budapest: Központi Statisztikai Hivatal, 1997. pp. 35-65
- Kristó, Gyula (ed.). Az államalapítás korának írott forrásai (Written sources from the period of the establishment of the kingdom). Szegedi Középkortörténeti Könyvtár 15. Szeged, 1999. 429 p
- Kristó, Gyula. Nem magyar népek a középkori Magyarországon (Non-Hungarian people in medieval Hungary). Budapest: Lucidus Kiadó, 2003. 313 p
- Kristó, Gyula, Engel, Pál and Makk, Ferenc (eds.). Korai magyar történeti lexikon 9-14. század (Early Hungarian historical lexicon 9th-14th centuries). Budapest: Akadémiai Kiadó, 1994. 753 p
- Kubinyi, András. A Magyar Királyság népessége a 15. század végén (Population of the Hungarian Kingdom at the end of the 15th century). *Történelmi Szemle* 28 (1996): 135-161
- Kubinyi, András. A magyar királyság népessége a 15. század végén (Population of the Hungarian Kingdom at the end of the 15th century). In: Kovacsics, József (ed.). Magyarország történeti demográfiája 896-1995 (Historical demography of Hungary 896-1995). Budapest: Központi Statisztikai Hivatal, 1997. pp. 93-110
- Kubinyi, András. Vitéz János és Janus Pannonius politikája Mátyás uralkodása idején (The Politics of János Vitéz and Janus Pannonius During the Reign of King Matthias). In: Bertók, István, Jankovits, László and Kecskeméti, Gábor (eds.). Humanista műveltség Pannóniában (Humanist culture in Pannonia). Pécs: Művészetei Háza, Pécsi Tudományegyetem, 2000. pp. 7-26
- Kücsán, József. Hol termett a soproni bor? Sopron szőlőskertjei a 17-18. században (Where were the Sopron wine produced? Vineyards of Sopron in the 17th-18th centuries). *Soproni Szemle* 53/1 (1999): 5-20
- Lamb, Hubert Horace. Climate, history and the modern world. London: Routledge, 1995. 400 p
- Laszlovszky, József. "Dedi eciam terram, que adiacet circa aquam, que vocatur Tisa": Adatok az 1075-ös garamszentbenedeki oklevél helyneveinek lokalizálásához (Data to the localisation of the place names in the charter of Garamszentbenedek dated to 1075). *Zounuk* 1 (1986): 5-24
- Lászlóffy, Woldemár. A Tisza. Vízi munkálatok és vízgazdálkodás a tiszai vízrendszerben (Waterworks and water management in the Tisza hydrological systems). Budapest: Akadémiai Kiadó, 1982. 609 p
- Lexer, Matthias. Mittelhochdeutsches Taschenwörterbuch. Leipzig: S. Hirzel Verlag, 1974. 504 p
- LexLat = Harmatta, János, Boronkai, Iván and Szovák, Kornél (eds.). A magyarországi középkori latinság szótára / Lexicon Latinitatis Medii Aevi Hungariae. Budapest: Akadémiai Kiadó-Argumentum Kiadó, 1983-1999. Vol. 1-5
- Lindeck-Pozza, Imtraut. Urkundenbuch des Burgenlandes. Vol. 4. Wien-Köln-Graz: Böhlau, 1985. 446 p
- Lovász, György. A Dráva-Mura vízrendszer vízjárási és lefolyási viszonyai (Water course and discharge of the Drava-Mura system). Budapest: Akadémiai Kiadó, 1972. 158 p
- Lovász, György. Általános vízrajz (General hydrography). Pécs University Press, 2000. p. 108
- Lukács, Károly. Fok-Sár-Sió-Siófok. *Magyar Nyelv* 47 (1952): 255-266
- Lukács, Károly. Adatok a Fertő és a Rábaköz halászatának történetéhez (Data to the history of fishery of Lake Fertő and the Rábaköz area). *Ethnographia* 64 (1953): 282-290

- Lukcsics, Pál. XV. századi pápák oklevelei / Diplomata pontificum saec. XV. Tomus 1. Olaszországi Magyar Oklevélétár / Monumenta Hungariae Italica 1. Budapest: Magyar Tudományos Akadémia, 1931. 317 p
- Macklin, Mark G., Johnstone, Eric and Lewin, John. Pervasive and long-term forcing of Holocene river instability and flooding in Great Britain by centennial-scale climate change. *The Holocene* 15/7 (2005): 937-943
- Macklin, Mark G., Benito, Gerardo, Gregory, K.J., Johnstone, Eric, Lewin, John, Michczyńska, D.J., Soja, R., Starkel, Leszek and Thorndycraft, Varyl R. Past hydrological events reflected in the Holocene fluvial record of Europe. *Catena* 66 (2006): 145-154
- Maksay, Ferenc. A magyar falu középkori településrendje (Medieval settling order of the Hungarian village). Budapest: Akadémiai Kiadó, 1971. 237 p
- Maksay, Ferenc, Fehér, Ibolya, W. Beretzky, Nóra and T. Polonyi, Nóra. Urbáriumok XVI-XVII. század (Urbaria from the 16th-17th centuries). MOL kiadványai 2. sorozat: Forráskiadványok 7, Budapest: Magyar Országos Levéltár, 1959. 895 p
- Marsina, Richard. Codex diplomaticus et epistolaris Slovaciae. Tomus 2. Inde ab a. MCCXXXV usque ad a. MCCLX. Bratislava: Ozbor, 1987. 608 p
- Marx, Mária: Húsvéti határjárás Zalaegerszegen (Easter perambulation in Zalaegerszeg). *Zalai Múzeum* 10 (2001): 239-245
- Mayhew, Susan. Oxford Dictionary of Geography. Second edition. Oxford: University Press, 1997. p. 175
- Mályusz, Elemér. A szlavóniai és horvátországi középkori pálos kolostorok oklevelei az országos levéltárban (Medieval charters of the Paulaner cloisters on Slavonia and Croatia in the National Archives). *Levéltári Közlemények* 9 (1931): 284-315.
- Mályusz, Elemér. Egyházi társadalom a középkori Magyarországon (Church society in medieval Hungary). 2nd, extended edition. Edited by Homonnai, Sarolta and Koszta, László. Budapest: Műszaki Kiadó, 2007. 457 p
- McP = Dreska, Gábor. A pannonhalmi konvent hiteleshelyi működésének oklevéltára / Monumenta credibilia conventus de monte Pannoniae. 3 Vols. A Győri Egyházmegyei Levéltár Kiadványai: Források, feldolgozások 6. Győr, 2007-
- Mészáros, Orsolya. Késő középkori ház Visegrád polgárvárosában – Fő utca 32. (Birkl-telek). Héjj Miklós és Parádi Nándor ásatása, 1963 (Late medieval house in the civil town of Visegrád – Fő utca 32. Birkl-yard. The excavation of Miklós Héjj and Nándor Parádi). *Archaeologiai Értesítő* 131/1 (2006): 145-168
- Mészáros, Orsolya. Visegrád késő középkori város története és helyrajza (Late medieval history and topography of Visegrád town). PhD dissertation. Theses. University of Debrecen, Faculty of Arts, 2008. p. 7
- MGH Dt. Chron. Vol 5/1 = Monvmenta Germaniae Historica. Deutsche Chroniken und andere Geschichtsbücher des Mittelalters. Vol. 5: Ottokars Österreichische Reimchronik. Vol. 1. Hannover: Hahnische Buchhandlung, 1890. 720 p
- MGH SS Vol. 3 = Pertz, Georg H.. (ed.). Monvmenta Germaniae Historica. Vol. 3: Annales, chronica et historiae aevi Saxonici. Hannover: Impensis Bibliopolii Hahniani, 1839. 920 p
- MGH SS Vol. 5 = Pertz, Georg H.. (ed.). Monvmenta Germaniae Historica. Vol. 5: Annales, chronica et historiae aevi Salici. Hannover: Impensis Bibliopolii Hahniani, 1844. 598 p
- MGH SS Vol. 9 = Pertz, Georg H.. (ed.). Monvmenta Germaniae Historica. Vol. 9: Chronica et annales aevi Salici. Hannover: Impensis Bibliopolii Hahniani, 1851. 910 p
- MGH SS Vol. 17 = Pertz, Georg H.. (ed.). Monvmenta Germaniae Historica. Vol. 17: Annales aevi Suevici. Hannover: Impensis Bibliopolii Hahniani, 1861. 908 p
- MGH SS Vol. 23 = Pertz, Georg H.. (ed.). Monvmenta Germaniae Historica. Vol. 23: Chronica aevi Suevici. Hannover: Impensis Bibliopolii Hahniani, 1874. 1028 p

- MGH SS Vol. 27 = Pertz, Georg H.. (ed.). Monvmenta Germaniae Historica. Vol. 27. Ex rerum Anglicarum scirptoribus saec. XII. et XIII. Hannover: Impensis Bibliopolii Hahniani, 1885. 590 p
- MGH SS rer. Germ. Vol. 11 = Pertz, Georg H.. (ed.). Monumenta Germaniae Historica. Scriptores rerum Germanicarum in usum scholarum. Vol. 11: Annales Polonae. Hannover: Impensis Bibliopolii Hahniani, 1866. 120 p
- MGH SS rer. Germ. Vol. 36/2 = Schneider, Fedor (ed.). Monumenta Germaniae Historica. Scriptores rerum Germanicarum in usum scholarum. Vol. 36/2: Iohannis Abbatis Victoriensis Liber certarum historiarum. Hannoverae et Lipsiae [Hannover-Leipzig]: Impensis Bibliopolii Hahniani, 1910. 343 p
- MGH SS rer. Germ. Vol. 61 = Bresslau, Harry (ed.). Monumenta Germaniae Historica. Scriptores rerum Germanicarum in usum scholarum. Vol. 61: Wiponis opera. Hannoverae et Lipsiae [Hannover-Leipzig]: Impensis Bibliopolii Hahniani, 1915. 127 p
- MGH SS rer. Germ. N.S. Vol. 2 = Monvmenta Germaniae Historica. Scriptores rervm Germanicarvm nova series. Vol. 2: Cosmae Pragensis Chronica Boemorvm. Berolini [Berlin]: Apvd Weidmannos, 1923. 296 p
- MGH SS rer. Germ. N.S. Vol. 3. = Monvmenta Germaniae Historica. Scriptores rervm Germanicarvm nova series. Vol. 3: Chronica Iohannis Vitodurani. Berolini [Berlin]: Apvd Weidmannos, 1924. 332 p
- MHHD = Horváth, Mihály. Magyar történelmi okmánytár a Brüsseli országos levéltárból és a Burgundi könyvtárból. Magyar történelmi emlékek. Első osztály: Okmánytárak. / Monumenta Hungariae Historica. Diplomatária. Vol. 4. Pest: Magyar Tudományos Akadémia Történelmi Bizottsánya, 1859. 323 p
- MHJ = Friss, Ármin. Magyar zsidó okmánytár / Monumenta Hungariae Judaica. Vol. 1. Budapest: Wodiarer F. és fiai bizománya, 1903. 524 p
- Migne, Jacques-Paul (ed.). Patrologia Latina. Vol. 185, Paris: n.p., 1855. pp. 21-23
- Mihály, Péter. Régészeti kutatások a Hanságban I., II (Archaeological investigations in the Hanság/Wesen). *Soproni Szemle* 25/1, 2 (1971): 17-28, 109-128
- Mihály, Péter. Egy középkori határijárás történetének birtoklástörténeti vissgalata. Adatok Cserépváralja és Cserépfalu történetéhez (Examination of medieval boundary inspection. Data on the history of Cserépváralja and Cserépfalu). *Geodézia és Kartográfia* 50/9 (2000): 27-32
- Millennium project: European Climate of the Last Millennium: <http://137.44.8.2/>
- Mollay, Károly. Sopron a középkor végén (Sopron at the end of the Middle Ages). *Soproni Szemle* 10/1 (1956): 31-42
- Mollay, Károly. Középkori háztörténet és várostörténet (Medieval house- and urban history). *Soproni Szemle* 43/1-3 (1989): 18-40, 126-148, 205-224.
- Mollay, Károly. A Tómalom középkori előzményei (Medieval antecedents of the Tómalom). *Soproni Szemle* 46/2 (1992): 150-162
- Mollay, Karl (ed.). Die Denkwürdigkeiten der Helene Kottannerin (1439-1440). Neuauflagen und Erstrucke deutscher literatischer Texte. Band. 2. Wien: Österreichischer Bundesverlag (Für Unterricht, Wissenschaft und Kunst), 1971. Wiener Neudrucke. 95 p
- Molnár, Antal. A báta apátság és népei a török korban (The Báta Abbey and its people in the Turkish period). Budapest: METEM, 2006. 169 p
- Moravcsik, Gyula. Az Árpád-kori magyar történet bizánci forrásai / Fontes Byzantini historiae Hungaricae aevo ducum et regum ex stirpe Árpád descendientium. 2nd edition. Budapest: Akadémiai Kiadó, 1988. 363 p
- Mordovin, Maxim. Késő-középkori udvarház Zalavár-Réceskúton (A late-medieval manor house in Zalavár-Réceskút). *Castrum* 5/1 (2007): 65-76

- MREV = Lukcsics, József. *Monumenta Romana Episcopatus Vesprimiensis*. Vol. 1. 1103-1276. Budapest: Franklin Társulat, 1896. 874 p
- Mudelsee, Manfred, Deutsch, Matthias, Börngen, Michael and Tetzlaff, Gerd. Trends in flood risk of the River Werra (Germany) over the past 500 years. *Hydrological Sciences Journal* 51/5 (2006): 818-833
- MVH Vol. 1/1 = Pápai tizedszedők számadásai / Rationes collectorum pontificorum in Hungaria. 1281-1375. In: Várszegi, Asztrik and Zombori, István (eds.). Vatikáni Magyar Okmánytár / *Monumenta Vaticana Historiam Regni Hungariae Illustrantia* Vol. 1/1new edition. Budapest: METEM, 2000. 520 p
- MVH Vol. 1/4 = IX. Bonifác pápa bullái / Bullae Bonifacini IX. P. M. Vol. 2. In: Várszegi, Asztrik and Zombori, István (eds.). Vatikáni Magyar Okmánytár / *Monumenta Vaticana Historiam Regni Hungariae Illustrantia* Vol. 1/4. New edition. Budapest: METEM, 2000. 275 p
- MVH Vol. 1/6 = Máryás király levelezése a római pápákkal / *Mathiae Corvini Hungariae regis epistolae ad Romanos pontifices datae et ab eis acceptae*. 1458-1490. In: Várszegi, Asztrik and Zombori, István (eds.). Vatikáni Magyar Okmánytár / *Monumenta Vaticana Historiam Regni Hungariae Illustrantia* Vol. 1/6. New edition. Budapest: METEM, 2000.
- Nagy, Balázs (ed.). Tatárjárás (The great Mongol invasion). Budapest: Osiris, 2003. 638 p
- Nagy, Balázs. A középkori magyar városok a külföldi utazók leírásaiban (Medieval Hungarian towns in the description of foreign travelers) *Koral* 2009 (38): 79-90
- Nagy, Imre. A Fertő régi áradásai (Past floods of the Fertő). *Századok* 1 (1869): 690-709
- Nagy, Iván and B. Nyáry, Albert. Magyar diplomaciai emlékek Mátyás király korából 1458-1490 (Documents of Hungarian diplomatics from the time of King Matthias 1458-1490). Vol. 2. Budapest: M. T. Akadémis Könyvnyomda, 1877. 489 p
- Nagyné Bodor, Elvira and Cserny, Tibor. A balatoni öblök vízborítottságának összehasonlító fejlődéstörténete a palinológiai vizsgálatok alapján (Comparative history of water cover of Balaton bays based on palinological analyses). *Hidrológiai Közlöny* 78/5-6 (1998): 360-363
- Nagyváradi, László. Klímaváltozások következményeként fellépő extrém árvizek kimutatása árvízi üledékekkel a Dunán és magyarországi mellékfolyóin (Detecting extreme floods by flood sediments as a consequence of climate changes on the Danube and its Hungarian tributaries). In: Füleky, György (ed.). A táj változásai a Kárpát-medencében. Víz a tájban (Landscape changes in the Carpathian Basin. Water in the landscape). Gödöllő: Környezetkímélő Agrokémiáért Alapítvány, 2004. pp. 241-248
- National weather service weather forecast office (NOAA). Definitions of flood and flash flood. <http://www.srh.noaa.gov/mrx/hydro/flooddef.php>
- Nesje, Atle, Dahl, Svein Olaf, Matthews, John A. and Berrisford, Mark S. A. ~4500-yr record of river floods obtained from a sediment core in Lake Atnsjøen, eastern Norway. *Journal of Palaeolimnology* 25 (2001): 329-342
- Neumann, Tibor. Telekpusztásodás a késő-középkori Magyarországon (Land desertion in late medieval Hungary). *Századok* 137/6 (2003): 849-884
- Nyári, Diána and Kiss, Tímea. Blown sand movement at Kiskinalas on the Danube-Tisza interfluve, Hungary *Journal of Environmental Geography* 2/3-4 (2009): 11-18
- Oblack, Rachelle. Torrential rain. http://weather.about.com/od/t/g/torrential_rain.htm
- Oefelete, Edmundus (ed.). *Scriptores rerum Germanicarum in usum scholarum. Annales Altahenses Maiores*. Vo. 4. Hannover: Impensis Bibliopolii Hahniani, 1891. 105 p
- Ortvay, Tivadar. Magyarország régi vízrajza a XIII-ik század végéig (Early hydrography of Hungary until the end of the 13th century). Vol. 1. Budapest: A M. Tud. Akadémia Könyvkiadó-Hivatala, 1882. 544 p

- Ortvay, Tivadar. Pozsony város története (History of Pozsony town). Vols. 2/2-3. Pozsony [Bratislava]: Stampfel Károly, 1895-1898. 528, 412 p
- P. Károlyi, Zsigmond. Adatok a Tisza-völgy árvizeinek történetéhez (Data to the flood history of the Tisza valley). *Vízgazdálkodás* 10 (1970): 150-152, 191-192
- Pakucs-Willcocks, Mária. Sibiu – Hermannstadt. Oriental trade in sixteenth century Transylvania. *Städteforschung A/73*. Köln-Weimar-Wien: Böhlau, 2007. 219 p
- Pautsch, Evelin. Elementarereignisse in den Erzählenden Österreichische Geschichtsquellen des 14. und 15. Jh. Unpublished Dissertation in the Österreichische Nationalbibliothek, Vienna: 1953.
- Pálfai, Imre. A belvíz definíciói (Definitions of inland excess water). *Vízügyi Közlemények* 83/3 (2001): 376-392
- Pálfai, Imre. Belvizek és aszályok Magyarországon (Inland excess waters and droughts in Hungary). Budapest: Közlekedési Dokumentációs Kft., 2004. 492 p
- Pálóczi Horváth, András. Pechenegs, Cumans, Iasians. Steppe peoples in medieval Hungary. Budapest: Corvina Kiadó, 1989. 142 p
- Pápai Páris, Ferenc. *Dictionarium Latino-Hungaricum et Hungarico-Latino-Germanicum*. First published: Nagyszében [Sibiu], 1708. Reprint: Budapest: Universitas Könyvkiadó, 1995. 278 p
- Perjés, Géza. Mohács. Budapest: Magvető, 1979. 465 p
- Pesty, Frigyes. Elsüllyedt falvak a Fertő mentén (Sunk villages along the Fertő). *Vasárnapi Újság* 08.01.1865
- Petrić, Hrvoje. Drava river flooding in Varaždin and Koprivica parts of Podravine (Drava river region – between Croatia and Hungary) in the period of 17th-19th centuries. *Podravina* 12 (2007): 136-147
- Pécsi, Márton and Sárfalvi, Béla. The physical and economic geography of Hungary. Budapest: Corvina Press, 1964. pp. 45-46
- Pécsi, Márton. Az 1970. évi dunaföldvári földcsuszamlás (Loess-fall event of Dunaföldvár in 1970). *Földrajzi Értesítő* 20/3 (1971): 233-238
- Pécsi, Márton. Geomorfológia és domborzatminősítés (Geomorphology and morphological evaluation). Budapest: MTA Földrajztudományi Kutató Intézet, 1991. 296 p
- Pfister, Christian. Überschwemmungen und Niedrigwasser im Einzugsgebiet des Rheins 1500-2000. In: Bürgin, Toni, Capaul, Urs, Hilfiker, Helen, Klötzli, Frank, Müller, Jürg Paul and Schäfli, August (eds.). Der Rhein – Lebensader einer Region. Neuharsblatt der Naturforschenden Gesellschaft Zürich auf das Jahr 2006, 208: 265-273
- Pinke, Zsolt and Szabó, Beatrix. Analysis of the map of the Ministry of Agriculture: Water Covered Areas and Wetlands in the Carpathian Basin Before the Commencement of Flood Protection and Draining. In: II. Nemzetközi VIII. Országos Interdiszciplináris Grastyán Konferencia tanulmánykötete (II International, VIII National Interdisciplinary Grastyán Conference: Scientific studies). Pécs: in press 2010, pp. 194-203
- Pinke, Zsolt and Szabó, Beatrix. A Kárpát-medence vízborította és vízjárta területei az ármentesítő és lecsapoló munkálatok megkezdése előtt című térkép vizsgálata (Analysis of the map Water Covered Areas and Wetlands in the Carpathian Basin Before the Commencement of Flood Protection and Draining). A Hidrológiai Társaság XXVIII. országos vándorgyűlése. Tanulmányok (28th annual meeting of the Hungarian Hydrological Society. Studies). Sopron, 2010
http://www.hidrologia.hu/vandorgyules/28/dolgozatok/pinke_zsolt.html
- Pišút, Peter and Tímár, Gábor. A csallóközi Duna-szakasz folyódinamikai változásai a középkortól napjainkig (Changes of the dynamics of the Danube River in Žitný ostrov, Slovakia). In: Kázmér, Miklós (ed.). Környezettörénet. Az elmúlt 500 év környezeti eseményei történeti és természettudományi források tükrében (Environmental history.

- Events of the last 500 years in the light of the historical and natural scientific evidence). Budapest: Hantken Kiadó, 2009. pp. 55-70
- Pongrácz, Pál. Régi malomépítészet (Mill-building in the past). Budapest: Műszaki Kiadó, 1967. 247 p
- R. Várkonyi, Ágnes. "A természet majd az értelemmel...." Történeti ökológia és a XVIII. századi Magyarország környezeti válsága ("Then nature with the help of reason..." Historical ecology and the environmental crisis in the 18th-century Hungary). In: Kázmér, Miklós (ed.). Környezettörténet. Az elmúlt 500 év környezeti eseményei történeti és természettudományi források tükrében (Environmental history. Events of the last 500 years in the light of the historical and natural scientific evidence). Budapest: Hantken Kiadó, 2009. pp. 21-54
- Radnóti, Aladár. Une église du haut moyen âge a Zalavár. *Études Slaves et Roumaines* 1 (1948): 21-30
- Rady, Martyn. Nobility, land and service in medieval Hungary. New York: Palgrave, 2000. 231 p
- RAS = Rauch, Adrianus. Rervm Avstriacarvm Scriptores. Vindobonae: Iosephvm Stahel, 1793. Vol. 2, pp. 240, 278-279
- Rácz, Anita. A régi Bihar vármegye településeinek történeti-etimológiai szótára (Historical-etimological dictionary of settlements of the old Bihar county). A Magyar Névarchívum Kiadványai 12. Debrecen: Debreceni Egyetem Magyar Nyelvtudományi Tanszéke, 2005. 235 p
- Ráduly, János. Kibédi és sóváradi határjárás 1838-ban (A perambulation of Kibéd and Sóvárad in 1838). *Néprajzi látóhatár* 1/1-2 (1992): 81-89
- Répássy, Miklós. A Tisza halászata hajdan és most (Past and present fishery of the Tisza river). Budapest: Pátria, 1903. 35 p
- Réthly, Antal. Időjárási események és elemi csapások Magyarországon 1700-ig (Weather events and natural disasters in Hungary up to 1700). Budapest: Akadémiai Kiadó, 1962. 450 p
- Réthly, Antal. Időjárási események és elemi csapások Magyarországon 1701-1800 (Weather events and natural disasters in Hungary, 1701-1800). Budapest: Akadémiai Kiadó, 1970. 622 p
- Réthly, Antal. Időjárási események és elemi csapások Magyarországon 1801-1900-ig (Weather events and natural disasters in Hungary, 1801-1900). Vol. 1. Budapest: Országos Meteorológiai Szolgálat, 1998. 616 p
- Reumont, Alfred and Harrison, Robert. Lorenzo De' Medici, the Magnificent. London: Smith Elder and Co., 1876. Vol. 2. 489 p
- Rohr, Christian. Der Fluss als Ernährer und Zerstörer. Zur Wahrnehmung, Deutung und Bewältigung von Überschwemmungen an den Flüssen Salzach und Inn (13.-16. Jahrhundert). In: Gisler, Monika, Hürlmann, Katja and Nienhaus, Agnes (eds.). Naturkatastrophen / Catastrophes naturelles. *Traverse* 10/3 (2003): 37-49
- Rohr, Christian. The Danube floods and their human response and perception (14th to 17th). *History of Meteorology* 2 (2005): 71-86
- Rohr, Christian. Measuring the frequency and intensity of floods of the Traun River (Upper Austria), 1441-1574. *Hydrological Sciences Journal* 51/5 (2006): 834-847
- Rohr, Christian. Extreme Naturereignisse im Ostalpenraum. Naturerfahrung im Spätmittelalter und am Beginn der Neuzeit. Köln, Weimar, Wien: Böhlau Verlag, 2007a. 640 p
- Rohr, Christian. Leben mit der Flut. Zur Wahrnehmung, Deutung und Bewältigung von Überschwemmungen im niederösterreichischen Raum (13.-16. Jahrhundert). In: Risner, Willibald and Motz-Linhart, Reinelde (eds.). Kriege – Seuchen – Katastrophen. Studien

- und Forschungen aus dem Niederösterreichischen Institut für Landeskunde 46, St. Pölten, 2007b. pp. 63-115
- Ruhmann, Jenő. A Rák (Bánfalvi)-patak hasznosítása a XIV. századtól napjainkig (Utilisation of the Rák/Bánfalvi stream from the 14th century up to the present). *Soproni Szemle* 42/1 (1988): 40-55
- Rusu, Adrian Andrei. Körösszeg vár. Körösszeg – Cheresig, Bihar megye (The castle of Körösszeg. Körösszeg – Cheresig, Bihar county). Budapest: Castrum Bene Egyesület, n.d. <http://www.castrumbene.hu/erdelyivarak/var/korosszeg.html>
- Sági, Károly. A Balaton vízállástendenciái 1863-ig a történeti és kartográfiai adatok tükrében (Water-level tendencies of Lake Balaton in the light of historical and cartographical data). *Veszprém megyei múzeumok közleményei* 7 (1968): 441-468
- Sági, Károly. Egy történeti vita természettudományos vonatkozásai (Natural scientific aspects of a historical debate). *Földrajzi Értesítő* 19 (1970): 200-207
- Sági, Károly and Füzes, Miklós. Újabb adatok a Balaton 1863 előtti vízállás tendenciáinak kérdéséhez (Recent data on the question of the water-level tendencies of Lake Balaton before 1863). *Somogyi múzeumok közleményei* 1 (1973): 247-261
- Scherer, Ferenc. Gyula város története (History of the town of Gyula). Vol. 1. Gyula: Gyula M. város kiadása, 1938. 478 p
- Senga, Toru. Béla királyfi bolgár, halicsi és osztrák hadjárataihoz (Military campaigns of prince Béla to Bulgaria, Halič and Austria). *Századok* 122/1-2 (1988): 37-50
- Siklósy, Zoltán, Demény, Attila, Szenthe, István, Leél-Őssy Szabolcs, Pilet, Sebastian, Lin, Yin and Shen, Chuan-Chou. Reconstruction of climate variation for the last millennium in the Bükk Mountains, northeast Hungary, from a stalagmite record. *Időjárás* 113/4 (2009): 245-263
- Simon, Zsolt. The trade of Hungary with Wallachia and Moldavia during the reign of Matthias Corvinus. In: Bárány, Attila and Györköös, Attila. Matthias and his legacy. Cultural and Political Encounters between East and West. *Speculum Historiae Debrecenense* 1. Debrecen: Debreceni Egyetem Történeti Intézete, 2009. pp. 243-261
- Smičiklas = Smičiklas, Tadija (ed. in chief). *Codex Diplomaticus regni Croatiae, Dalmatiae et Slavoniae / Diplomatički Zbornik kraljevine Hrvatske, Dalmacije i Slavonije*. Vol. 9, 18. Zagreb: Jugoslavenska Akademija Znanosti i Umjetnosti, 1911, 1990. 678, 597 p
- SRA = Pez, Hieronymus. *Scriptores rerum Austriacarum veteres ac genuini*. Lipsiae [Leipzig]: Sumptibus J.F. Gleditschii, 1721. Vol. 1, pp. 707-724, 812-813, 979
- SRH = Szentpétery, Imre. *Scriptores rerum Hungaricarum. Tempore ducum regumque stirpis Arpadianae gestarum*. 2 Vols. Budapest: Academia Litter. Hungarica atque Societate Histor. Hungarica, 1937-1938. New extended edition (reprint): Budapest: Nap kiadó, 1999. 553, 799 p
- Somogyi, Sándor (ed.). A XIX. századi folyószabályozások és ármentesítések földrajzi és ökológiai hatásai Magyarországon (The geographic and ecological impact of the 19th-century water regulation and drainage works in Hungary). Budapest: MTA Földrajztudományi Kutatóintézet, 2000. 302 p
- Stančík, Andrej and Jovanovič, Slavoljub (eds.). The Danube. Hydrology of the river. Bratislava: Príroda, 1988. 345 p
- Stankoviansky, Miloš. Gully evolution in Myjava Hill Land in the second half of the last millennium. *Geographia Polonica* 76 (2003): 89-107
- Starkel, Leseck. Heavy Rains and Floods in Europe during the Last Millenium. In: Obrevska-Starkel, Barbara (ed.). Reconstructions of Climate and Its Modelling. Cracow: Jagellonian Univ., 2000. pp. 55-62
- Strayer, Joseph R. (ed.). Dictionary of the Middle Ages. Vol. 2. New York: Charles Scribner's Sons, 1983. 655 p

- Strömer, Elisabeth. Klima-Geschichte. Methoden der Rekonstruktion und historische Perspektive. Ostösterreich 1700 bis 1830. Vienna: Franz Deuticke, 2003. 325 p
- Sturm, Katrin, Glaser, Rüdiger, Jacobbeit, Jucundus, Deutsch, Matthias, Brázil Rudolf, Pfister, Christian, Luterbacher, Jürg and Wanner, Heinz. Floods in Central Europe since AD 1500 and their Relation to the Atmospheric Circulation. *Petermanns Geographische Mitteilungen* 145/6 (2001): 14-23
- Sümegi, Pál. A középkori Kárpát-medence éghajlati és környezeti viszonyai (Climatic and environmental conditions of the medieval Carpathian Basin). In: A középkori agrárium (The medieval agricultural regime). Ópusztaszer: Nemzeti Történeti Emlékpark Kht., 2000. pp. 9-26
- Sümegi, Pál, Jakab, Gusztáv, Majkut, Péter, Törőcsik, Tünde and Zatykó, Csilla. Middle Age paleoecological and paleoclimatological reconstruction in the Carpathian Basin. *Időjárás* 113/4 (2009): 265-298
- Sümegi, Pál, Jakab, Gusztáv, Persaits, Gergő and Törőcsik, Tünde. A Baláta-tó környezettörténete (Environmental history of the Baláta Lake). In: Erdő és klíma (Forest and climate). Accepted for publication: 2010
- SvO = Nagy, Imre. Oklevélköt Sopron vármegye történetéhez (Chartulary to the history of Sopron county). 2 Vols. Sopron: Litfass Károly Könyvnyomda, 1889-1891. 648, 650 p
- SVT = Házi, Jenő. Sopron királyi város története (History of Sopron royal town). Sopron: Székely és Tsa, 1921-1943. 1/1-7, 2/1-6 Vols.
- Szabó, István. Magyarország népessége az 1330-as és az 1526-os évek között (Population of Hungary between the 1330s and 1526). In: Kovacsics, József (ed.). Magyarország történeti demográfiája. Magyarország népessége a honfoglalástól 1949-ig (Historical demography of Hungary. Population of Hungary from the conquest period to 1949). Budapest: Közgazdasági és jogi könyvkiadó, 1963. pp. 63-114.
- Szabó, István. A középkori magyar falu (The medieval Hungarian village). Budapest: Akadémiai Kiadó, 1969.
- Szabó, Károly. Az erdélyi muzeum eredeti okleveleinek kivonata 1232-1540 (Excerpts from the original charters of the Transylvanian museum 1232-1540). Budapest: Az Athenaeum r. társulat könyvnyomda, 1890. 118 p
- Szabó, Péter. Woodland and Forests in Medieval Hungary. Oxford: Archaeopress, 2005. 187 p
- Szabó, Péter. Hagyományos erdőgazdálkodás a Kárpát-medencében (Traditional forest management in the Carpathian Basin). In: Andrásfalvy, Bertalan and Vargyas, Gábor (eds.). Antropogén ökológiai változások a Kárpát-medencében (Ecological changes of anthropogenic origin in the Carpathian Basin). Budapest: PTE Néprajz-Kulturális Antropológia Tanszék-L'Harmattan, 2009. pp. 129-144
- Szamota, István. Régi utazások Magyarországon és a Balkán félszigeten (Old journeys in Hungary and the Balkan Peninsula). Budapest: Franklin Társulat Nyomda, 1891. 559 p
- Szántó, Richárd. Az 1315-1317. évi európai éhínség (Famine in Europe in 1315-1317). In: Marton, Szabolcs and Teiszler, Éva. Medievisztikai tanulmányok 4 (Studies on medieval history 4). Szeged: Szegedi Középkorász Műhely, 2005a. pp. 135-142
- Szántó, Richárd. Természeti katasztrófa és éhínség 1315-1317-ben (Natural catastrophe and famine in 1315-1317). *Világtörténet* 27 (2005b): 50-64
- Szántó, Richárd. Környezeti változások Európában a 14. század első évtizedeiben (Environmental changes in Europe in the first decades of the 14th century). In: Révész, Éva and Halmágyi, Miklós. Medievisztikai tanulmányok 5 (Studies on medieval history 5). Szeged: Szegedi Középkorász Műhely, 2007. pp. 159-164
- Szászhelyi, Pál Az 1956. évi dunai jeges árvíz Magyarországon (Ice flood in 1956 in Hungary). *Hidrológiai Közlöny* 3 (1956): 161-165

- Szenti, Tibor. Újabb levéltári adatok a vásárhelyi pusztáról: 1775-1859 (Archival data about the 'puszta' of (Hódmező)Vásárhely: 1775-1859). *A Békés Megyei Múzeumok Közleményei* 7 (1983): 279-295
- Szentmártoni Szabó, Géza. Janus Pannonius szülőhelyéről (About the birthplace of Janus Pannonius). In: Jankovics, József (ed. in chief). "Nem süllyed az emberiség. ..." (Mankind is not yet sinking). Budapest: MTA Irodalomtudományi Intézet, 2007. pp. 225-235
- Szentmihályi, Imre. Történeti események tükröződése a Fertő vidéki néphagyományokban (Historical events reflected in the folk tradition of the Fertő area). *Arabona* 16 (1974): 213-230
- Szentpétery = Szentpétery, Imre. Az Árpád-házi királyok okleveleinek kritikai jegyzéke (Critical collection of charters of the Árpádian kings). 1/1-3, 2/1-4 Vols. Budapest: Akadémiai Kiadó, 1923-1987
- Szentpétery, Imre. Magyar Oklevél tan (Hungarian Charter studies). Budapest: Magyar Történelmi Társulat, 1930. 275 p
- Szentpétery, Imre. A kronológia kézikönyve (Handbook of chronology). Corrected and extended edition by Gazda, István, Érszegi, Géza, Raj, Tamás and Szögi, László. Budapest: Könyvértékesítő Vállalat, 1985. 211 p
- Szilassi, Péter, Jordán, Győző, van Rompaey, Anton and Csillag, Gábor. Impacts of historical land use changes on erosion and agricultural soil properties in the Káli Basin at Lake Balaton, Hungary. *Catena* 68 (2006): 96-108
- Szlávík, Lajos (ed.). Az 1998. évi árvíz (Flood of the year 1998). Special issue of the *Vízügyi Közlemények*, Vol. 1. Budapest: Országos Vízügyi Igazgatóság, 2003. 213 p
- SzO = Szabó, Károly. Székely oklevétár (Székely chartulary). Kolozsvár [Cluj Napoca]: K. Papp Miklós Nyomdája, 1872. Vol. 1. 562 p
- Sztáray = Nagy, Gyula. A nagymihályi és szlávai gróf Sztáray család oklevéltára (Chartulary of the count Sztáray family of Nagymihály and Szlává). 2 Vols. Budapest: Franklin Nyomda, 1887-1889. 452, 628 p
- Szűcs, Jenő. Az utolsó Árpádok (The last Arpadians). História Könyvtár. Monográfiák 1. Budapest: História-MTA Történettudományi Intézete, 1993. 515 p
- Tagányi, Károly. Magyar erdészeti oklevél (Chartulary of Hungarian forestry). Vol. 1 (1015-1742). Budapest: Pátria, 1896. 735 p
- T. Mérey, Klára. A XVIII. századi határperek néprajzi és történeti forrásértéke (Value of 18th-century perambulations as an ethnographic and historical source). *Ethnographia* 78/4 (1967): 533-546
- Takács, Miklós. Húsvéti határjárás 1761-es leírása (Description of an Easter perambulation dated 1761). *Ethnographia* 85/2-3 (1974): 389-396
- Takács, Lajos. Határjelek, határjárás a feudális kor végén Magyarországon (Landmarks and perambulation in Hungary at the end of the feudal period). Budapest: Akadémiai kiadó, 1987. 227 p
- Tallóczy, Lajos and Áldásy, Antal. Magyarország és Szerbia közti összeköttetések oklevéltára 1198-1526 (Chartulary to the relationship between Hungary and Serbia). Magyarország melléktartományainak oklevélára / Codex diplomaticus patrium regno Hungariae adnexarum 2, Magyaro történelmi emlékek. Okmánytárak / Monumenta Hungariae Historica. Diplomatária Vol. 23, Budapest: Magyar Tudományos Akadémia, 1907. 479 p
- Teleki, József. A Hunyadiak kora Magyarországon. Oklevétár (The period of the Hunyadi family in Hungary. Chartulary). Vol. 11. Budapest: Emich, 1855. 584 p
- Telelis Ioannis, Evangelos Chrysos. The Byzantine Sources as Documentary Evidence for the Reconstruction of Historical Climate. In: Frenzel, Burkhard (ed.). European climate

- reconstructed from documentary data: Methods and results. European Palaeoclimate and Man 2, Stuttgart-Jena-New York, 1992. pp. 17-31
- Tetzlaff, Gerd, Börngen, Michael, Mudelsee, Manfred and Raabe, Armin. Das Jahrtausendhochwasser von 1342 am Main aus meteorologisch-hydrologischer Sicht. *Wasser&Boden* 54/10 (2002): 41-49
- Thorndycraft, Varyl R, Barriendos, Mariano, Benito, Gerardo, Rico, Mayte and Casas, Angeles. The catastrophic floods of AD 1617 in Catalonia (northeastern Spain) and their climatic context. *Hydrological Sciences Journal* 51/5 (2006): 899-912
- Thuróczy = De Thurocz, Johannes. Chronica Hungarorum. Augsburg: Theobald Feger-Ratdolt, Erhard, 1488. p. 305. After the original (OSZK Inc. 1143):
<http://www.corvina.oszk.hu/corvinas-html/hub1inc1143.html>
- TO = Ortvay, Tivadar. Oklevélár Temesvármegye és Temesvár város történetéhez (Chartulary to the history of Temes county and Temesvár). Pozsony [Bratislava]: Eder István Könyvnyomdája, 1896. Vol. 1, 420 p
- Tockner, Klement, Robinson, Christopher and Uehlinger, Urs (eds). Rivers of Europe. Burlington-San Diego: Academic Press, 2009. 700 p
- Tol, Richard S. J. and Langen, Andreas. A concise history of Dutch river floods. *Climatic Change* 6/3 (2000): 357-369
- Tóber, Márta. Anjou-kori határjárások időpontjainak elemzése esettanulmányok segítségével (Analysis of dates of Angevin-period perambulations through case studies). Unpublished MA thesis, Department of Historical Auxiliary Sciences, University of Szeged, 2010. 43 p
- Tóber, Márta. „Tartsd fel három ujjad, esküdjél az égre....” Határjárás: több, mint népszokás (“Hold up your three fingers, make an oath for heaven....” Perambulation. More than a public tradition). Accepted for publication: *Belvedere* (2011)
- Tóber, Márta. A Duna-Tisza közi Homokhátság késő középkori tájhasználata. Szakirodalmi áttekintés (Late medieval land use of the Sand Ridge area in the Danube-Tisza Interfluve). Submitted to: *Korall* (2011)
- Tóth, István. Jannus Pannonus származása (Origin of Janus Pannonius). *Irodalomtörténeti közlemények* 69/5 (1965): 603-613
- Tóth, Tamás and Gyuró, György. Jelentős csapadékhulással járó földközi-tengeri ciklonok klímatológiája a blokkoló anticiklonok gyakoriságának függvényében (Climatology of Mediterranean cyclones with extreme precipitation events, in relation to the frequency of blocking anticyclones). In: II. Magyar tájökológiai konferencia tanulmánykötet (Scientific studies of the second Hungarian conference on landscape ecology). Debrecen: Debreceni Egyetem, 2006. 7 p
- Töröcsik, István. Egy határkő a Jászságból (A stone landmark from the Jászság area). Jászsági Évkönyv, Jászberény 2004. pp. 55-59
- Tringli, István. A magyar szokásjog a malomépítésről (The Hungarian customary law of mill-building). In: Neumann, Tibor (ed.). Tanulmányok a középkorról (Studies about the Middle Ages). Analecta Medievalia 1. Budapest: Argumentum Kiadó-Pázmány Péter Katolikus Egyetem, 2001. pp. 251-267
- Tripartitum = Gazda, István, Kálmán Csíky and György Bónis (eds.). Werbőczy, István. Tripartitum. Latin-Hungarian bilingual edition). Budapest: Téka, 1990. 560 p
- US = Zimmermann, Franz, Werner, Carl and Müller, Georg. Urkundenbuch zur Geschichte der Deutschen in Siebenbürgen. Hermannstadt [Sibiu]: Verein für siebenbürgische Landeskunde, 1897. Vol. 2. 781 p
- Xoplaki, Elena, Fleitmann, Dominik, Diaz, Henry, von Gunten, Lucien and Kiefer, Thorsten. Medieval Climate Anomaly. *PAGESnews* 19/1 (2011): 39 p

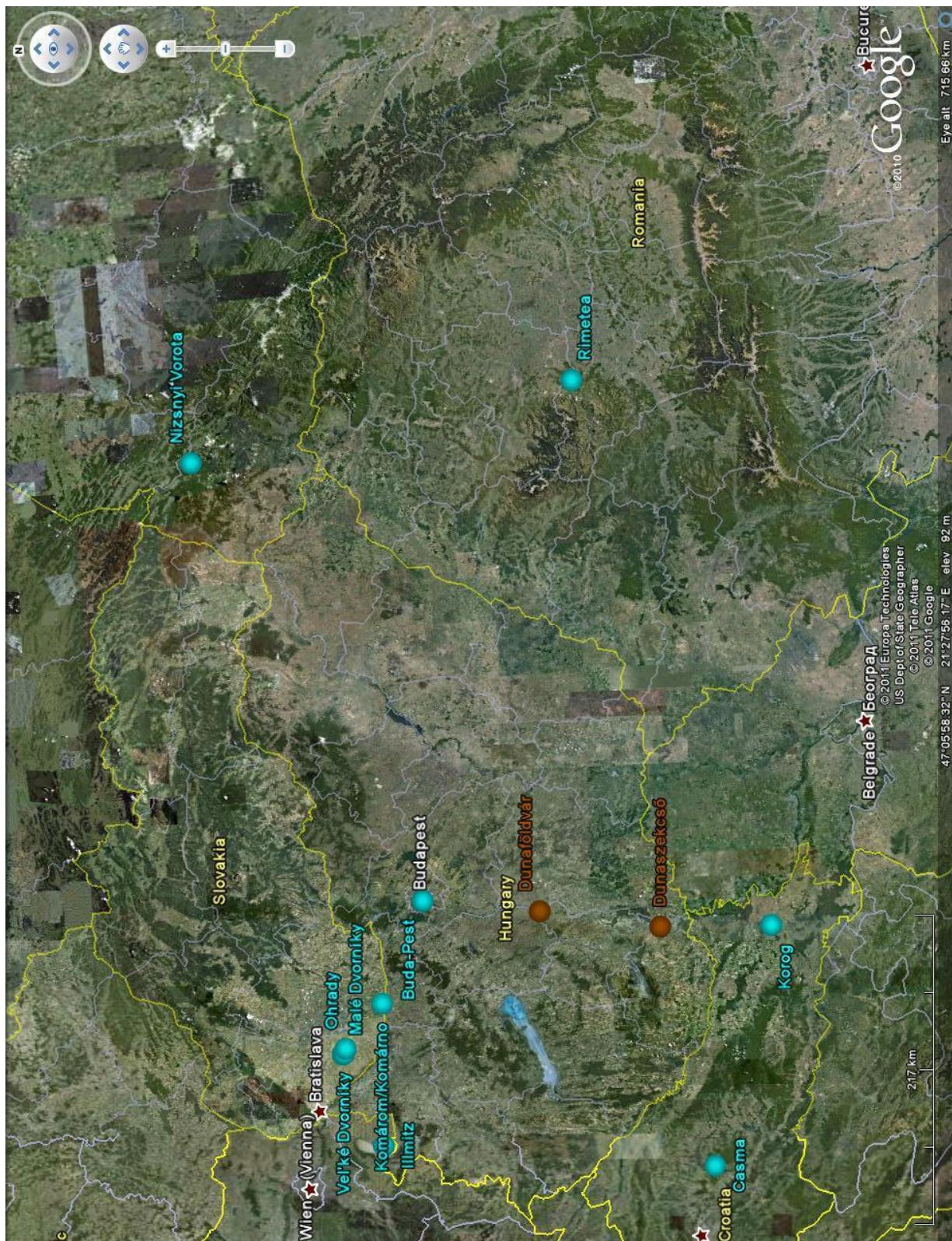
- V. Kovács, Sándor. Janus Pannonius munkái latinul és magyarul. Janus Pannonius élő emlékezetének halálának ötszázadik évfordulója alkalmából. / Jani Pannonii opera latine et hungarice. Viva memoriae Iani Pannonii qvingentesimo mortis suae anniversario dedicatvm. Budapest: Tankönyvkiadó, 1972. pp. 371-381
- Vadas, András. Documentary evidence on weather conditions and a possible crisis in 1315-1317: Case study from the Carpathian Basin. *Journal of Environmental Geography* 2/3-4 (2009): 23-29
- Vadas, András and Kiss, Andrea. Európa klimatikus viszonyai a középkorban, különös tekintettel a 14. századi változásokra. *Soproni Szemle* 63/2 (2009): 239-252
- Vadas, András and Rácz, Lajos. Éghajlati változások a Kárpát-medencében a középkor idején. *Agrártörténeti Szemle* (2011/1-4): 15 p
- Vajda, Tamás. Adatok a Dráva menti középkori fokgazdálkodásról (Data to the medieval 'fok' management along the Drava river). In: Weisz, Boglárka, Balogh, László and Szarka, József (eds.). Tanulmányok a középkorról (Studies about the Middle Ages). Szeged: Szegedi Középkorász Műhely, 2001. pp. 125-137
- Vajda, Tamás. Hazai vízimalmaink 1301-1325 közötti okleveles adatai (Charter data of Hungarian watermills in the period 1301-1325). In: Weisz, Boglárka (ed.). Középkortörténeti tanulmányok 3 (Studies on medieval history 3). Szeged: Szegedi Középkorász Műhely, 2003. pp. 193-213
- Vajda, Tamás. Okleveles adatok Árpád-kori vízimalmainkról (Charter data of Hungarian watermills in the Arpadian period). In: Marton, Szabolcs and Teiszler, Éva. Medievisztikai tanulmányok 4 (Studies on medieval history 4). Szeged: Szegedi Középkorász Műhely, 2005. pp. 193-220
- Vajda, Tamás. Újabb adatok Árpád-kori vízimalmainkról (Data to the history of Hungarian watermills in the Arpadian period). In: Révész, Éva and Halmágyi, Miklós. Medievisztikai tanulmányok 5 (Studies on medieval history 5). Szeged: Szegedi Középkorász Műhely, 2007. pp. 211-245
- Vajda, Tamás. A középkori Magyarország történeti demográfiaja (Historical demography of medieval Hungary). Manuscript. Szeged: (University of Szeged, Institute of History), 2011. 235 p
- Vargha, Magda and Both, Előd. Astronomy in Renaissance Hungary. *Journal History of Astronomy* 18/4 (1987): 279-283
- Varjú, Elemér. A Losonczi Bánffy család története. Oklevélkötő I. 1214-1457 (History of the Bánffy family of Losoncz. Chartulary 1: 1214-1457). Budapest: Hornyánszky Viktor Könyvnyomdája, 1908. 711 p
- Vauchez, Andre, Dobson, Barrie and Lapidge, Michael (eds.). Encyclopedia of the Middle Ages. Cambridge: James Clarke, 2001. 1624 p
- Vásáry, István. Nagy Lajos tatár hadjáratai (Military campaigns of Lajos the Great against the Tatars). *Studia Caroliensia* 3-4 (2006): 17-29
- Vágás, István. A Tisza árvizei (Floods of the Tisza). Budapest: VIZDOK, 1982. 283 p
- Veszprémy, László. Historical Past and Political Present in the Latin Chronicles of Hungary (12th-13th Centuries). In: Kooper, Erik (ed.). The Medieval Chronicle. Amsterdam-Atlanta: GA, 1999. 299 p
- Vukov, Konstantin. A szigetelésekrol az épített örökség szemszögéből. Régi ház – új anyagok (Isolation from the viewpoint of built-up heritage. Old house – new materials). *Magyar Építéstechnika* 10 (2007): 5 p
<http://www.muszakilapok.hu/magyar-epitestechnika/szigetelesekrol-az-epitett-orokseg-szemszogebol-regi-haz-%E2%80%93-uj-anyagok-5>
- Wanner, Heinz, Beck, Christian, Brázdil, Rudolf, Deutsch, Matthias, Glaser, Rüdiger, Jacobbeit, Jucundus, Luterbacher, Jürg, Pfister, Christian, Pohl, Stefan, Sturm, Katrin, Werner, Peter

- C. and Xoplaki, Elena. Dynamic and socioeconomic aspects of historical floods in Central Europe. *Erdkunden* 58 (2004): 1-16
- Weikinn, Curt. Quellentexte zur Witterungsgeschichte Europas von der Zeitwende bis zum Jahre 1850. Hydrographie. Teil 1 (Zeitwende–1500). Berlin: Akademie-Verlag, 1958. p. 177
- Wellmann, Imre. Királyi mérték és mérő alá való föld (Land under royal measure). *Agrártörténeti Szemle* 7 (1965): 236-244
- Wenzel, Gusztáv. Magyarország bányászatának kritikai története (Critical history of mining in Hungary). Budapest: A M. Tud. Akadémia Könyvkiadó-Hivatala, 1880. 456 p
- Williamson, Maya Bijvoet. The memoirs of Helene Kottanner. Cambridge: D.S. Brewer, 1998. 91 p
- Wolf, Mária. Elpusztult középkori település Sajólád határában (Perished medieval settlement in the neighbourhood of Sajólád). *A Herman Ottó Múzeum Évkönyve* 25-26 (1986-1987): 189-202
- Zahn, Johann. Anonymi Leobiensis Chronicon. Grätz: Leuschner&Lubensky k.k. Univers.-Buchhandlung, 1865. 51 p
- Zatykó, Csilla. Medieval settlement history of the Baláta-tó area. In: Zatykó, Csilla, Juhász, Imola and Sümegi, Pál (eds.). Environmental archaeology of the Transdanubia. Budapest: Archaeological Institute of the Hungarian Academy of Sciences, 2007. pp. 259-266
- Zawadowski, Alfréd. Magyarország vizeinek statisztikája (Statistics concerning the waters in Hungary). Vol. 1, Budapest: Országos Magyar Királyi Statisztikai Hivatal, 1891. 450 p
- Zentai, László and Kósa, Pál (eds.). A történelmi Magyarország atlasza és adattára 1914 / Atlas and gazetteer of historic Hungary 1914. 3rd edition. Pécs: Talma Kiadó, 2005. 246 p
- Zhang, Mao-Sheng: Features on Torrential Floods and Its Precaution in Shaanxi Province. Academic Papers of the Xi'an Center of Geological Survey (CGS), Xi'an Institute of Geology and Minerals Resources (China Geological Survey). http://www.xian.cgs.gov.cn/english/2008/0912/article_106.html
- Zichy = A zichi és vásonkeői gróf Zichy-család idősb ágának okmánytára / Codex diplomaticus domus senioris comitum Zichy de Zich et Vasonkeő. 12 Vols. Pest: Magyar Történelmi Társulat, 1871-1931
- ZmO = Nagy, Imre, Véghely, Dezső, Nagy, Gyula. Zala megye története. Oklevélár. Budapest: Magyar Tudományos Akadémia, 1886. 640 p
- Zöllner, Erich. Ausztria története (History of Austria). Budapest: Osiris-2000, 1998. 553 p
- ZsO = Mályusz, Elemér, Borsa, Iván and C. Tóth, Norbert. Zsigmondkori oklevélár (Chartulary of the Sigismund period). 12 Vols. Budapest: Akadémiai Kiadó, 1951-

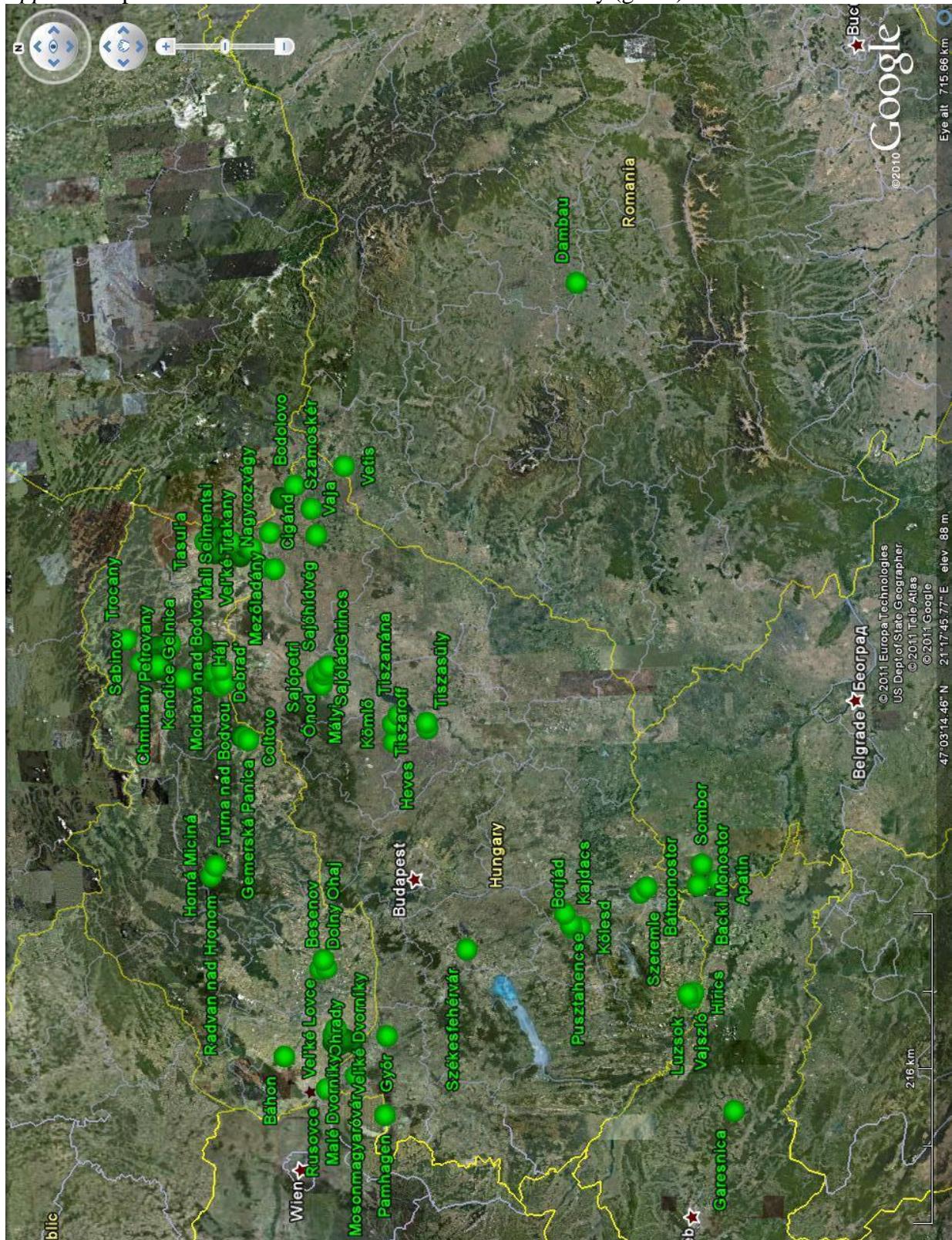
8 Appendix

1. App. Map of locations mentioned in the text

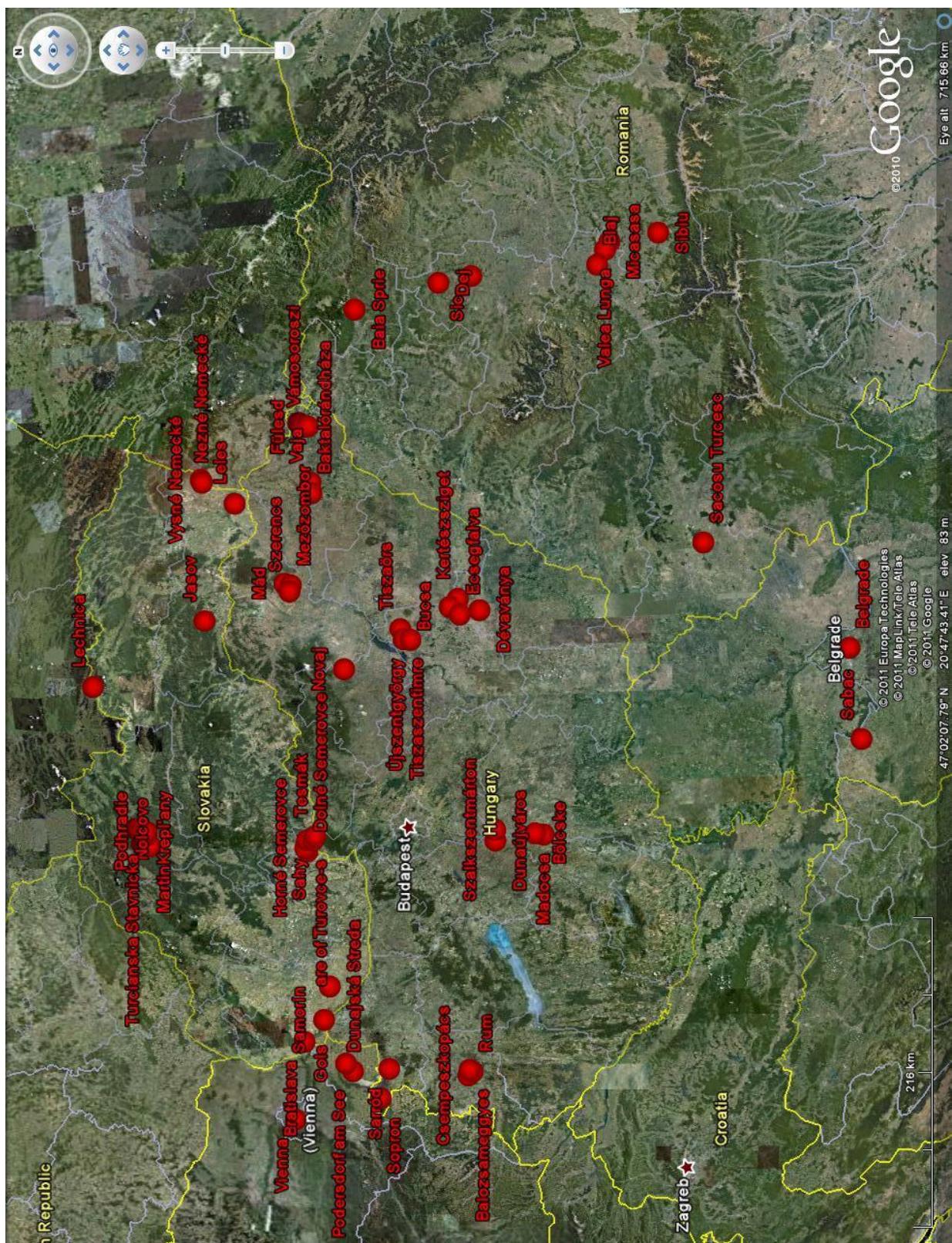
App. 1a: Map of locations mentioned in the text: 11th (brown) and 13th (blue) centuries



App. 1b Map of locations mentioned in the text: 14th century (green)



App. 1c Map of locations mentioned in the text: 15th century (red)



2. App. Janus Pannonius: De inundatione (the full version; V. Kovács 1972, pp. 371-381)

DE INUNDATIONE

Tantus ab assiduis, quid vult sibi, nubibus imber?
Quid tempestatum copia tanta parat?
Unde tot humores nebulis? tot nubila coelo?
Quando potens madidi, tam fuit aura Noti?
Quisve unquam tantum variae bibt Iridis arcus?
Pontus an arcana scandit in astra via?
Saepe exhalatos, ima de parte, vapores,
Smintheos igniferi sustulit acre iubar.
Nec potuit tantum radiis consumere, quantum,
Traxerat, in tenues, sed solvit pluvias,
Non tamen a levibus, manant tam grandia, causis,
Nec de consuetis, rara venire solent.
Iste poli furor est, ista est gravis ira Deorum,
Aëris et fluxus, sidera summa iuvant.
Nunc omnes Hyades, Haedi ambo, totus Orion,
Liquitur, et Delphin aequora multa vomit.
Nunc pariter geminas inclinant funditus urnas,
Hinc pater Eridanus, Troius inde puer.
Aut certe suprema alti convexa tegentes,
Aetheris, in terras praecipitantur aquae;
Ingeminant densi, valido sic turbine, nimbi,
Sic agit abruptum, machina laxa, Iovem.
Infelix deflet non unum rusticus annum;
Nam tritura simul cum satione perit.
Squalentes nuda, marcent in vite, racemi,
Putris et effuso, diffluit uva, mero.
Deficiunt pecudes, et clausi millia vulgi,
Urbibus in plenis, obsidet atra fames.
Dum queror, incubuit gravior metus; en vaga late,
Excurrunt victis flumina litoribus.
Ac primum valles, et plana iacentia complent,
Mox etiam campis editiore premunt.
Nec iam de totis, nisi summa cacumina, silvis,
Extant, et rapido gurgite pulsa tremunt.
In tumulos fugere ferae, fugere volucres,
Pellit et e tumulis has tamen unda sequax.
Quadrupedum pisces subeunt loca; volvitor ingens
Pelamys, in lustro dente minantis apri.
Collecta in spirae nodos anguilla recumbit,
Auritus jacuit qua modo parte lepus.
Vulpinam cancer foveam petit; ova natantum
Nunc gerit, alitum, qui tulit ante locus.
Ludimus. Innumeros hominum nova fata paventes,
Cum grege, cum stabulis, corripit uda lues.
Pagus erat, subito palus est, et mersa profundo,
Quaerunt montivagi culmina ruricolae.
Nec res ulla magis miseros, spe perdit inani,
Dum mala crementum non habitura putant.
Huic nimium celsae fidenti margine ripae,
Subsedit media subruta nocte domus.

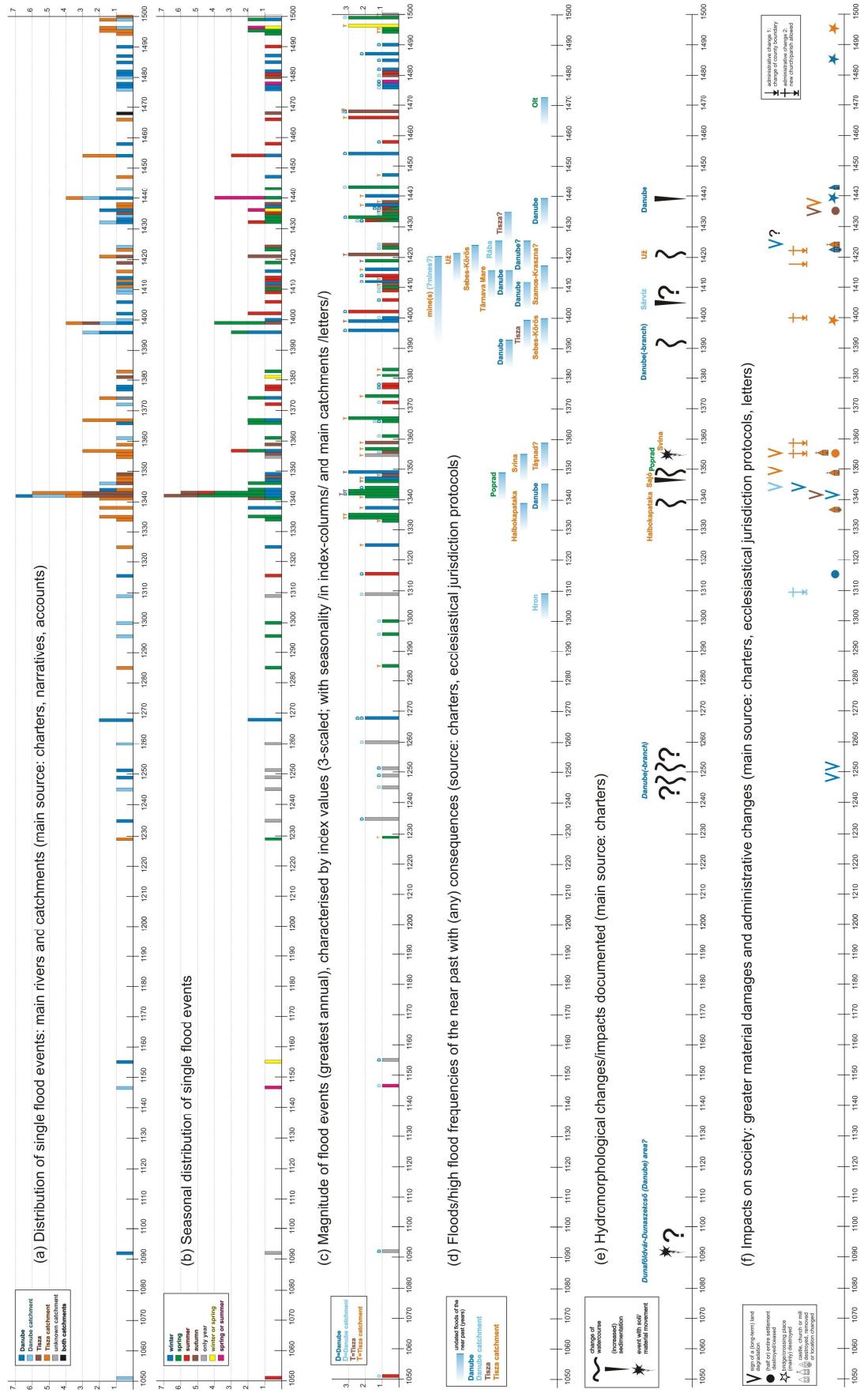
Transtulit ille lares sublimis in ardua clivi,
Cautus, et, hoc, inquit, vertice tutus ero.
Parva mora est, et parte omni surgentibus undis,
Nec, stet ubi, nec, quo progrediatur, habet.
Iam Savus et Marisus, iam Dravus et ipse Tibiscus,
Inter et Arctoas, maximus Hister, aquas;
Terrarum quamvis longo discrimine distent,
Confusis, inter se coiere, vadis.
Noscere nec possis, ubi rus, ubi collis, ubi arbor,
Omnia sic facies aequoris una tegit.
Haud secus Emathiam Penei stagna tenebant,
Unus cum vertex Ossa et Olympus erat.
Passa sub Ogygio, est aliud nec Graecia, regno,
Inachiae si quid credimus historiae.
Tale fuit Latium tunc, cum superantibus Umbris,
Ausoniam gemini, condidit unda, maris.
Nimirum natura suas praepostera leges
Vertit, et autumnus veris ademit opus.
Vere tument amnes, et per montana voluti,
Lubrica, terribili murmure, saxa rotant.
Iam tepidum extremi cum solvunt aëra pisces,
Cum zephyro afflatae, dimaduere nives.
At modo successit flavae vindemia messi,
Coepit et aequatum, nox superare diem.
Nunc etiam torrens Nilus redit, et pia Memphis,
Reddit lunato, mystica sacra, bovi.
Pannoniae in fluvios pluvialia toxica misit
Iam refugis Phoebi Scorpius ustus equis.
Quanquam non solis illos reor imbribus auctos,
Nec tantum guttas evaluisse leves;
Sed penitus gravidas terrae patuisse cavernas,
Cuspide percussas Ennosigae tua.
Quicquid et in venis cava celat abyssus opertis
Lympharum, ad superas emicuisse plagas.
Hoc nobis, hoc nempe atri nova cauda cometae,
Est nuper longa vaticinata iuba;
Qualis tunc, Helicen cum et Buran sorbuit aequor,
Vicini casus nuntia signa dedit.
Cum Thetis ignotas stupuit sub marmore turres,
Dormiit et medio phoca supina foro.
Quid tamen o Superi? nosne haec tantummodo clades,
Tot petit e populis, quos alit uber humus?
An totum involvit strages simul unica mundum?
Imus et illuxit gentibus iste dies?
Si pereunt omnes, nec nos superesse rogamus,
Aequo animo quivis, publica fata subit.
Sin soli, luimus communia crimina, Chuni,
Humanum, nobis dulce piare, genus.
Sed partis non esse malum, docet ipsa mali vis,
Tanta mole decet non nisi cuncta rapi.

Nunc et lata natat fuso, Germania, Rheno,
 Sarmaticum Tanain nec sua ripa capit.
 Proluit et Rhodanus Gallos, et Baetis Hiberos,
 Nec Padus Hesperiis clauditur aggeribus.
 Acer et Argolicas supra furit Inachus urbes,
 Improbis, nec parcis Thracibus, Hebre, tuis.
 Nunc Indi sub Gange iacent, sub Tigride Parthi,
 Sub Cydno Cilices, et sub Oronte Syri.
 Nec sic est unquam pontem indignatus Araxes,
 Nex sic Cappadocas turbidus hausit Halys.
 Maior in invisum nec crevit Xanthus Achillen,
 Diffudit tantas, ante nec Hernus, opes.
 Sicca prius, nimios incusans Africa soles,
 Mutata nimias, nunc vice, damnat aquas.
 Saevit in hanc oolidus Cinyps, et Bagrada monstro
 Nobilis, et Triton, casta Minerva, tuus.
 Ac Gir, Divum hospes, cum spreto nectare coeli,
 Aethiopum viles appetiere dapes.
 Flumina sed levius, pelago cessante, nocerent,
 Eminet e totis, insula nulla, fretis.
 Non pomosa olim Corcyra, nec impia Lemnos,
 Non indepreensi, conscia Creta, Iovis.
 Non Sardo sunt Cynros; nullos, restincta profundo,
 Flammarum eructat Sicelis Aetna, globus.
 Vasto iterum Rhodos est, iterum sub gurgite Delos,
 Tristia nec ratibus navita saxa timet;
 Non Libycis alte stantes in fluctibus aras,
 Non vestrum, Syrtes, magna minorve, vadum.
 Quin ipse Oceanus, rerum genitalis origo,
 Qui certa ambitam, lege coërcet, humum,
 Transilit per tot servatos saecula fines,
 Nec satis ora sibi quattuor esse putat;
 Per quae se possit mediis immittere terris,
 Sed passim ruptis ingruit obicibus,
 Non qualis reffluo, Cimbros aut Santonas, aestu
 Territat, ad motus, menstrua luna, tuos,
 Verum quantus erat, cum sidera celsa petentes,
 Obruit impulsis montibus anguipedes.
 Ille et frondosos saltus iam mersit Eoe
 Taprobanes, ipso cum grege dentifero.
 Mersit et adversos, tecum Iuverna, Britannos,
 Nec fortunatis temperat a populis.
 Illius immensis iam fluctibus astrifer Atlas
 Tunditur, et collo non bene fulcit onus.
 Nec dubito coeptum, Fortuna urgente, tenorem,
 Quin vivum, toto restet in orbe, nihil,
 Sed quicquid tellus, quicquid levis educat aër,
 Omne vagis fiat praeda natatibus.
 Ullo Carpathius potuit nec tempore vates,
 Tam nitidum dominis annumerare pecus.
 Ergo vetus veterum verax est dogma sophorum;
 Saepe homines igni, saepe perire salo;
 Deleri et toties deleta renasci,

Omnia, Phoebeae scilicet instar avis;
 Quae se morte parit, vitam cui funera reddunt,
 Natalem cineres, ultima principium.
 Nec certum quis scire potest, quotus iste senescat
 Mundus adhuc quot erunt, quotve fuere prius.
 I nunc, ventosae petitur cui gloria famae,
 Casurum nullo tempore nomen ama!
 Cum tibi sive toga partum, seu Marte cruento,
 Tangere non valeat saecla secunda, decus!
 Nec ventura minus te nascitura sit aetas,
 Quam Phaëthon teas, quae fuit ante faces.
 Magne Deum genitor, tantos qui fusus in artus,
 Vitali hoc ingens, flamme corpus alis;
 Qui propria humanas dignatus imagine mentes,
 Nostra ad cognatos, erigis ora, polos;
 Nonne semel stabili, mundum tu, pace ligasti?
 Iam tum, pulchra rudi, cum data forma chao est?
 Frigida ne calidis instant, humida siccis,
 Sed par temperies conciliaret opus.
 Nunc adeo nil flamma et humus, vereamur et omnes,
 Ne fiant unus, cuncta elementa, latex.
 Nonne semel firmo sanxisti foedere pactum,
 Diluvio haud ultra perdere velle tuos,
 Dum picturato signaret nubila tractu,
 Iunoni gratae semita curva Deae?
 Aspice nunc, et quem nunquam sententia vertit,
 Promissis memorem mitibus adde fidem.
 Quodsi fatali constrictum lege teneri,
 Parcarum et tabulis scis superesse trium,
 Quondam submersas, tantum succendere, terras
 Ut possis iterum; quid vetita arma moves?
 Sin rerum iam sinis adest, iace solus ab alto,
 Facta Pyracmonia, tela trisulca, manu.
 Undosam cohibe pestem; revocetur in antrum
 Auster, et expurgent Thracia flabra diem;
 Fluctibus et reduces, Tritonia concha, receptus,
 Neptuno gentes iam miserante, canat.
 Vota nihil prosunt; et quae fert omnia secum,
 Haec eadem nostras, fert simul unda, preces.
 Ecce magis, dirus, magis ecce ad sidera, pontus,
 Se levat, et tantum non, iuga summa premit.
 Iam iam contigui iungentur nubibus amnes,
 Nec spatium, per quod defluat imber, erit.
 Surge age cara soror, superentem nubila Olympum,
 Scandamus, celeri, dum licet, ambo fuga.
 Vel Parnasiaceae, potius fastigia, Cirrhae,
 Altior est lymphis omnibus ille locus.
 Hic ego post tergum lapides, magnae ossa parentis
 Iactabo, extinctos et reparabo viros.
 At tu temineam renovabis femina turbam
 Saxa pari mittens, sed leviora, manu.
 Sic ego Deucalion, sic tu Pyrrha altera fies,
 Sic erimus mundi, semina prima, novi.

Flood events and their documented impacts in the Carpathian basin: an overview of the period 1000-1500

3. App. Floods, flood-related hydromorphological events, damages and administrative changes reported in medieval Hungary



9 A catalogue of floods in medieval Hungary: analysis of individual flood reports

In this chapter the description of individual flood events, reports on previous floods or information closely related to preceding flood events are presented. Although in one way or another all the information is included in the analysis later, many of these evidence – due to the fact that no information is available concerning the time or even year of flood event – are not included in the frequency and magnitude diagrams, only in the descriptive analysis. Moreover, according to the different type and source of information, the length of description in this chapter will be different, which means that in some cases more background analysis is needed, while in some other cases timing, location and other basic information can be clearly provided and thus, less explanations and a shorter text are needed.

9.1 Analysis of 11th-century evidence

Although these sources are far less dateable and clear sources, after some more detailed examination they still might contain some useful information. In this sense 11-12th-century evidence significantly differ from the sources and analysis-possibilities of the 14-15th centuries.⁷⁷⁰ Thus, method of analysis should differ from the one in the subsequent centuries. In the case of the 11th century in the very rare cases reported, it is already a question of analysis to detect floods or high-water events and preceding high precipitation events in and behind descriptions, related to military campaigns or certain geo- and/or hydromorphological events. The location of places mentioned in the text, can be followed on *App. 1a*.

9.1.1 Natural or artificial inundations? Military campaigns of Henry III: 1043 and 1044

Concerning 11th-century flood events, we have only a very limited number of evidence referring to medieval Hungary. Thus, it is worth to follow those information which although refer to neighbouring areas and Hungary, mainly in connection with the 11th-century German military campaigns to Hungary. The first such remaining evidence is when Emperor Henry III entered Hungary in August 1043, but the swamps and inundations of the Rábca river stopped him in the northern Transdanubia.⁷⁷¹ According to *Herimannus Augiensis*, the summer of 1043 was rather rainy in the German territories. It was in fact so wet that a shortage of crops occurred.⁷⁷²

Nevertheless, also in 1044 when Henry III entered Hungary, before gaining victory against King Aba at Ménfő, he had to cross the Rábca river. Similar to 1043, it was again a rather difficult task due to the swampy waters ('*invenit iter stagnantibus aquis*'). It is supported by the chronicle of Henrik Mügeln, who worked with some early sources.⁷⁷³ However, people

⁷⁷⁰ Weather- and flood-related medieval data was provided and analysed earlier in the following paper: Kiss 2000, pp. 249-263. In the present work, an extended version of the flood-related information is included.

⁷⁷¹ Oefele 1891, p. 33: "1043. Veniens ergo rex ad terminum regni, ubi exercitus recenseretur, decrevit, ut hostilis terra procul dubio invaderetur, et factis machinis contra opus, quo fluvium Rapinisa occluserant, in crastinum impugnare disposuerant."

⁷⁷² MGH SS Vol. 5, p. 124 (*Herimannus Augiensis Chonicon*): "1043. ... Aestas pluviosa frugum et vindemiarum penuriam effecit. Heinricus rex iterum Pannonias petens, ab Ovone, vix impetrante pactum..."

⁷⁷³ SRH Vol. 2, p. 158 (*Chronicon Henrici de Mügeln*): "Do het sich daz wasser Raba genant und Rapcha genant erglossen, daz der keyser nicht über daz wasser moch kumen, wann die weld warn dick ind die pruch warn tieff. Do czoh der keyser das wasser auf die ganczen nacht und kom dez morgens fru, do dye sunne schein, an ein furt und czoh laylich über dy Rab."

of the 'other' Hungarian king (Peter I), riding all night found/showed a ford where it was easy to cross the river. Then they crossed the Rába river, but no more difficulties with crossing were mentioned at this time, only that Aba's army was waiting for them at the other side of the Rába river.⁷⁷⁴

There is a chance that summer of 1043 was also wet in more easterly parts of Central Europe. Collecting waters in a much larger catchment, this might be especially true for the Danube. Nevertheless, no such information is available referring to 1044. And still, as we could see, the Emperor's army was again (at least for a while) obstructed by extensive swampy waters. This is due to the fact that south of them the extensive Hanság (Wasen) wetlands were situated. The waters of the Hanság were collected and led to the Danube by the short lower section of the Rábca river. Between the Hanság and the Danube, at its lower section the Rábca met the Rába river, just before entering the Danube. Due to the little difference in elevation, the waterlevel of the Danube can, at this lower section, already significantly influence the waterlevel of the Rábca and Rába rivers. Thus, due the sensitive hydromorphological conditions, it is rather easy to 'manipulate' the hydrological conditions of the lower Rábca, and thus, make crossing very difficult or impossible for those not familiar with the environmental conditions of the area. As such, natural flood event is not necessarily needed to 'produce' flooding.

Is there any information available that Hungarians influenced the water-system, applied any sort of 'manipulation' or management of this fragile water-system? Already in the case of the 1043-campaign the *Annales Altahenses Maiores* mentioned a certain '*opus*' on the Rábca river, which later indirectly reappeared (e.g. in 1044: '*et machinis more illis solito*') presumably referring to an 'object' closing down the riverflow ('*et factis machinis contra opus, quo fluvium Rapinisa occluserant*') of artificial management on the river.⁷⁷⁵ In the 14th century chronicle composition the even more direct word '*obstacula*' is mentioned.⁷⁷⁶ Presumably the same sort of '*machinae*' appeared in the *Annales Altahenses Maiores* in 1043 and 1044.⁷⁷⁷

9.1.2 Rábca-inundations and military campaigns in 1030, 1042, 1043, 1044, 1063, 1074: 'real' flood events or an usual phenomenon mixed with human impact?

Using the above-mentioned two examples and accounting with all the examples containing direct weather and military reference, it is worth to compare the conditions of the obstructive 'waterline' in Western Hungary which caused so much troubles to the emperor's

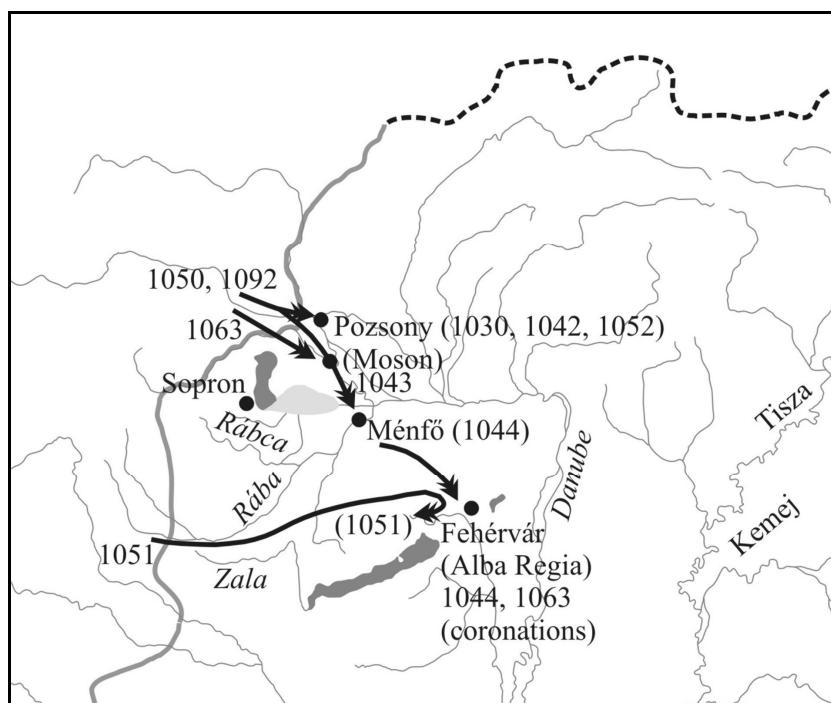
⁷⁷⁴ Oefele 1891, pp. 35-36 (*Annales Altahenses Maiores*): "1044. ... Quo die cum noster heros ad locum condictum venisset et illum minime reperisset, volens eum insequi ultra Rabanisa fluvium, invenit iter stagnantibus aquis et machinis more illis solito interclusum. Ducatum autem praebentibus Ungris, quos secum habuit, tota nocte equitato sursum per ripam crepusculo facili vado transit. Tercia demum die post condictum praelium, cum primi nostrorum transirent Rhaba fluvium, ecce innumerae acies armatorum eminus apparent, qui campum latissimum, quasi silva succrevisset, operuerunt." Besides *Annales Altahenses Maiores*, the 13th-century domestic *Gesta Hungarorum*, written by *Simonis de Keza* described the situation in a rather similar way (SRH Vol. 1, p. 176): "Concitato igitur cursu invasit fines Hungarie intrans per Supronium et, cum vellet in Bobut pertransire, non poterat propter aquas. Hungari ergo, qui erant cum ceasare et Petro rege, duxerunt caesaris exercitum sursum iucta flumen Rebche et utraque flumina tota nocte equitando orto sole facili vado transierunt."

⁷⁷⁵ Oefele 1891, p. 33 (*Annales Altahenses Maiores*).

⁷⁷⁶ SRH Vol. 1, p. 329.

⁷⁷⁷ Oefele 1891. pp. 35-36 (*Annales Altahenses Maiores*): "Quo die cum noster heros ad locum condictum venisset et illum minime reperisset, volens eum insequi ultra Rabanisa fluvium, invenit iter stagnantibus aquis et machinis more illis solito interclusum. Ducatum autem praebentibus Ungris, quos secum habuit, tota nocte equitando sursum per ripam crepusculo facili vado transit. Quorum adventum prospectantes, qui machinas custodiebant, relictis omnibus, quae habuerant fugerunt."

army in late June – early July of 1030,⁷⁷⁸ 1042, 1043, late June - early July of 1044 and August of 1051. In 1030 – similar to 1044 – the campaign started around the turn of June and July.⁷⁷⁹ At the that time, as a result of shortage in beverages (as a result of the so-called 'burnt-up land' tactics of Hungarians), as well as obstructed by rivers and wetlands, the emperor had to make a peace-treaty with King István I.⁷⁸⁰ Similar to 1030, in 1042 mainly due to the rivers and swamps, the Emperor could proceed only until the Rába river.⁷⁸¹ After the summer of 1043, rainy according to *Herimannus Augiensis*, Aba made a peace treaty with the Emperor and thus, no intensive wars were reported in Hungary.⁷⁸² In all cases the extensive wetland areas made it impossible to go ahead, and even in 1044, when finally the emperor's army managed to cross the river, it happened with the help of King Péter's (local) "people who knew the fords and the area well enough".



38. Fig. Route of German military campaigns in the 11th century

⁷⁷⁸ About this unlucky campaign of the Emperor, a short description was added in the *Annales Altahenses Maiores*: Oefele 1891, p. 18: "1030. Chonradus imperator in Ungariam cum exercitu properans natali sancti Albani in dominica die in monasterio Altahensi pernoctavit. Rediit autem de Ungaria sine militia et in nullo proficiens, ind quod exercitus fame periclitabatur, et Vienna ab Ungris capiebatur."

More interesting evidence is available at *Herimanni Augiensis Chronicon* p. 121 (MGH SS Vol. 5): "1030. Ernust dux cum exilio relaxatus ducatum, pravorum consilio usus, et denuo imperatori refragatus, ducatu privatur, et frater eius iunior Herimannus dux Suevorum efficitur. Counradus imperator, iam dudum inimiciis cum Stephano Ungariorum rege conflatis, Pannonię petuit, et quantum fluminibus et paludibus non obstantibus poterat, Rabam usque devastavit."

⁷⁷⁹ Oefele 1891, p. 18. Since the Emperor (Konrad) spent the feast (birthday) of Saint Alban in Neideraltaich, the beginning of the campaign can be dated to 21 June, 1030. For more details, see: Kristó 1999, p. 239.

⁷⁸⁰ MGH SS rer. Germ. Vol. 61, p. 44 (*Wipos Gesta Chuonradi imperatoris*): "XXVI. Quod imperator super Ungaros cum exercitu venit. Eodem tempore (1030) multae dissensiones inter gentem Pannonicam et Baioarios, Unde commotus imperator Chuonradus cum grandi exercitu super Ungaros venit. ... Imperator tam munitum regnum fluiis et silvis intrare non valens multis tamen praedationibus, incendiis circa terminos regni iniuriam suam satis ilciscens reversus est, volens tempore oportuniiori coepit sua peragere."

⁷⁸¹ MGH SS Vol. 5, p. 124 (*Herimanni Augiensis Chronicon*): "1042. ... Heinricus quoque rex autumno Pannoniae petens, Heimenburg et Brezesburg evertit, septentrionalem Danubii partem, qui flumina australem et paludes munierant, usque ad Grana flumen vastavit seu in dedicionem accepit; et pars exercitus bis numero Ungariis incursantibus congediens, strages magnas efecit."

⁷⁸² For more details, see: Kristó 1999, p. 221.

In some cases it was possible to stop the German army already at the borderline (e.g. 1050, 1052,⁷⁸³ 1108), while in the majority of cases they managed to enter the country (1030, 1042, 1043, 1044, 1051, 1063, 1074, 1079).⁷⁸⁴ In 1044 and 1063 they managed to cross the Rábca,⁷⁸⁵ but only in cases intervening in civil war at one or the other side and thus, Hungarians showed them the way of crossing. In all other cases, similar to the unsuccessful 13th-century attempt of the Czech-Polish (and partly Austrian) army of Ottokar in 1271,⁷⁸⁶ German army ended up in the 'fatal triangle' surrounded by waters which only in especially dry periods did not provide enough water to protect the hinterland, especially since Hungarians usually applied water management and the so-called 'burnt-up land' tactics. Only exception is 1051 when Henry III chose a more proper way of entering the country, but in a bad, rainy period.

Months of the events have special importance, since in the catchment areas of the Rába and Rábca rivers, according to 20th-century observations, the main flood period is usually spring. Additionally, there is another flood period which causes a secondary flood maximum on the Rába river (especially on its upper sections, in today Styria and Burgenland – Austria) in the period of June-July.⁷⁸⁷ If probable flood-periods on the Rába-Rábca-system occurred in the same time both in the 20th- and the 11th-centuries, then dating of military campaigns and the time of the army's arrival were in all cases rather unfortunate for the emperor, and made the defence for Hungarians easier (for locations and route of campaigns, see *Fig. 38*).

Thus, the fact that Germans could not cross the swamps and/or waters of the Rábca river in itself does not necessarily suggest rainy conditions in Hungary for the period before or during the military campaigns. Only in case of the summer 1051 campaign it seems to be probable that rainy conditions also prevailed in West-Hungary, causing river floods (already at the Austrian sections) while in all other cases more additional data is needed to decide over the character of contemporary weather conditions.

9.1.3 Floods of a rainy summer: 1051

Another military campaign was led to Hungary in August 1051. As the *Annales Altahenses* interprets the events, it was a difficult campaign ('*Ad Ungros expeditio facta incommoda ac satis laboriosa.*'), largely due to the fact that the whole summer was with abundant rains and waters ('*Totum namque aestivum tempus, pluviis abundans, inmanes fecit prorumpere aquas.*'). During this campaign, many people and horses submerged in waters ('*Qua de re plures tam hominum quam equorum summersi sunt.*').⁷⁸⁸ At this time, however, the

⁷⁸³ SRH Vol. 1, p. 125 (*Annales Posonienses*): "1052. Henricus imperator castrum Poson obsedit."

MGH SS Vol. 5, p. 131 (*Herimannus Augiensis chronicon*): "1052. Inde ipse, cum Turegi pentecosten peregisset, in Pannonicam itidem expeditionem proficiscitur. Andreaque, rege Ungariorum minus minusque pro pacto pacis postulando alligate et promittente, Brezisburg castrum obsedit, et variis belli machinis diu oppugnatum, Deo obsessis se anxie invocantibus opitulante, frustratis semper nisibus, nullo modo capere potuit."

⁷⁸⁴ Kristó 1986, p. 170.

⁷⁸⁵ There was another military campaign of Henry IV in August-September 1074, but this one was led all the way north to the Danube (thus, mostly in the area of present Slovakia) and thus, they did not have to cross the Rábca. For more details, see Kristó 1986, pp. 65-66.

For the other military campaign of Henry IV, occurred in spring 1079, no details are available. It is, however, known as another unsuccessful attempt. See Kristó 1986, p. 67.

⁷⁸⁶ MGH SS Vol. 9, pp. 703-704 (*Continuatio Vindobonensis*).

See also MGH SS Vol. 9, p. 744 (*Continuatio Claustroneoburgensis VI*).

⁷⁸⁷ See, for example, Goda-Vaszári 1997, p. 530; Ambrózy 1997, pp. 508-509.

⁷⁸⁸ Oefele 1891, p. 47 (*Annales Altahenses Maiores*): "1051. Natale Christi Caesar augustus Pholide celebrat, paschalia Agrippinae feriat, ibique filium baptisari curavit. Ad Ungros expeditio facta incommuta ac satis

emperor avoided the 'fatal triangle' of the Fertő-Hanság-Rábca-Danube waterline, and arrived more from the south, along the Zala river, from Styria.⁷⁸⁹

Presumably the same campaign is described by *Aventinus* though without mentioning the exact date.⁷⁹⁰ For the negative result of the campaign *Aventinus* blamed prevailing weather conditions. Great showers and floods of rivers occurred in the western, west-central Transdanubia, where the German army proceeded from the south-southwest (between the Rába and the uppermost section of the Zala river). Interestingly enough, *Herimannus* only mentioned the 'usual things', namely that the several swamps and dangers obstructed the army in their way.⁷⁹¹

Based on the above-mentioned evidence, no direct information is available concerning the whole summer weather conditions of Hungary, but from *Aventinus'* report it seems quite likely that during the invasion (early August and probably also before) weather was rather rainy in Hungary, too. It is, on the other hand, an interesting addition that, according to the descriptions, the 'burnt-up-land' technique was successfully applied (thus, it was not so rainy all the time) against the emperor's army, so that even horses had not enough food to eat.

laboriosa. Totum namque aestivum tempus, pluviis abundans, inmanes fecit prorumpere aquas. Qua de re plures tam hominum quam equorum summersi sunt."

⁷⁸⁹ The *Chronicon Monacense* vividly describes conditions of the campaign (SRH Vol. 2, pp. 72-73): "41. Sequenti anno (1051) cesar cum magna multitudine bellatorum ob easdem causas venit in Hungariam, iuxta fontes rivorum Zala et Zelice, misitque naves victuales per Danubium in Hungariam, quibus fratrem suum Gebhart episcopum prefecit. Hiis auditis Andreas rex et dux Bela omnes acervos segetum et trisos (*sic*) herbarum igne combusserunt; habitatoresque cum universis animalibus de partibus illis, per quas cesar erat transiturus, procul (p. 73) abduxerunt. Quo cum cesar pervenisset et victimum non habuit nesciebatque, ubi naves eius essent. Interea autem episcopus frater venit in Iaurinum et mittens epistolam ad Heinricum cesarem, sciscitabatur, ubi deberet ipsum exspectare. Nuncius caitur a latronibus Andree regis et ad eum dicitur. Misit ergo per alium nuncium Andreas episcopo literas quasi ab imperatore emanassent, conbuentes (*sic*), quod ardua negotia imperii ipsum arcerent et ob ea in Teutoniam ire compelleretur, quare destrutis navibus etc. In Ratisponam duceret gressus. Cesar horum inscius cum suis maxima egestate laborabat, et multi fame perierant, plurimi ab inimicis sagittis interierunt. Annuit rex Andreas et misit copiam victualium in exercitum imperatoris adeo sumptosam, ut Teutoici ex potus ingurgitatione crapulari morerentur; residuis suspellectili abiecta in Teutoniam reversis. Et locus ille, unde tam turpiter fugierunt, usque hodie vocatur Werteshege (Vérteshegye)."

⁷⁹⁰ Aventinus (*Annalium Boiorum*) p. 327: Liber quintus: "Imperator peiti coactoque exercitu Ungariam invadere imperioque subigere tentat. ... Ubi illi fines hostium attigere agrosque urunt, aedificia, vicos incidunt, eiusmodi tempestates sunt consecutae, ut expeditio necessario intermitteretur, et continuatione imbrrium, torrentum fluminumque diluviae, plerisque equorum et mortalium absuntis, sub papilionibus milites contineri non possent ... Porro imperator cum valida Francorum, Gallorum, Polonorum, Longobardorum, Venedorum, Suevorum, Saxonum manu Pannoniam, australem Ungariae partem, terrestri itinere, absque carrucis, annona equis clitellariis avecta, invadit: sed paludibus fluminumque eluvie iter sibi interclusum offnedit: longisque anfractibus alluviones amnium, qui iugi fluvia aucti excreverant alveosque egrediebantur, circuit, per Chironum fines Ungariam intrat."

⁷⁹¹ MGH SS Vol. 5, p. 130 (*Herimannus Augiensis Chronicon*): "Sequenti autumno magno cum exercitu imperator, pctum Andree regis ut per legatos offerebatur accipere contemnens, Pannonias petiit, Gebehardoque atispone se episcopo et Welf Brezislaoque ducibus ad septentrionalem Danubii partem depopulandam transmissis, ipse, devecto e navibus, quantum in equis poterat, sumptu,, longo propter fluviorum illuvionem circuitu per Carentani fines transiens, periurumque regnum invadens, hac ac illac Ungarico exercitu latrocinantium more fugitante et nusquam aequo Marte conferre manum audente, omnia circumquaque, quoad sumptus militi suppetebant, vasta reddidit. Sed cum laboranti iam penuria et fame exercitui Ungarii iam redditum pararent intercludere, obpositisque per ripas fluminum praemunitas vadosaque paludes copiis suis, omnes se vel ad ditionem, incunctanter tranvadentes, fugant, quandamque munitionem firmissimam ad pontem Rabanisa fluminis structam, in qua maximam hostis fiducium habebat, quidam ex Burgundionibus Saxonibus et Bolanis milites, non sine sui periculo flumine transito, in brevi expugnatam capiunt, caesis palatisqui Ungariis, reliquo exercitui viam pandunt. Que pertranseuntibus pene cunxitis incensa, aliquot de postremis, in magnó periculo hostibus insequentibus, redditum interclusit; sicque redeunte imperatur, illisque quod ultra Danubium transmiserat rebus prospere gestis iam dudum reversis, Andreas rex a nostro marchione Adalberto pacem postulatum mittit, eamque vicissim tribuit."

9.1.4 Description of natural phenomena and a possible 'flood' event in 1092

Referring to the year of 1092, an interesting set of natural phenomena possibly related to wet conditions and flood, was included in the description of *Bernoldus monachus*, based on the reference of contemporary eye-witnesses.⁷⁹² He was not present at the events described, only heard about them from others, the eye-witnesses ('ut audivimus'). Since the monk who died in 1100, in those few cases when talked about Hungary, was otherwise quite well-informed about Hungarian matters (e.g. 1083: canonisations; 1096: events around the first Crusade), and all of his reference concerning Hungarian events mentioned in his work were correctly dated, it is worth studying his description in more detail.

Before giving full credit to the present description of *Bernoldus monachus*, it is reasonable to have a closer look on the geographical and weather-related background of these 'possible' events. The monk mentions five separate phenomena, he heard about/from Hungary:⁷⁹³

1. A hill, located along the Danube 'slipped' or 'fell down' ('*Nam quidam mons se in Danubium praecipitavit*') and devastated areas around. Danube changed its riverbed and destroyed broad areas ('*unde fluvius ille alveum suum mutare coactus, circumiacentes terras longe lateque vastavit*').
2. At another place/case a great lake emerged in a dry area (dryland) ('*Item in sicca terra lacus magnus alibi emersit, ...*').
3. In another lake suddenly a hill appeared ('*in alio lacu mons quidam de repente apparuit.*').
4. River Tisza (?) flowed with blood for three days ('*Fluvius quoque nomine Thisaha per triduum sanguineus fluxit.*').
5. Immensely great thunder, which had not been heard for centuries, frightened people, which was sensed to be crossing over the ground and then returning under the ground ('*Tonitru quoque maximum et a seculis inauditum homines ibi terruit quod supra terram transivit, et sub terra redire sentiebatur eadem via.*').

Analysis of reference No. 4, and in some extent as well No. 3 sounds problematic and has relatively little importance from our present viewpoint. Related to No. 5, an earthquake in Hungary is also mentioned in the *Annales Augustani*.⁷⁹⁴ Event No. 1 contains the reference on a devastating Danube flood, when a hill or mountain (*mons*), falling into the Danube, caused a devastating flood event. At first site, these events sound to be rather 'mysterious', even if monk *Bernardus* – based on his other works – seems to be a particularly reliable annalist of his time. Nevertheless, he only 'heard' about the events and was not an eye-witness himself.

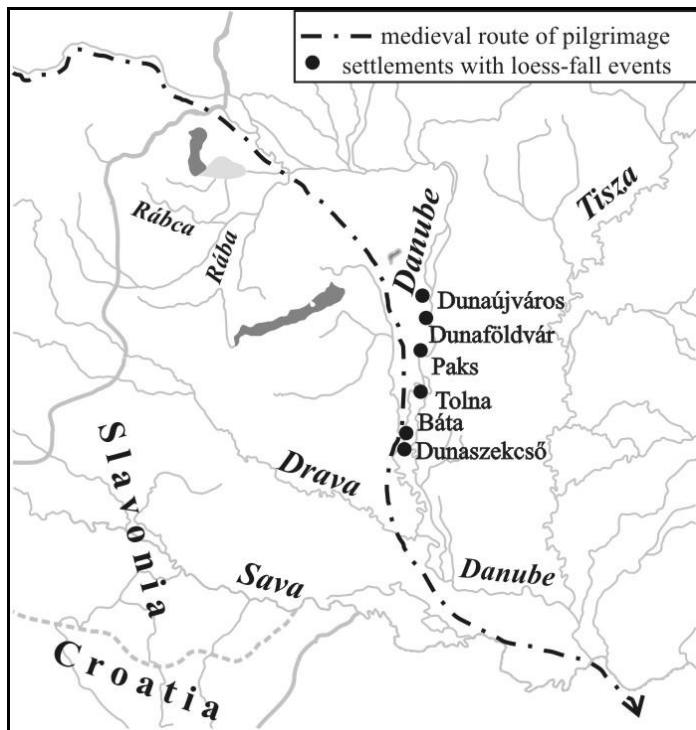
Where could he get his information? *Bernoldus* at that time (1092) lived in Schaffhausen, today located in nothern Switzerland at the Rhein river, west of Lake Boden. Since *Bernoldus* himself died in 1100, we can presume that he had relatively up-to-date 'news'

⁷⁹² Strayer 1983, p. 197: "Bernold of Constance (or of St. Blasien, around 1050-1100) was canon of Constance; monk of St. Blasien and then of Schaffhausen; chronicler, canonist, liturgist, polemicist; and earliest and most influential disseminator of the ideas of Pope Gregory VII in Germany. His chronicle (autograph in Munich, MS lat. 432, the Codex latinus monacensis) is the most extensive source for the history of the Investiture Controversy." See also: Vauchez et al. 2001, p. 176.

⁷⁹³ MGH SS Vol. 5, p. 454 (*Bernoldi Chronicon*): "1092. In Ungaria his temporibus multa prodigia contigerunt, ut audivimus. Nam quidam mons se in Danubium praecipitavit: unde fluvius ille alveum suum mutare coactus, circumiacentes terras longe lateque vastavit. Item in sicca terra lacus magnus alibi emersit, et in alio lacu mons quidam de repente apparuit. Fluvius quoque nomine Thisaha per triduum sanguineus fluxit. Sed et terrae motus ibi inauditus factus est, ita ut homines eius impetum stando sustinere non possent. Tonitru quoque maximum et a seculis inauditum homines ibi terruit, quod supra terram transivit, et sub terra redire sentiebatur eadem via." On the next page (p. 455) *Bernoldus* reported an earthquake in the same year, which occurred in the bishoprix of Constanz.

⁷⁹⁴ MGH SS Vol. 3, p. 134 (*Annales Angustani*): "1092. In provincia Ungarorum una die, 6. Kal. Iulii ter terrae motus factus est urbesque submersae sunt."

about Hungary. Probably the source of information were pilgrims coming from the Holy Land via Hungary (or any travelers/merchants using this main route), crossing the town of Schaffhausen as well. And while staying at the monastery or in the town, they could discuss their 'adventures' with *Bernoldus*, his brothers or any other people. It is even more probable if we have a closer look on the location of the transcontinental route of pilgrimage (and travel/trade) through Hungary.



39. Fig. International route of medieval pilgrimage (11th-12th centuries) leading through Hungary and the endangered edge of the loess plateau along the Danube⁷⁹⁵

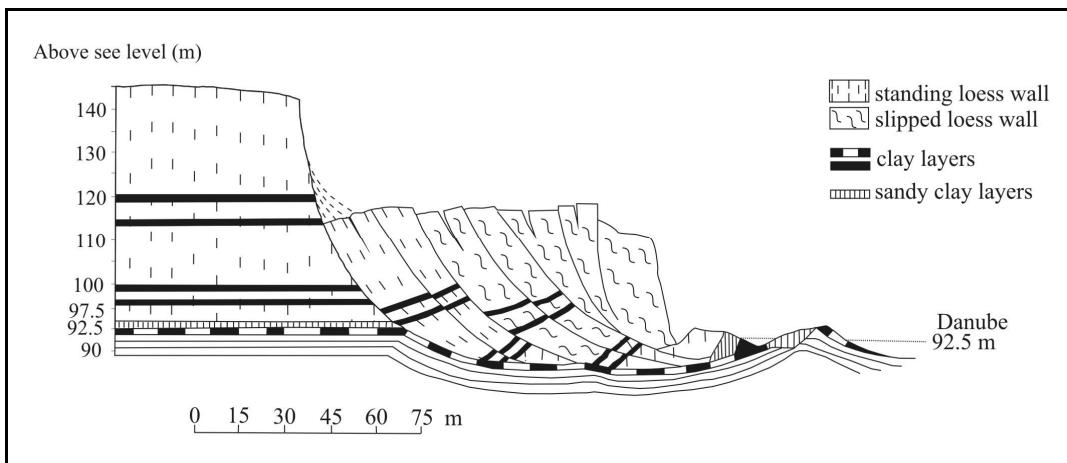
As we can see in Fig. 39, the main branch of this transcontinental route in Hungary largely led along the Danube. Entering Hungary, the route first proceeded along the Danube, but soon turned away of the river towards the southeast, and reached the Danube again at its middle section, where in a long way (hundreds of km) continued along the river. If travellers see or heard about any natural phenomena related to the Danube, it is more likely to take place either at the upper, or this latter middle sections (with loess wall).

In historical Hungary, the Upper-Danube section is completely flat with several islands and thus, it is less likely to have any sort of 'hill' falling into the river. The middle section of the river, however, seems to be an ideal place for the phenomena probably described by the monk. Although this is also lowland area, for several dozens of kilometres the southeastern edge of the Mezőföld loess plain descending towards the Danube – divided into a row/series of, as locally called, 'hills' or 'mountains'⁷⁹⁶ following the western banks of the river. The edge of this loess plateau, approximately 50-60 metres higher than the waterlevel of the Danube, is even today very much endangered and thus, subject to such 'slipping or falling' events (which indeed occurred in the extraordinary wet year of 2010).

⁷⁹⁵ For the Hungarian section of the medieval route of pilgrimage, see Borosy-Laszlovszky 2006, pp. 78, 81. See also Gerevich 1973, p. 274. Map is based on: Dúdar 1991, p. 109.

⁷⁹⁶ In medieval and modern Hungarian terminology, the Hungarian word 'hegy' (Latin 'mons') were equally applied for 'real' hill/mountain (in its present geographical meaning), but also for smaller mounds rising above its surroundings. See, for example, Kristó 2003, p. 37.

In present days, this middle section is the area where the most likely to have such mass-erosion event within a very short period of time (couple of minutes to some hours). The loess plain of the Mezőföld area reaches the south-east, at the Danube forming an instabile set of loess walls between Paks and Dunaszekcső. Underneath the Mezőföld loess plain clay layers, forming a hollow declining towards the Danube. This clay hollow collects and leads waters towards the Danube, under the loess layer. Basically, the slippery surface between the clay and the loess, with wet previous period as well as human activity over the loess surface, then minor earthquakes and/or existence of some water-reservoir in the neighbourhood, and waterlevel-changes of the Danube may be primarily responsible together for the fall of a loess 'hill'.⁷⁹⁷ Very frequently, such event occurs at a place where a previous falling event already obstructs the water in its natural downflow underneath the loess layer. It is also important to mention that the occurrence of this certain phenomenon requires the constellation of specific conditions (e.g. wet period, waterlevel-changes, minor earthquake/artificial damming) listed above. This phenomenon is very typical even today, and we can count several such cases, for example in Dunaszekcső, Dunaújváros or Dunaföldvár (see Fig. 39).⁷⁹⁸



40. Fig. Modelling the fall of loess wall called 'Öreghegy' in Dunaföldvár, 1970 (after Pécsi 1971)

The above-mentioned fall of the loess wall of Dunaföldvár, called 'Öreg hegy' (meaning: 'Old Hill') occurred in 1970 forms a good parallel to the description of *Bernoldus monachus*. Here the previous, almost one-year period was wet (app. 20% precipitation surplus) in the whole Mezőföld area. Moreover, the summer of 1970 was very rainy. Thus, the (sandy clay) layer between the clay and loess became wet and slippery.⁷⁹⁹ The water level of the Danube was high in late August-early September. As a result, on 15 September the Öreghegy collapsed with one enormous sound of crack. In the foreground of the (former) Öreghegy the loess pushed up and ahead the clay, forming two new rows of islands in the Danube, whereas the sudden flood event devastated and inundated surrounding areas (see Fig. 40).⁸⁰⁰

As a conclusion, preceding wet period (seasons, year, years) over the underground catchment area (the Mezőföld) as well as some physical disturbance (minor earthquake) and improper outflow (abundant rainfall, high water-level conditions of the Danube) are all necessary circumstances which result the above-described mass-erosion event. Thus, whenever such an event occurred, the occurrence of the event itself already suggest a previous wet period and high water-level conditions over a well-definable, larger area.

⁷⁹⁷ Pécsi 1971, p. 236.

⁷⁹⁸ Pécsi 1991, p. 171.

⁷⁹⁹ Pécsi 1971, p. 233.

⁸⁰⁰ Pécsi 1991, p. 171.

One can notice several similarities between the description of *Bernoldus monachus* and the 1970-fall of the Öreghegy at Dunaföldvár. Here not only the first, but No. 2, 3, 5 and 6 as well might be worth to take into account, even if some of them are described as separate events. A separate analysis of events No. 2, 3 and 5, due to lack of information, would not lead too far. Nevertheless, connecting all of them together show clear similarities to a prototype of a loess-fall event, described above: hill falling into the Danube, the river changed its bed and destroyed (flooded) broad areas, a lake emerged, in a lake a 'hill' appeared suddenly, earthquake, thunder-like great noise frightened people, which was sensed to be crossing over the ground and then returning under ground.

It is, however, important to emphasise that *Bernoldus monachus* was not an eye-witness, presented an information which he had not seen, and only heard from others. Biblical meaning and therefore an attempt to find set of events connected to the 7 disasters and signs predicting the end of the world might also influenced the above-mentioned descriptions. Further information, possible parallels referring to the year of 1092 might have great significance while deciding over the application possibilities of the above-mentioned descriptions. Based on *Cosmas Pragensis*, great intrusion of winter with ice, frosts and abundant snowfall was witnessed on 1 April 1092.⁸⁰¹ According to Glaser the autumns of the 1090s were wet in Augsburg.⁸⁰²

9.2 12th-century floods recorded

9.2.1 Byzantine evidence on a presumable flood event: turn of 1154-1155

Probably a Danube flood event was recorded by Ioannes Kinnamos, referring to either late 1154 or early 1155 (during the attack of Hungarians against the Byzantine Branizova): "However, when they (Hungarians) arrived (to the crossing place), the Danube was in flood (stormy weather menaced), and therefore they turned towards Belgrade."⁸⁰³ Since Byzantine authors of that period often used symbolic pictures to make fights more heroic, the evidence on flood event cannot be completely proved, even if Kinnamos in political and other questions seem to be a reliable source.

9.2.2 Flood of the Drava river in 1147

Documented by Odo de Deogilo who also took part of the campaign, moderate rainfall and the extensive swamps, flood event due to rainfall occurred in 1147: here not directly the river itself is mentioned to be in flood, but rather the swamps in the vicinity.⁸⁰⁴ Thus, the

⁸⁰¹ MGH SS rer. Germ. NS Vol. 2, p. 157 (*Cosmas Pragensis*): "Quos dux iam mutato animo benigne suscepit et celebravit cum eis pascha in urbe Wissegrad. Et in ipsa pasche ebdomada circa kal. Aprilis descendit maxima nix et tantum inhorruit frigus mixtum cum glacie, quantum raro in media contigit hyeme." For further analysis, see Brázil-Kotyza 1995, p. 94.

⁸⁰² Glaser 2001, p. 88.

⁸⁰³ Moravcsik 1988, p. 212 (*Ioannes Kinnamos*): "Οπως μέντοι Βρανιτζόβιται τήν πόλιν τέως αύτώ τηρήσωσι, γράμμα χαράξας οσον ούκ ηδη ἀφίξεσθαι τοῦτον μηνῦν τών στρατιωτών τινι ἐνεχείρισε κελεύσας ἐπί τήν πόλιν αύτό διαφεναι βέλει ἔνδησαντα. Ο μέν οὖν κατά τό κελευσθέν ἐποίει. Τό δέ βέλος πορρωτέρω ἡ ἔχρην ἀφεθέν Οὐννοῖς εἰς χείρας ἥλθεν. Εύθυς οὖν ταραγμός είσηλθεν αύτούς, καὶ δή τάς τε ἐλεπόλεις καὶ οσα πρός τειχομαχίαν αύτοῖς παρεσκεύαστο πυρί φλέξαντες ἐπί τόν Ιστρου πορθμόν ἡσαν. Πλήθοντι δέ αύτῳ ἐντευχηκότες (χειμών γάρ ἐκ τῶν ἀνωθεν ἡπειργεν), ὡς ἐπί Βελέγραδα πόλιν ἐφέροντο."

⁸⁰⁴ Migne 1855, pp. 21-23. Odo de Deogilo: De profectione Ludovici VII in Orientem (Odonis de Diogilo De Ludovici VII Francorum regis cognomento junioris profectione in orientem Cui ipse interfuit Opus septem libellis distinctum. Epistola Odonis ad venerandum abbatem suum Sugerium). Libellus Secundus: ".... Hungaria ex hac

swamps around the river inundated and as such, many soldiers submerged in the waters. The Crusaders in this year (2nd Crusade) came to Hungary, but crossing of the Drava river caused great difficulties: many Crusaders got drown in the river. Since in 24 June Crusaders were already at the Hungarian-Byzantine borderline,⁸⁰⁵ the time of crossing the Drava river could happen in early-mid June. No any problems were mentioned concerning the crossing of the (even bigger) Sava river. As such, probably May-early June could be rich in precipitation. Since he was present in the troops of the second Crusade, there is quite a good probability that he was an eye-witness of the event.

9.2.3 Flood of the Danube in 1194?

Although no information is available whether this evidence as well refer to Hungary, since it talks about the whole Danube, might be possible that the event reached Hungary as well. In a non-defined date (*Circa hec tempora*), the sudden great flood of the Danube caused a large number of casualties and great material damage.⁸⁰⁶ Referring to the Danube at Neuburg, flood was reported by the *Continuatio Cremifanensis*, similar to 1194, caused by ice.⁸⁰⁷ Without mentioning location, *Radulphus Niger* (as a contemporary chronicler) provided information on a Danube flood around 1194.⁸⁰⁸ In the same year, locust invasion, usually associated with dry and hot (pre)conditions, was reported from Hungary, more closely from the Danube-Sava interfluve, in the autumn period.⁸⁰⁹

parte aqua lutosa cingitur; ex alia vero a Bogaria amne lucido separatur. In medio sui fluvium habet Droam, qui stanni more unam ripam proclivem habet, et alteram arduam, unde modica pluvia effluit, et adjutus vicinis paludibus, etiam aliquanto remota submergit. Audivimus eum multos Alemannorum, qui nos praecesserant, subito inundasse; nos autem ubi castra eorum fuerant, vix potuimus transvadere. In hoc parvas naves habuimus et paucas; ideo fuit opus equos natare, qui facilem ingressum et egressum difficilem habentes, cum labore quidem, (1213B) sed tamen Deo volente sine damno transibant. Caetera omnis aqua terrae hujus, lacus sunt, et paludes et fontes, si tamen fontes sunt, quos paululum fossa humo, etiam in aestate faciunt transeuntes, excepto Danubio qui hanc satis in directum praeterfluit, et multarum regionum divitias nobili civitati Estrigini navigio invehit."

⁸⁰⁵ Borosy-Laszlovszky 2006, p. 86.

⁸⁰⁶ MGH SS Vol. 27, p. 332 (*Radulphi Nigri Chronica Universali*): "/A. 1194/ Circa hec tempora Danubius subito irrupit et multos fines terrarum extinxit, homines et iumenta et alia terrarum volatilia. Redeunte demum Danubio in alveum suum, exierunt de terra culices et vastaverunt agros et vineas et arbusta et depopulaverunt universam terram. Irrupuerunt igitur porci et aliq[ue] alie bestie et irruerunt in culices, devorantes eas et ingrassati sunt vehementer, et muti mortui sunt."

⁸⁰⁷ MGH SS Vol. 9, p. 548 (*Continuatio Cremifanensis*): "1194. ... Danubius in Austria glaciali molestia versus Niwenburch ebullit, et meatum suum longius vagando relinquens, homines cum villis mergendo adnichilavit. Eadem quoque regio mirabili incendio in civitatibus et opidis et villis et uredine in agris longius late raa annona consumendo depauperatur. Inundationes tribus vicibus magnae et intolerabiles atque insolitae omnes pene regiones, villas et circumpositas domos demoliendo occupaverunt."

⁸⁰⁸ MGH SS Vol. 27, p. 332 (*Radulphi Nigri Chronica Universali*): "/A. 1194/ Circa hec tempora Danubius subito irrupit et multos fines terrarum extinxit, homines et iumenta et alia terrarum volatilia. Redeunte demum Danubio in alveum suum, exierunt de terra culices et vastaverunt agros et vineas et arbusta et depopulaverunt universam terram. Irrupuerunt igitur porci et aliq[ue] alie bestie et irruerunt in culices, devorantes eas et ingrassati sunt vehementer, et muti mortui sunt."

⁸⁰⁹ See, for example: MGH SS Vol. 23, p. 870 (*Chronicon Albrici monachi*): "1194. Memorabile quiddam contigit hoc anno in Hungaria, quia in autumno quadam die fuit inter Dravum et Savum pluvia locustarum densissima."

9.3 Recorded flood events in the 13th century

Although the database is still far from being representative, considerably more evidence is available concerning the last century of the high medieval period than in the previous centuries altogether. For the location of places mentioned in this chapter, see *App. 1a*.

9.3.1 The decade of 1220s: (flash) flood in the Carpathians – spring 1229?

In 1229 (most probably spring time), prince Béla (later King Béla IV) and the Hungarian army, while crossing the 'Hungarian Mountains' (Carpathians) through the Verecke-pass (Верещий перевал-Ua) towards Halič (located at Нижні Ворома-Ua), amongst others (e.g. a battle), suffered from a flood, caused by great rains (flash flood?), in the mountains in which many horses died (got drowned). The event most probably took place in (early or mid?)⁸¹⁰ spring time.

9.3.2 Floods of the Danube in 1234 and 1235: only 1235 in Hungary?

Whereas in several sources a 1234 spring flood event appears, occurred in Austria,⁸¹¹ a flood caused by incessant rains is described referring to 1235: three days and nights continuous rainfall occurred in Austria and Hungary, which had not been seen for many years. Caused by abundance of waters, Danube extended and destroyed lands, settlements and islands. This was the year when the king of Hungary, András II died.⁸¹²

In the *Continuatio Sancrucensis* (II) flood events appear both under 1234 and 1235. In this case of 1235 the three-day intensive rainfall in Austria and Hungary and its direct effects, together with a great Danube flood, are mentioned.⁸¹³ Thus, types and origin of the 1234 and

⁸¹⁰ Halič-Volodimer annals, 1229. In: Hodinka 1916, p. 366: "... изииде же Была рикъмыи король Оугорьскыи в силы тяжкыи рекшю емоу, яко не имать остатй градъ Галичъ, ны кто избавляи и о роукоу мою. вшедьшоу же емоу во горы Оугорьскыи, посла на ны Бъ архангла Михаила отворити хляби нбияя. конем же потопающимъ и самымъ возбыгающимъ на высокая мыста, ономоу же одико оустремисшия прияти гра и землю, ..." For the analysis of events, see for example: Senga 1988, pp. 38-39. See also: Kristó 1986, pp. 107-108. The prince and the royal army went to Halič for the 'invitation' of the actual king (Danilo), a vasal of the Hungarian king at that time. It is also interesting to mention that while rains and flood caused problems to the prince's army in the Carpathians, later the Dnjeper was still frozen when they crossed the river.

⁸¹¹ Danube flood with ice in Austria, dated to 1234, appears in the *Annales Sancti Rudberti Salisburgenses*, in its *Codex Sancti Petri*-version: MGH SS Vol. 9, p. 786: "1234. ... Danubius alvum suum egressus, vicos quam plures et civitates muratas in Austria impetu glaciali destruxit."

Similarly referring to 1234, the *Continuatio Lambacensis* dated a Danube flood event after the resolution of ice. This narrative otherwise dates to 1212, one year early (occurred in 1213), the murder of the Hungarian queen (of Meranian origin), late wife of king Andreas II: MGH SS Vol. 9, p. 558 (*Continuatio Lambacensis*): "1234. Hoc anno, resoluta glacie Danubii, ipse Danubius meatus suos longe lateque diffudit, et tanta inundatione excrevit, ut omnes vicos et villas adiacentes destruxerit. Omnis etiam annona et pecorum infinitus numerus interierit, et quod his omnibus miserabilibus est, infinita hominum multitudo periret. Quam vastationem valida fames subsecuta est."

⁸¹² SRA Vol. 1, pp. 812-813 (*Anonymi Leobiensis*): "1235. Ubi dum moraretur, tanta inundatio pluviae erupit fere per tres dies et noctes per Austriam et Hungariam, quod ante per multos annos non est visum vel auditum. Item Danubius ex abundantia aquarum terminos excedens agros, villas, segetes vastans, homines quoque, qui in insulas confugerant, cum iumnetis suis et aliis rebus extinxit. Andreas rex Hungariae obiit."

⁸¹³ MGH SS Vol. 9, pp. 637-638 (*Continuatio Sancrucensis* II): "1234. ... Andreas rex Ungarie cum filio suo Bela partem terre Austrie incendio et rapina devastavit. Tota hyeme illa tanta asperitas frigoris inhorruit, ut multi fluvii qui ante large fluebant, a fundo usque ad summum ita indurescerent pre frigore, ut fluere desineret. Circa

1235 flood events are different: while the 1234 spring (*vernale*) flood occurred due to melting of ice after a hard winter, the 1235 one, both in Austria and Hungary, was caused by rainfall. The *Continuatio Sanrcrucensis* (II) clearly states that two different flood events occurred in 1234 and 1235. The 1235 events are also mentioned in other narratives.⁸¹⁴

In the *Chronicon Anonymi Leobiensis* it is mentioned that an unusually great amount of fish swam up from Hungary and were found in the Mura river and other waters of Styria.⁸¹⁵ Dated most probably to 1236 or 1235, but with the mentioning of King Béla, 1236 seems to be more likely.⁸¹⁶ Appearance of much fish in the river is usually connected to a prolonged, long-lasting inundation, especially referring to spring-early summer period.⁸¹⁷ Due to the fact that fish came from Hungary, there is a possibility that in this year inundation was extensive and prolonged at the lower sections of Styrian-Hungarian rivers.

Those Austrian narratives in which, referring to floods, Hungary was also mentioned, all are connected with the great rainfall event of 1235; none of them mentioned that the 1234 flood would have had any effects in Hungary.⁸¹⁸

tempus vero vernale cum solveretur glacies, Danubius ex multitudine glaciei et habundantia aquarum excessit terminos suos, turres muros domos pomaria arboresque subvertit, hominesque multos extinxit; vineas et agros a se remotos vastavit, replensque omnia glacie immensi ponderis, que glacies per magnum tempus ipsius anni duravit. ... 1235. ... Interea rex Boemie ex altera parte Danubii vastavit Austriam rapina et incendio usque Stadelowe; ubi dum moraretur, tanta inundatio pluviae erupit fere per tres dies et noctes per Austriam et Ungariam, quod ante per multos annos non est visum vel auditum. Item Danubius ex habundantia aquarum terminos suos excedens, agros, villas, segetes vastans, homines quoque qui in insulas configerant, cum iumentis suis et aliis rebus extinxit. Andreas rex Ungarie obiit."

⁸¹⁴ Since king Andreas II died in 1235, although under the year of 1236, both the *Anonymus Zwetlensis* and the *Anonymi Chronicon Austriacarum* presumably refer to the same, 1235 flood event: SRA Vol. 1, p. 979 (*Anonymus Zwetlensis*): "1236. Tanto inundatio pluviae erupit fere per tres dies et noctes per Austriam et Ungariam, quod antea per multos annos non est visum vel auditum. Item eodem anno rex Ungariae obiit."

RAS Vol. 2, p. 240 (*Anonymi Chronicon Austriacum*): "Mo.cc.xxxvj. Tota hyeme illa, tanta asperitas frigoris horruit. ut multi fluuij. qui ante large fluebant. a fundo vsque ad summum ita indurescerent pre frigore et fluere desinerent. Circa tempus vero vernale cum solveretur glacies. Danubius ex multitudine glaciei, et habundancia aquarum. excessit terminos suos. turres. muros. domos. pomaria. arboresque subvertit. hominesque multos extinxit. vineas et agros a se remotos vastavit. replensque omnia glacie immensi ponderis. que glacies per magnum tempus ipsius anni durauit ibidem. ... Interea rex bohemie ex altera parte Danubij vastavit austriam rapina et incendio. usque ad Stadelaw. Vbi dum moraretur tanta inundacio pluiae erupit fere per tres dies et noctes per austriam et Vngariam quod ante per multos annos non est visum vel auditum. Item Danubius ex habundancia aquarum terminos excendens agros. villas. segetes. vastans homines quoque qui in silvas configerant. cum Iuuenatis /forte iumentis/ suis. et aliis rebus extinxit. Andreas rex Vngariae obiit."

⁸¹⁵ Zahn 1865, pp. 4-5 (*Chronicon Anonymi Leobiensis*): "(1235 or 1236?) Mortuo uero principe isto de Paden domina predicta nupsit regi Bruzie qui moram tantum faciens in Austria reuersus in patriam, uxorem in Austria relinquens et ad eam numquam postea est reuersus. Nullum ex domina illa sicut nec rex Bohemie generauit puerum. Post recessum huius Bruzeni magne iterum rixe sunt exorte. Nam rex Bela Ungarie intromisit se de ducatu Austrie, Stiriam per se intrando et quamdui ibi dominabatur, tam diu pisces inconsueti de Ungaria per aquas ascendentibus in Mura et in aliis aquis Stirie in multa copia apparuerunt. Tandem Othacherus rex Bohemie ducatum Austrie sibi subget ex toto, Ungaros de Stiria etiam depellendo."

⁸¹⁶ King Andreas II died on 21 September, Béla IV was crowned on 14 October 1235. However, it is rather interesting to note that according to the leading Hungarian military history monograph of high medieval period (Kristó 1986, p. 114), Béla IV did not go or ordered any military campaigns outside of Hungary in the first years of his reign.

⁸¹⁷ According to some historical ethnography investigations on the Tisza river, especially great, sudden abundance of fish in the river appear after floodless period with prevailing low water levels (e.g. 1856-1859) when there was a shortage of fish, and then, a (mid-)spring flood of not extraordinary ('usual') magnitude occurred (e.g. 1860) and lasted for months, even in summer (Szilágyi 1977, pp. 166-168; see also: Répássy 1903, p. 6).

⁸¹⁸ For the analysis of Austrian flood events, see: Rohr 2007, pp. 219-220.

9.3.3 Floods in the decade of 1241-1250

9.3.3.1 Flood at Vízköz in 1245: case study from south of the Drava river

Due to a donation given by the King to *comes Hudina* and four of his relatives (*cum quatuor consanguineis suis*) for his services in the time of the (first) Mongol invasion, the land of *Wiscuz* (Vízköz) was reambulated presumably in spring time, before 26 April ('*sexta kalendas Maii*') when the charter was issued. Because of the flood of *aqua Churnuc/Churnue*, however, it was not possible to perambulate some parts of the boundaries of *terra Wiscuz*, located *ultra Dravam*, in *comitatus Simigiensis* (thus, in the area of present North-Croatia).⁸¹⁹ Waters in the close neighbourhood: *aqua Ribinac* (Ribnjačka?), *aqua Ratcha* (river Račacka?), *aqua Chasma* (Časma river), *aqua Musina*. Neighbouring lands are lands belonging to the people of *Garig* (Garity-Hr) and that of *Chesmice* (Časme-Hr). Although the issuing date of the charter, containing the description of the already-done perambulation, is known (26 April),⁸²⁰ unfortunately no information is available concerning the date when the perambulation of boundaries actually took place. Nevertheless, usually the act of perambulation was soon followed up by issuing the charter.

9.3.3.2 Flood along the Danube(?) in 1248

In 1248, *Erthuru, 'iobagio castri Posoniensis'* (serf of Pozsony castle; Bratislava-Sk) and his sons asked for and received a piece of land (terra) of *duo aratra* called *Karcha/Karchan*, similarly belonging to the castle of Pozsony (Karcsa; Kračany-Sk). It was due to the fact that their own (previous) piece of land was occupied by the flood of waters and therefore they were not able to serve the castle properly ('*nec utiliter posset castro deservire, sicut deberet*'). As for the date, we only have the information about the year, namely, the charter was issued in 1248.⁸²¹ This donation charter was corroborated in 1249 in the following way:

⁸¹⁹ The boundaries of high-medieval Hungary and Slavonia were changing: medieval Somogy county, for example, extended to areas further to the south, south of the Drava river, which later became part of such Slavonian counties as Körös (today Criş in Crotia) or Belovar. Due to the fact that king of medieval Slavonia was also the king of Hungary from the late 11th century onwards, this fact did not cause major problems between the two kingdoms (See e.g. Csánki 1890 Vol. 1, p. 567).

⁸²⁰ ÁUO Vol. 11, ch. 242 (pp. 337-340), p. 338: "... prima meta incipit ab oriente ab aqua Ribinac apud duas arboreas, quarum una gurtanfa dicitur et altera avellana, inde tendit per eandem aquam Ribinae versus meridiem perveniens ad aquam Ratcha, et incipit tenere metas cum Alexio, filio Moys, ubi sunt due mete terree sub arboribus, scilicet sub orno et piro, deinde per eandem aquam Ratcha tendit per partem meridionalem et ibi est meta terree sub arbore gurtanfa, et inde progrediens per eandem eadit in aquam Chasma, ubi est meta terrea sub arbore tulfa, et incipit tenere metas cum populi de Garig. Inde vero per Chasmam tendens inferius ad occidentem pervenit ad pontem, ubi est magna via, ubi eciam sunt due mete terree sub arboribus, quarum una tulfa dicitur et altera rekecia, incipiens ibidem tenere metas cum Episcopo Zagabiensi, deinde vero tendens per eandem aquam Chasma pervenit ad arborem pomi, sub qua est meta terrea, inde vero protenditur ad locum, ubi est aqua Churnue, et aqua illa progrediens superius ad locum ubi propter inundaciones aquarum meta terrea fieri non potest, sed est arbor cruce signata, que arbor tulfa dicitur, et ibi incipit tenere metas cum populis Chesmice, demum quoque iuxta eandem aquam Churnuc progreditur superius verses septemtrionem, ubi est meta terrea sub ulmo, et iuxta eandem aquam tendit ad arborem, que dicitur gurtanfa, sub qua est meta terrea, et ibi incipit metas tenere cum Dyonisio Bano. Deinde vero vertitur ad orientem per eandem aquam Churnuc, de qua tendit usque ad aquam Musina, ..."

⁸²¹ ÁUO Vol. 2, ch. 130, p. 206: "...quod cum Erthuru, iobagio castri Posoniensis, una cum filiis suis nobis sepius fuisset conquestus, quod terra eius per inundacionem aquarum fuisset occupata, nec utiliter posset castro deservire, sicut deberet, nos de (...) quandam terram Karchan (...) per euudem Ivancam Curialem Comitem nostrum percepimus (...)." See also: Marsina Vol. 2, ch. 309, pp. 217-218.

"We, *Rolandus*, the Palatine and Count of *Poson* wish to provide the proof to everyone that *Ethuruh*, the serf of *Poson* Castle provided us with the letter of Palatine *Dionysios* our predecessor in the way that his own land was occupied and annulated by the inundation of water, ..."⁸²²

This charter, together with the first one, both originally issued by the palatine, were again corroborated by the King in 1253.⁸²³ Another charter of corroboration was issued by the palatine in the same year.⁸²⁴ The location of the new piece of land of *Ethuruh* can be quite precisely provided, since today several villages share the medieval land of *Karcha*:⁸²⁵ one of them is called in Hungarian as *Etrekarsa* (*Král'ovičove Kračany* in Slovak) which kept the name of its first documented owner. The area of land and village is located today in the Žitný ostrov area, an extensive island-region, under the direct influence of the Danube.

Even if it cannot be surely stated that it was the Danube which flooded *Ethuruh*'s previous piece of land most probably it was not far from Karsca and thus, presumably it was similarly located today in the Žitný ostrov area. Concerning possible timing, the flood event could not occur years before, since the, at that time rather prestigious, title of *jobagio castrensis* (large part of this group later became nobles) clearly belonged to certain services. However, if they failed to provide the royal services, they could easily lose this privileged status.

Therefore, it is rather unlikely that originally the serf of the castle would have received a piece of land subject to such flood problems which make him not possible to do his obligations. As such, the most likely is that either the river changed its bed to which, among many other circumstances, a flood event was needed, or they faced with a time of floods with great magnitude (which, on the other hand, did not affect the other land of exchange).

9.3.4 Floods in the decade of 1251-1260

9.3.4.1 (Another) flood in Csallóköz/Žitný Ostrov: 1252

In a charter issued on 13 December 1252, a piece of land in the area of *villa Vduornuk* (Udvarnok; Dvorníky-Sk) was mentioned, belonging to *castrum de Szolgagyőr* (Posádka-Sk). Since the *comes uduornicorum de Chollokuz* was involved in the legal process, we can presume that it is about that certain Udvarnok, located in the *Chollokuz* area (Žitný ostrov-Sk), close to the lands of *Kurth* (Ohrady-Sk). The *clausura piscium*, called *Weyz* in the *aqua Saar* (at the boundaries of Kurt landed possession) is also mentioned, belonging to the estate in *villa Udvarnok*.⁸²⁶ In Udvarnok, *Emericus* and *Ioannes* possessed 22 *iugera* arable lands, and 15

⁸²² 1249: ÁUO Vol. 2, ch. 133, pp. 209-210: "Nos Rolandus Palatinus et Comes Posoniensis omnibus duximus significandum, quod Ethuruh jobagio Castri Posoniensis ad nos accedens litteras Dionysii Palatini predecessoris nostri nobis presentavit sub hac forma, quod cum terra sua propria per aque inundacionem fuisse occupata et annullata, per mandatum domini Regis et respectu necessitatis sue quandam terram castri Carchan nomine Vocatam sibi et suis filiis, Dominico, Seraphino et Petro contulisset, et eandem terram per Ivancam Curialem Comitem suum Posoniensem, et jobagiones eiusdem Castri fecisset assignari ad duo aratra sufficientem, cuius terre mete in litteris eiusdem Dionysii Comitis expresse continentur."

⁸²³ 1253: ÁUO Vol. 2, ch. 154, p. 232.

⁸²⁴ 1253: ÁUO Vol. 2, ch. 160, p. 242.

⁸²⁵ In the immediate neighbourhood of the village, today several other villages preserved the name of the formerly extensive landed property of *Karcha*, which was only partially possessed by Etruh: Királyfikarsa, Etrekarsa, Kulcsárkarsa, Móroczkarsa, Gönczölkarsa, Amadékarsa, Pinkekarsa, Egyházkarcsa, Erdőhátkarsa, Sólymoskarsa.

⁸²⁶ 1252: Marsina Vol. 2, ch. 408, p. 286 (13 December 1252): "Nos Rolandus, palatinus et comes Posoniensis, omnibus presentes litteras inspecturis duximus significandum, quod cum Lothardus et Endre ac cognati ipsorum de villa Vduornuk, Vduornici domini regis, Ioankam, iobagionem castri Zulgageuriensis, coram nobis convenissent, proponebant contra eundem, quod idem Ioanka in terra ville Vduornuk nullumpenitus haberet ius

iugera other lands deteriorated/taken by flood/inundation of waters ('*viginti duo et dimidium iugera terrarum in ipsa terra ville Vduornuk in terris arabilibus, quindecim vero iugera per inundacionem aquarum deteriorata in eadem villa*'). It is, however, interesting to note that in the same area they possessed a sufficient portion of meadow worth for mowing (4 *aratra*). Since in the charter 15 *iugera* lands, deteriorated by inundation of waters were mentioned and not only 'lake' or 'wetland' or anything alike, one cannot only presume that the water was still possibly there (either as a stagnant body of water or new bed of a waterflow/riverbranch), but also that the flood event itself did not occur (very) long time before. Thus, similar to the case of 1248, the flood event(s) did not happen several years before, but should be in the short (oral) memory of people. Lands owned in Udvarnok later, in the 14th century reappeared several times in other lawsuits. Several of the charters connected, together with the present 1252-charter, were included in a charter issued in 1399. In this charter and in the lawsuit a person, known as *Georgius de Kunchul-Karcha* (Göncölkarcsa; Kyncel'ove Kračany-Sk), is also involved which, being the neighbouring village of Etrekarcza (Etreove Kračany-Sk), turns us back to *Karcha* possession of the 1248 charter.⁸²⁷

Compared this 1252 case to the previous one of 1248, one may notice several similarities, and some connections can be as well drawn which provide more possibilities for further analysis. Both landed possessions, subject to deteriorating flood events, were located in the same Žitný ostrov area, a large and fertile island area of the Upper-Danube, criss-crossed by river-branches which divide the big island into several smaller ones. Thus, being under the direct influence of the Danube, any flood or inundation reference can be directly connected to a Danube high waterlevel/flood event. Both in 1248(?) and 1252, therefore, lands directly affected by Danube flood events were detested. In neither of the two cases we have evidence about the date of this/these flood event(s). Nevertheless, in both cases we can actually presume that the event(s) did not occur much back in time, thus it is rather unlikely that, let us say, flood event(s) happened several years before issuing the charters and having the new land donations (in whatever way).

9.3.4.2 Flash flood of the Morava river in 1260

Great rainfall through the whole night was mentioned by the *Annales Otakariani*.⁸²⁸ In a latter part in the same annals is mentioned that, after a great rain storm (a shower with thunderstorm), the Morava river very much flooded and many of the enemies submerged and died.⁸²⁹

hereditarium, sed super terra pignori oblata resideret in villa Wduornuk antedicta. Et cum ipsa lis diu coram nobis fuisse ventilata, postmodum partes habita a nobis licencia talem se mediantibus probis viris, scilicet Ianus, Nicolaum fratre Fyn, ac aliis quam plurimis retulerunt ordinasse compositionem, quod Lothardus et Endre ac cognati ipsorum de villa Wduornuk viginti duo et dimidium iugera terrarum in ipsa terra ville Vduornuk in terris arabilibus, quindecim vero iugera per inundacionem aquarum deteriorata in eadem villa, porcionem feneti ad quatuor falcastra sufficientem et unam clausuram piscium in aqua Saar, que wlgo Weyz dicitur, in terminis Kurth concesserunt memorato Ioance perpetuo iure possidenda. Et ne processu temporum series coram nobis habite compositionis per quempiam in irritum possit revocari, litteras presentes concessimus memorato Ioance sigilli nostri munimine roboras. Datum Posonii in octavis sancti Nicolay, anno domini Mo Cco quinquagesimo secundo."

⁸²⁷ 1399: Fejér Vol. 10/2, ch. 382, pp. 720-734.

⁸²⁸ MHG SS Vol. 9, p. 183 (*Annales Otakariani*): "1260. ... Qui cum venerabilis domini Brunonis Olomucensis episcopi et Henrici Sleziae et Wladislai Opoliensis illustrum ducum castra in pratis circa Pohorlis metata clam invadere et percutere decrevisset, et ad hoc peragendum tota nocte pluviosa et nubila processisset, ..."'

⁸²⁹ MHG SS Vol. 9, p. 184 (*Annales Otakariani*): "1260. Verum eodem marchione propius accende, facta tunc magna obscuracione aeris, et a commotione et voce tonitru et sonitu grandis pluviae cum fulgere choruscante, licet nemine persequente, eo quod supra modum defecissent lassati equi christiani exercitus, in fugam

9.3.5 Floods in the decade of 1261-1270

9.3.5.1 'Legendary' December–January flood events: 1267/1268 (or 1266/1267)?

As two of the most important and most frequently mentioned miracles, the memories of two Danube-flood events, one in late December (after Christmas), and the other after Epiphany (6 January) were included in the Inquisition Protocol (of her canonization trial) as well as in the legends of Princess Margaret (hereafter Margit).⁸³⁰ According to the eye-witnesses, Margit warned the chief prior of Hungarian Dominicans, her confessor (father *Marcellus*), who arrived after Epiphany (6 January), for the danger of sudden Danube flood events on the Island of Rabbits (*Insula Leporum*, today Margit Island), by describing a previous flood event occurred short before, after Christmas. Since the prior was surprised and questioned the possibility that such a sudden great flood event might have occurred at all short after Christmas, Margit prayed to Mary the Blessed to provide a proof. This proof was another sudden flood event of the Danube: increase of water was as prompt as its decrease: the whole event occurred within some hours, ending up until the evening prayer (vespers). Besides her confessor, ten Dominican nuns on the Island of Rabbits, mentioned the two flood events.

According to *Domina Margaretha* (1),⁸³¹ an younger relative of the princess (28 years old in 1276), three years before the death of Margit, the Danube flooded and entered the courtyard of the monastery. Eight days later arrived *frater Marcellus* with another brother, and the princess warned the prior for the flood-danger (of the location) on the example of the previous flood event (thus, occurred only 8 days before). Since *Marcellus* was surprised about this description, Margit prayed to Mary to provide a testimony – which happened to be the next sudden flood event. *Margaretha* was present at the event, and remembered that the miraculous flood event occurred three years before Margit's death.⁸³² Later, at her second confession she provided exact location where the miracle occurred.⁸³³ At the time of her first confession (25

sunt impii conversi. Et cum fluvius Morawa, quasi apertis coeli katharactis et velut facto desuper kathaclismo, tunc nimium inundasset, in eodem hostium plurimi veraciter feruntur periisse submersi."

⁸³⁰ The Inquisition Protocols remained to us almost in full length. Full edition of the remaining Protocols: MREV Vol. 1, pp. 159-383. Full title of the manuscript: "Inquisitio super vita, conversatione et miraculis beatae Margarethae virginis, Belae IV. Hungarorum regis filiae, sanctimonialis monasterii virginis gloriosae de insula Danubii, ordinis Praedicatorum, Vesprimiensis diocesis (hereafter *Inquisitio super vita*)."

⁸³¹ For the identification and family relations of the other Margarets and (from our viewpoint) important nuns in the nunnery see, for example: Klaniczay-Klaniczay 1994, pp. 154-157.

⁸³² MREV Vol. 1, pp. 183-184 (*Inquisitio super vita*): "Item dixit, quod in tantum crevit flumen Danubii qudam die, quod intravit cortem, ubi stant sanctimoniales eiusdem monasterii, et elapsis octo dieus frater Marcellus, provincialis predicatorum in Hungaria venit ad dictum monasterium, et predicta virgo Margaretha dixit ei: 'Sic aqua Danubii creverat et intraverat cortem nostram' predictam; sed frater noluit ei credere dicens: 'Quomodo potuit hoc esse?' Et dicta virgo Margaretha dixit: 'Oh sancta Maria, tu bene scis, quod de ore meo non consuevit exire mendacium, unde ostendas fratri Marcello, quod sit verum quod dico', et ita incontinenti crevut tantum aqua, quod inravit domos monasterii, ita quod frater Marcellus ascenderit suer quoddam lignum, propter illam aquam. / Interrogata, quomodo scit predicta, respondit: «Quia vidi et presens fui». / Interrogata de presentibus, respondit: «Dictus frater Marcellus et unus alius socius suus». / Interrogata de nomine illius fratris, respondit: «Ego non recordor». / Interrogata, si alie persone erant tunc presentes, respondit: «Sic quedam alie sorores istius monasterii, sed non bene recordor de nominibus illarum». / Interrogata, quot anni sunt, quod hoc fuit, respondit: «Per tres annos, sicut credo, ante mortem ipsius virginis Margarethe». / Interrogata de mense, respondit: «Non recordor». / Interrogata de die, respondit: «Nescio». / Interrogata de hora diei, respondit: «Non habeo in mente». Item dixit, quod dicta virgo Margaretha regulas et ordinem suum melius observavit et strictius, quam sorores eiusdem monasterii. / Interrogata, quomodo hoc scit, respondit: «Quia vidit»."

⁸³³ MREV Vol. 1, p. 184 (*Inquisitio super vita*): "Die Martis secunda mensis Septembris. Interrogata, in quo loco erat, quando rogaverat beata Margaretha, quod Danubius cresceret et crevit, ut dixit, respondit: «In quodam parvo campo, qui est ante loquutorium»."

July), *Domina Margaretha* dated the death of the princess to February, seven years before 1276 ('*Septem anni erunt in Februario, sicut credo.*'). Confessing for the second time, on 2 September 1276 she was not completely certain, so she only said 'around February' (*circa Februarium*), but could as well tell the exact day (*Die Jovis*) and hour (*Hora tenebrarum*).⁸³⁴

Domina Elisabeth, the 21 year-old daughter of Margit's brother, King Stephan V, described the memorable Danube flood-events in a way rather similar to *Domina Margaretha*(1)'s confession. However, there are some slight differences worth to note: according to Elisabeth, the first flood event lasted for 3 days. She could not tell how much later *frater Marcellus* came.⁸³⁵

Domina Margaretha(2), the 36 year-old duchess of Macsó (the today's region of Мачва-Srb), a cousin of the princess was as well present at the flood events. A new element in her description is that she remembered the name of not only one, but two other friars who came with *frater Marcellus* at the time of the second flood event. Moreover, she dated the second flood to '*die Martis inter epiphaniam et quadragesimam*'.⁸³⁶

The 38 year-old *Domina Benedicta*, nun of the same nunnery remembered the two floods in a rather similar way, and dated the second flood event to a day between Epiphany (6 January) and 1 March (*inter epiphaniam et carnis leviarium*), practically for the same period as *Domina Margaretha*(2).⁸³⁷ The well-informed *Domina Olimpiades* also remembered the first

⁸³⁴ MREV Vol. 1, pp. 184-185 (*Inquisitio super vita*): "Interrogata, quot anni sunt, quod obiit, respondit: «Septem anni erunt in Februario, sicut credo». Interrogata, si fuit docta, vel rogata dicere hoc testimonium, respondit: «Non». Die Martis secunda mensis Septembbris. Interrogata, quot anni sunt, quod audavit predicta verba a dicta virgine Margaretha, respondit: «Septem anni erunt circa Februarium, qui modo venit». / Interrogata de hora diei, respondit: «Hora tenebrarum»."

⁸³⁵ MREV Vol. 1, pp. 185-187 (*Inquisitio super vita*): "Domina Elisabeth, filia clare memorie regis Stephani Hungarie, soror et monialis dicti monasterii de insula Danubii iuravit ut supra. Item dixit, quod «Danubius ita crevit quodam tempore, ut cortem sanctimonialium istius monasterii intraret, et stetit ibi per tres dies, ut credo, et postea frater Marcellus, qui tunc erat provincialis fratrum predicatorum in Hungaria, venit ad istud monasterium, et cum dicta Margaretha diceret ipsi fratri Marcello, quod Danubius ita creverat, quod intraverat predictam cortem, respondit ipse frater Marcellus, hoc non posse esse, nec posse credere, et tunc dicta virgo Margaretha dixit: 'Oh beata virgo, rogo te, quod ostendas fratri Marcello, quod verum hoc sit, quod ego sibi dixi', et tunc statim dictum Danubium in tantum crevisse per dictam curiam et totum claustrum dominarum, quod aqua tantum fuit alta, quod dictus frater Marcellus ascendit quoddam lignum». / Interrogata de tempore, respondit: «Non recordor, sed credo, fuit ante tres annos ante mortem ipsius beate Margarethe, et hoc melius poteritis scire per alias dominas». / Interrogata de mense, respondit: «Non recordor». / Interrogata de die, respondit: «Non recordor». / Interrogata, qui erant presentes, respondit: «Frater Marcellus predictus et socius suus, nomen cuius nescio, et soror Olimpiades, et soror Margaretha, filia domine generose Anne, et multe alie sorores, de quibus non recordor». / Interrogata, in quo loco erant tunc, quando Danubius ita crevit, ut dixerat, respondit: «Ante loquitorium». Interrogata, quot anni sunt, quod mortua est predicta virgo Margaretha respondit: «Septem, vel circiter»."

⁸³⁶ MREV Vol. 1, pp. 191-192 (*Inquisitio super vita*): "Item dixit quod quodam tempore Danubius ita crevit, quod venit in curtem servitrialium sororum claustrum monasterii, et stetit ibi per aliquos dies, et postea reversus est ad locum suum. Et frater Marcellus, qui erat tunc prior provincialis fratrum predicatorum in Hungaria, postea venit ad istud monasterium et visitavit sorores, et tunc ipsa virgo Margaretha dixit: «Frater Marcelle, quomodo Danubius creverat, et quomodo intraverat curtem dictarum servitrialium»,» et tunc ipse frater Marcellus dixit «Quomodo possunt hec esse? Ego non possum credere»,» et tunc ipso virgo Margaretha dixit: «Oh, sancta Maria rogo vos, quod vos ostendatis fratri Marcello, quod ego non dixi mendacum»,» et tunc Danubius crevit ita, quod aqua intravit claustrum monasterii predicti, ubi erat ipse frater Marcellus et sorores, et fuit aqua ita alta in dicto claustro quod frater Marcellus ascendit quoddam lignum, quod erat ibi. / Interrogata, quomodo scit hec, respondit: «Quia eo et domina Elisabeth, filia quandam dominiregis Stephani et soror Margaretha, filia domine Anne et multe, de quibus non recordor, eramus ibi». / Interrogata, si aliquis frater erat cum dicto Marcello, respondit: «Sic, duo». / Interrogata de nomibus fratrum, respondit: «Unus vocabatur frater Joannes Lombardus, qui vivit, ut credo, alter vocabatur Tiburtius, qui mortuus est». / Interrogata, quot anni sunt, quod hoc fuit, respondit: «Non recordor». / Interrogata de mense, respondit: «Non recordor». / Item de die, respondit: «Quodam die Martis inter epiphaniam et quadragesimam». / Interrogata de hora diei, respondit: «Post horam none»."

⁸³⁷ MREV Vol. 1, pp. 196-197 (*Inquisitio super vita*): "Item dixit, quod aqua Danubii venit in cortem, in qua stant servitiales dominarum, et postea reversa fuit ad locum suum, et frater Marcellus, qui tunc erat provincialis in Hungaria, venit post illud tempus ad monasterium istud, et tunc dicta Margaretha incepit dicere sibi, sicut aqua

flood event which was followed by the second one in some days time (*post aliquot dies*). Similar to the other nuns, she dated the flood event three years before the death of Margit, to a non-specified day '*ante carnelevarium*', to the afternoon hours (*circa horam vesper(arum)*). Moreover, besides *Marcellus*, she also remembered the name of the other monk, *frater Joannes*.⁸³⁸

The 49 year-old nun, *Domina Alexandra*, not merely reported the two flood events and the eight-day difference between them and Margit's pray to God, but she also added a new, interesting detail, namely that the second flood event occurred not only fast, but also with great 'sound effects' ('*cum magno sonitu*').⁸³⁹ For dating the second event, as some other nuns, she provided only an interval of between Epiphany and '*carnis biduum*' (app. last days of carnival=same as the two previous datings), after the 9-o'clock prayer (*post nonam*), before the

fuerat magna, et ille frater dicebat: «Quomodo possum hoc credere, non potest esse» et tunc dicta soror Margaretha rogabat Deum et beatam virginem, quod facerent, quod frater Marcellus videret, quod verum esset id quod dixerat sibi, et statim aqua Danubii in tantum crevit, quod venit in curiam dictarum servitrialium et in claustrum dictarum dominarum, et frater Marcellus ascendit quoddam lignum, et intravit capitulum dominarum. / Interrogata, qui fuerunt tunc presentes, respondit: «Margaretha, que fuit filia dominie Gulielmi et Judit subpriorissa et multe alie, de quibus non recordor». / Interrogata, in quo loco erant tunc, respondit: «In lebio antee loquitorium». / Interrogata, quot anni sunt, respondit: «Fuit per tres annos ante mortem eiusdem virginis Margarethe». / Interrogata de mense, respondit: «Non recordor, sed fuit inter epiphaniam et carnis leviarium». / Interrogata de die, respondit: «Non recordor». / Interrogata de hora diei, respondit: «Non habeo in mente»."

⁸³⁸ MREV Vol. 1, pp. 196-197 (*Inquisitio super vita*): "Item dixit, quod quadam die in tantum crevit Danubius, quod aqua ipsius intravit in curiam servitrialium, et post aliquot dies provincialis (fratrum) predictorum venit ad dictum monasterium «et nos diximus sibi, sicut increverat aqua dictam curiam, et ipse dixit: 'Hoc non possum credere, quomodo posse esse'; et tunc beata Margaretha dixit: 'Non creditis nobis?' et rogavit Deum, et beatam virginem, quod ostenderent ipsi fratri, quod dactum fuerat; et statim in tantum crevit aqua Danubii, quod intravit dictam curiam et claustrum monialium, et eramus tunc extra claustrum in quoddam viridario, et quando vidimus, quod aqua in tantum crescebat, fugimus in claustrum, et intravimus in domum capituli, et non ptuimus ibi stare, et exivimus et ascendimus lignum dolii». / Interrogata, quot anni sunt, quod hoc fuit, respondit: «Ante mortem ipsius virginis Margarethe per tres annos». / Interrogata de mense, respondit: «Ante carnelevarium». / Interrogata de die, respondit: «Non recordor». / Interrogata de hora diei, respondit: «Circa horam vesper(arum)». / Interrogata, in quo loco erant tunc, respondit: «In viridario, ante loquitorium, in quo consuevimus laborare». / Interrogata de nomine provincialis, respondit: «Frater Marcellus». / Interrogata, si aliis frater erat tunc cum eo, respondit: «Soc, frater Joannes, qui modo stat iuxta mare in Cadria». / Interrogata que fuerunt alie sorores, que fuerunt presentes, quando sic dixerunt fratri Marcello, et predicta virgo Margaretha rogavit Deum, it dixit, et crevit aqua, respondit: «Soror Margaretha, filia domine Anne et soror Margaretha, filia domini Gulielmi». / Interrogata de aliis, respondit: «Non habeo in mente»."

⁸³⁹ MREV Vol. 1, pp. 242-243 (*Inquisitio super vita*): "item dixit, quodam tempore Danubius crevit in tantum, quod dubitabant sorores, quod nocte illa deberet intrare coquinam, et ipsa sancta Margaretha stetit per totum illam noctem in coquina, et paravit omnia, que erant necessaria infirmis, et per diem sequentem. / «Bene scio, quia secum fui». Item dixit, quod aqua Danubii in tantum crevit, quod nocte illa intravit in domum, in qua est infirmaria et in curtem servitrialium, et postea aqua rediit ad locum suum, et frater Marcellus, qui tunc erat provincialis, forte per octo dies postea venit ad istud monasterium, et visitavit sorores, et tunc ista sancta Margaretha dixit sibi, qualiter aqua Danubii creverat, et intraverat curtem servitrialium et domum de furno, et tunc frater Marcellus dixit: 'Quomodo posset hoc esse, non possum credere,' et tunc ista sancta Margaretha dixit: 'Domine Deus, fac, quod aqua crescat, et veniat huc, et monstru, quod hoc quod dixi fratri Marcello, fuit verum', et tunc incontinenti aqua Danubii crevit et incepit venire cum magnó sonitu et intravit claustrum sororum et crevit usque ad ligna, que vadunt circa claustrum. / Interrogata, in quo loco erant tunc dictus frater Marcellus et sorores, respondit: «In lebio, quod est post loquitorium». / Interrogata, si ibi sunt, aliique arbores, respondit: «Sic, arbores parve et herba, quasi viridarii». / interrogata, que erant presentes, respondit: «Domina Margaretha, filia domine Anne ac Margaretha, filia Gulielmi, et multe alie, de quarum nimonibus non recordor». / Interrogata, si aliquis frater erant dicto fratre Marcello, respondit: «Non recordor». / Interrogata, quot anni sunt, quod hoc futi, respondit: «Per tres annos ante mortem suam». / Interrogata, quot anni sunt, quod mortua est dicto virgo Margaretha, responsit: «Septem anni sunt». / Interrogata, de quo mense fuerunt predicta, respondit: «Inter epiphaniam et carnis biduum». / "

evening prayer (*ante vesperas*).⁸⁴⁰ Margit asked her not to tell the others what happened in full detail, and she should not tell more than that a miracle has happened.⁸⁴¹

Being Margit's confessor, *frater Marcellus* had to know the environmental conditions of the Island quite well.⁸⁴² Since Margit's childhood, he had been frequently visited the Dominican nunnery where Margit lived her holy life. And whenever he visited, every time he had to cross the Danube on ferry and thus, he had to have a deeper knowledge on the nature of the river as well. Although he did not know how old he was, he was in the order already for 42 years in 1276. In his testimony, he only mentioned that Margit warned him to the danger of Danube floods concerning the nunnery, thus he did no mention the first flood. New element is that Margit prayed to Jesus instead of Mary or God, as the previous eye-witnesses remembered.

It is interesting that for the second flood he was the only one who used the word '*inundatio*', which might derive from the fact that, unlike others speaking only Hungarian, he directly spoke in Latin and thus, his confession was not translated.⁸⁴³ He did not remember the date when Margit died (all the others did), but he knew having it written. He did not remember the date of the flood event either, but he presumed it had been in April 'when rivers usually in flood' ('*in Aprili quando solent inundare aque*').⁸⁴⁴

As we could see, according to the eye-witnesses the two flood events occurred three years before the death of Margit (18 January 1270).⁸⁴⁵ Thus, the two winter flood events might have occurred in the winter of 1267/1268 (or 1266/1267?). In the greater, so-called Garinus-legend – presumable written in the mid-14th century based on the full text of the canonisation

⁸⁴⁰ MREV Vol. 1, p. 243 (*Inquisitio super vita*): "Interrogata, quot anni sunt, quod hoc futi, respondit: «Per tres annos ante mortem suam». / Interrogata, quot anni sunt, quod mortua est dicto virgo Margaretha, respondit: «Septem anni sunt». / Interrogata, de quo mense fuerunt predicta, respondit: «Inter epiphaniam et carnis biduum». / Interrogata de die, respondit: «Non recordor». / Interrogata de hora diei, respondit: «Post nonam ante vesperas»."

⁸⁴¹ MREV Vol. 1, p. 243 (*Inquisitio super vita*): "Interrogata, si aliquid aliud volt dicere, respondit, quod: «Fuit ita humilis et ita sancta domina, quod non possem totum dicere et de miraculis nihil aliud dico, quia totum id quod erat in ea miraculum fuit»."

⁸⁴² *Frater Marcellus* himself talks about this fact in the Inquisition Protocols. See: MREV Vol. 1, p. 275 (*Inquisitio super vita*): "Ego fui a tenera etate istius beate virginis, de qua facitis inquisitionem istam, prelatus et confessor suus; ..."

⁸⁴³ For the translators and the circumstances of translations, see: Deák 2005, p. 280. For more detailed analysis: Klaniczay 2004, pp. 259-288.

⁸⁴⁴ MREV Vol. 1, pp. 280-281 (*Inquisitio super vita*): "Item dixit: «Veneram de Strigonio ad stud monasterium, et ista beata Margaretha dixit mihi: 'Nos fuimus in periculo submersionis propter inundationem Danubii, si pervenissemus, ubi pervenissemus ossa mea, (?) aque usque huc venit mihi'; certum locum demonstrando, et ego resondi: 'Vadas, vadas, hoc ego non credo'; et tunc illa dixit: 'Domine Jesu Christe, ostendas veritatem istius facti priori, qui hic est, ut ipse creditur verbis meis'; et cum tanta velocitate statim aqua reversa fuit, quod oportuit me ascendere, fugiendo ante aquam, suer assidem positum super murum, in quo sunt columne, que sustinent porticum ipsius claustrum et satis maior fuit aqua, quam rius fuerant, et usque ad matutinum aqua ita se retraxit, quod vix vestigia ipsius apparebant». / Interrogatus, cuiusmodi tempus erat tunc, respondit: «Sicut recordor, serenum erat». / Interrogatus, qui erant tunc præsentes, quando dicta virgo Margaretha dixit et rogavit, ut dictum est supra, respondit: «Priorissa, que tunc erat, et est mortua, soror Judith, que tunc erat subpriorissa Margaretha, filia domine Anne, et soror Olimpiades; de aliis non recordor». / Interrogatus, n quo loco erant, quando tunc sic rogavit et redacta aqua sic crevit, respondit: «Ante loquitorium, quod est n cemeterio dominarum». / Interrogatus, quot anni sunt, quod predicta fuerunt, respondit: «Non recordor». / Interrogatus de mense, respondit: «Credo, quod fuerit in Aprili, quando solent inundare aque». / Interrogatus de die, respondit: «No recordor». / Interrogatus de hora diei respondit: «Post prandium inter nonam et vesperas». / Interrogatus, quot anni sunt quod mortua et dicta virgo Margaretha, respondit: «Non recordor ad presens, sed habemus in scriptis et de tempore mortis et de die». / Interrogatus, quot annorum est ipse frater Marcellus, respondit: «Nescio numerum annorum, sed bene recordor, quod fui in ordine predicatorum fratrum quadraginta duos annos». / Interrogatus, si fuit doctus, vel rogatus dicere hoc testimonium, respondit: «Non»."

⁸⁴⁵ For the currently accepted date of Margit's death see: Dümmerth 1972, pp. 617-620. For a detailed overview of scientific literature (both international and Hungarian) about the antecedents and the circumstances of the canonization trial, and the later medieval and early modern-modern applications for the beatification of Margit (who became a canonized saint only in 1943) see: Klaniczay 2006, pp. 443-453.

trial – the first flood stayed in the yard of the serving nuns for three days, then after eight days brother *Marcellus* arrived to the nunnery (it is in clear agreement with the trial-confessions, described earlier), and the second flood lasted only some hours and passed away without harm. In the Garenus legend, otherwise, an even more vivid and descriptive (also 'enriched') picture is available about this flood event, when 'the water of the Danube got multiplied'.⁸⁴⁶

9.3.5.2 Flood in 1268

According to the testimony of the charter of Béla IV about the fact that sons of the Jewish *Henuk*, namely *Welven*, *Nekkul* and *Oltman* as a compensation of their loans gave their possessions (namely the castle of Komárom and the mill of Tata with all belongings) to the queen. The queen in the meantime sold these possessions to count Walter for 800 Mark fine silver. The King corroborated these transactions and described all lands belonging to the above-mentioned possessions in full detail. No information is available concerning the date of the perambulation process, but it is known that the charter was issued on 14 October in 1268.⁸⁴⁷

The settlements and lands mentioned in the text partly belonged to the Castle of Komárom (Komarno-Sk), in Komárom county (e.g. Örs, Szakálos, Szentandrás, Kesző). The inundation of waters was detected at the landed possession of *Oxunteleke* (after leaving the boundaries of Örs), not far from the Danube. Perambulation was possible to carry out until the *Guestre/Buestre* water(flow?); after that they could not proceed due to the inundation of waters. Based on the description it seems more probable that it was an (longer-lasting) inundation rather than a flood event, since perambulators could still reach the *Guestre* water (thus it had a definite bed/basin), but then they could not continue.

This inundation could be the one of the *Guestre* water, but also a more general inundation in a low-lying area which fact may suggest a high ground watertable (thus, it may also be inland excess water) or a Danube flood as well. Unfortunately, since we have no closer information about the location of the waterflow, we cannot really state that it had any connections to the Danube.

⁸⁴⁶ After Deák 2005, p. 356 (Garinus 230): "Multiplicate sunt aque danubii, intumuerunt nimis et inundauerunt, et omnia repleuerunt que erant in curia. Irruit danubius quasi fluuius violentus quem spiritus domini cogit. Ascenderunt aque fluminis fortes, et inundatione facta illisum est flumen domui sororum, intravit claustrum, domos et officinas earum. ..." For recent literature and a newly-found full intact text of the Garinus-legend with its detailed interpretation, see: Deák 2005, pp. 355-356.

⁸⁴⁷ MHJ Vol. 1, ch. 27, pp. 35-45 (1268): "Item mete ville Urs castro pertinentes sic distinguntur: cuius prima meta incipit prope Danubium, que vicina aque Danubii de Kathpan monasterio pertinentis superius ascendendo, que est commetanea alteri ville domini archiepiscopi, que Urs vocatur, deinde vadit ad partes ecclesie sancti Pauli, ubi sunt populi ecclesie Iauriensis, et inde vadit usque ad locum, qui dicitur Oxunteluke, qui est iuxta aquam que vocatur Buestre, et ulterius propter in undacionem aque nequoverunt transmeare neque metas assignare." The charter is also published in: MRES Vol. 1, ch. 721, p. 553; Fejér Vol. 4/3, pp. 443-456. Local geographic names: water bodies: *aqua Buestre/Guestre*, *stagnum verch*, *aque danubij*, *wag/waag*, *dudwag*, *paludis Kubuldukfo*, *wagtu*. Lands and related geographical names mentioned: *villa Urs/Wrs/vrs* (Örs), *possessio/locum Oxuntelke/Oxunteluke/Oxunteleke*, *terra villa sancti andree* (Szentandrás), *terra villa Kezw/Kezew/kescu* (Kesző), *Castrum Kezw* (Várkeszi?), *Ecclesiam s. Andree apostoli, Monasterij de Kothpan/Kathpan*, *loci Chena et Nogud*, *populis de Nandur*, *Ecclesie de Moyk*, *que vocatur Kothouch/Gothouch*, *Ecclesie sancti pauli*, *populi ecclesie Jauriensis*, *locum sasuch/sasuth*, *locum Kormun/Kormon*, *terra Balyan*, *villam Zakalus/Zakalos/Scakalus* (Szakálos), *locum Bursos/Bursous*.

9.3.5.3 Flood of the Dunajec river at the Polish border in 1270

According to the descriptions of the *Annales Capituli Cracoviensis*, there was unheard flood of rivers, especially on the Wisła, Raba and Dunajec, in August 1270.⁸⁴⁸ The flood of these three rivers was also reported by the *Annales Polonorum* (I).⁸⁴⁹ While the catchment areas of the Wisła and Raba rivers belong to the other, Polish side of the Carpathians, the upper section of the Dunajec originated in historical northern Hungary (northern Slovakia), forming a borderline between historical Hungary and the Polish kingdom. As such, the flood of the Dunajec river might have as well originated partly from the Hungarian side of the catchment. It is, however, also possible that the flood-water of the Dunajec river entirely came from the Polish side (thus, it is not included in any the main analyses).

9.3.6 Flood in the 1271-1280: An inundation of the Rábca river in 1271?

Military campaign of the Czech, Polish and partly Austrian military troops occurred in 1271. According to the description, at this time not the invaders but defenders made the unsuccessful attempt to cross the river, and several soldiers (Hungarians) submerged in the water of the Rábca while crossing the river.⁸⁵⁰ Although it is not sure whether there was a flood

⁸⁴⁸ MGH SS rer. Germ. Vol. 11, p. 32 (*Annales Capituli Cracoviensis*): "Anno Domini 1270, 12. Kal. Augusti, fuit inaudita inundacio fluviorum, precipue Wisle, Rabe et Dunaiech. Verum quanta dampna fecerit horror est referre. Namque sua torrenti violencia in ultraque parte littorum et riparum longe lateque villas agrosque miserabiliter abolevit, adeo quod humanis usibus isque ad centum annos vel amplius reddidit inutiles et inaptos. Homines, iumenta ceteraque animalia in parte maxima submergendo et quicquid occupans violenter. Tunc serpentes et volucres habuerunt pro refugio arbores eminentes, domus quoque si aliique pre fluctus impetu poterant remanere. Nec hoc dubium, quod Omnipotens tantam plagam super faciem terre immiserit peccatis hominum exigentibus, ut graviora scelera animdversione insolita multarentur."

⁸⁴⁹ MGH SS rer. Germ. Vol. 11, p. 58 (*Annales Polonorum* I): "1270. ... Iterum circa festum beate Marie Magdalene (21 July) tribus diebus fuit maxima inundacio aquarum in Cracovia per Wyslam, qualis nunquam visa fuit, quia occupavit villas, segethes, prata et totum campum et spaciun a monte sancti Stanislav usque ad montem sancti Benedicti, et multos homines submersit t domos et molendina, et duravit hoc malum per 15 dies, et hoc diluvium per diversas prvoncias mundi, et fecit Raba et Dunajecz. Obiit regina Ungarorum domina Maria, mater domine Kinge."

⁸⁵⁰ MGH SS Vol. 9, pp. 703-704 (*Continuatio Vindobonensis*): "1271. Rex Bochemie multis principibus in unum collectis, inter quos erat marchio de Pronswich et duces Polonie et alii quam plures, et cum maxima multitudine armatorum, bene ad nonaginta milia, intravit Ungariam ponte pulcherrimo per Danubium preparato; et in primo ipsius regis Bochemie ingressu Posonium, quod vulgariter dicitur Prespurch, potenter expugnavit, quod factum est infra hora prima et tercia. Rex vero Bochemie cives Wiennensis cum mille et quingentis equis predicti castri fecit esse custodes. Postea vero aliud castrum dictum apud Sanctum Georium, et castrum dictum Poesinge, et Piberspurch, et civitatem dictam Tirna, hec omnia in illo loco existentia viriliter expugnavit. Postmodum vero per pontem, quem per Danubium fieri iussit, cum omnibus suis transiens, ad aliam partem Ungarie se recepit, quedam, castrum dictum Cherfullenburch, et Wart, et Altenburch, potenter expugnavit, et civitatem Misenburch cum castro totaliter devastavit. Rex vero Bochemie valida manu nullo sibi resistente per duos menses in eisdem partibus Ungarie potenter manebat. Interea rex Stephanus Ungarie, maxima multitudine Comanorum tam Ungarorum collecta in oppositum regi Bochemie venit, in aquam dictam Rebint se locavit. Sed contra regem Bochemie nichil facere potuerint, tam ex ipsis scilicet Ungaris qui predictam occulte transierunt, plurimi submergebantur, et ab adversariis sunt occisi. Item vero rex Bochemie videns quod pre nimia fame que tantum invaluit, et usque ad messem plenarie perduravit, diuicius cum tanta multitudine stare non posset, scessit inde, et in Wiennam suam civitatem se recepit, et alii vero omnes ad propria sunt reversi. Quod videns rex Stephanus Ungarie, regem Bochemie a terra Ungaria exivisse, et suos homines dimisisse a se omnes, misit 30 milia Comanorum et Marhvelt et Moraviam; qui plurimam partem terre per incendia et rapinas vastaverunt, et prohdolor multi sunt occisi et multi ex eis sunt capti, et plurimi Ungariam introducti." See also MGH SS Vol. 9, p. 744 (*Continuatio Claustroneoburgensis VI*).

or high-water event at all (thus, it is not included in the main analyses), this information has relevance with comparing it to the 11th-century cases.

9.3.7 Flood in the decade of 1281-1290: Rainfall and flood in 1285 – events of the Second Mongol Invasion

The *Continuatio Vindobonensis* writes about the Tatar attack, which became known in medieval Hungary as the Second Mongol (Tatar) Invasion:

After the Christmas of 1285 immense quantity of Cumans and Tatars broke into the country. However, God sent on them clouds and great rains. Cloudburst in spring caused such a great flood that almost all of them suffocated,⁸⁵¹ but also the great amount of snow was mentioned as a reason of flood.⁸⁵² Tatars descended some time in early or mid spring time towards southern Transylvania where they planned to leave the country.

While the *Continuatio Claustroneoburgensis* (VI) mentioned that many Tatars died in the frost, others emphasised the great rainfall and flood occurred, in which Tatars submerged.⁸⁵³ *Hermann Altahensis Annales* and its copies also mentioned natural conditions unfavourable for the Tatars: in this case ice, snow and rain fell in great quantity.⁸⁵⁴ The *Österreichische Reimchronik* mentioned a snowy-rainy storm, followed by frosty weather, which caused great damage among the Tatars.⁸⁵⁵ Without dating, the location of the battle, with

⁸⁵¹ MGH SS Vol. 9, p. 713 (*Continuatio Vindobonensis*): "Anno Domini 1285 post nativitatem Domini Comani et Tartari cum innumerabili multitudine intraverunt Ungariam, et vastaverunt eam, et occiderunt et deduxerunt ex ea innumerabiles viros et mulieres et parvulos eorum; tandem vero ab incolis terre circa Septem castra turpiter sunt de terra fugiti, occisis ex eis innumerabili multitudine. Reliqui vero qui evaserunt, quamvis pauci, fugientes latitantes inter montes et valles nemoras, divino iudicio ibidem fere omnes perierunt. Nam Dominus qui ubique est protector in se sperancium, misit super eos nives et pluvias ingentes, confractisque nubibus super eos tanta inundatio aquarum irrupt, quod fere omnibus submersis pauci ex eis evaserunt."

⁸⁵² MGH SS Vol. 17, p. 414 (*Hermann Altahensis Annales*): "(1285...) Preterito anno, hoc est anno 1280, tempore Ladislai regis Ungarie, filii regis Stephani, Tartari in tanta multitudine intraverunt Ungariam, quod dicebantur cum exercitu suo undecim miliaria occupare. Qui tandem non humano auxilio, sed divino iudicio perierunt. Supervenit enim grando, nix et pluvia in tanta quantitate, quod se de loco movere non poterant; et sic a christianis in circuitu positis sunt occisi, et iusti tulerunt spolia impiorum."

See also (non-contemporary): RAS Vol. 2, pp. 278-279 (*Anonymi Chronicon Austriacarum*): "Mo.cc.lxxxvo. Post nativitatem Domini Comani et tartari. cum in numerabili multitudine intrauerunt Vngariam. et vastuerunt eam. et occidentur et Deduxerunt ex ea in numerabiles viros et mulieres. et paruulos eorum. tandem vero ab incolis terre circa septem castra. turpiter sunt de terra fugati. occisis ex eis in numerabili multitudine. Reliqui vero qui euaserunt. quamvis pauci fugientes latitantes inter montes et valles memorosas. Diuino iudicio fere omnes erierunt. Nam Dominus qui vbique est protector in se sperancium. misit super eos Nives et pluuias ingentes. confractisque nubibus. super eos tanta invndacio aquarum irrupt. quod fere omnibus submersis pauci ex eis euaserunt. Eodem anno post pascua. Martinus papa theutonicorum inimicus. mortuus est. cui successit Honorius iij-us."

⁸⁵³ SRA Vol. 1, pp. 707-724 (*Paltramus seu Vatzo*): "1285. Chumani et Thartari circa Septem Castra Nam Dominus,, misit super eos nubes et pluvias ingentes: confractisque nubibus super eos, tanta innundatio aquarum irrupt, quod fere omnibus submersis, pauci ex eis evaserunt."

⁸⁵⁴ MGH SS Vol. 17, p. 414 (*Hermann Altahensis Annales*). As for copies, see MGH SS Vol. 17, p. 595 (*Eberhardi Archidiaconi Ratisponensis Annales*); MGH SS Vol. 9, p. 810 (*Weichardus de Polhaim*).

⁸⁵⁵ MGH DC Vol 5/1, p. 313 (*Österreichische Reimchronik*): "CCLIII. nû wurden si gedancahaft, / wie si gewunnen die kraft, / dâmit si sich gefristen. / swâ si werlich liute wisten, / die besanden si sâ / beidiu verre unde nâ. / di Tâteraer si riten sân / an dm vordern orte an. / dishalp des Snêberg si lâgen. / die welde wâren in verslagen, / sô daz si mit gedrenge / muosten durch die enge / in daz lant ze Unger rîten. / den hindern wart der voren strîten / wol zwênc tac verswigen: / sô lanc sach man si ligen. / si ahten in ir sinne, / dô si des wurden inne, / daz in was verhamit / der selben strâzen wit, / sô daz ir grôzez her / moht niht kommen ze wer / an die Unger mit schocken, / die als die snêflocken / wâren unzellich, / do vereinten si sich kurzlich / ûf ein widerreise / und liezen in der freise, / mit den man hezlichen vaht. / ein ganzen tac und ein naht / mit strîte wâren si gequelt. / si belfbent ungezelt, / die dâ tôt beliben. / die aber hinder sich triben, / dô die kommen wârn / an den Snêbere mit scharn, / dô erzeigte got der

Hungarian-Székely victory over the Tatars, took place in Transylvania, in the vicinity of the Székely castle of *Turuskou* (Torockó; Rimetea-Ro) where, according to the charter, thousands of captured people were freed.⁸⁵⁶

In conclusion, Mongols (and others e.g. Cumans) broke into the county through Transylvania around or short after Christmas, and left the country latest until end of May when the King already issued charters with regards to the past invasion, even if according to other evidence Mongols might stay even longer and were still around in June.⁸⁵⁷ The battle, victorious for Hungarians, took place in spring time in the Székely area around Torockó, where the flood, presumably caused by snowmelt and rainfall, unfortunate for Mongols, occurred.

9.3.8 Floods in the 1290s

9.3.8.1 Temporary waterflow leading rainwater in Slavonia, (prior to?) 1296

According to the *Continuatio Claustroneoburgensis* in 1295 a flood occured in Vienna⁸⁵⁸ which, due to its location close to the Hungarian border, probably reached in some extent parts of western Hungary. Although there is no information for this year, a flood and a temporary waterflow (*Kaista*) holding water, located over the Drava, close to the Karaso river, is mentioned in a charter, dated to March (*mense Marcio*) 1296.⁸⁵⁹ Connected to an exchange of estates, perambulation of two landed possessions took place, namely *terra/possessio Keulges (tota porcio)* with two *villa-s* and all belongings together with *terra/possessio (porcio) Francheusfeldy* or *Zeueboog (iuxta fluum Karaso)*, all located *ultra fluum Draue*. The

guote, / der in sîner huote / het die kristenheit, / swer an im niht verzeit / und sich sîner helfe trôst, / daz er den schiere hât erlôst / ûz aller nôt bitter. / ez kom ein solich ungewitter / von schûre und von snê, / daz die Tâtraer niht mêt / geluste her wider. / si sluoc der schûr dar nider, / darzuo der frost ir verderbte / sô vil und ersterbte, / daz man daz wol aht, / die si heten ûz brâht, / der kom hin wider mit unheil / kûm der hundertist teil. / die Unger dancten sîre / got, der in die êre / und di gnâde het getân."

⁸⁵⁶ SzO Vol. 1, pp. 21-22, ch. 18. Donation charter issued on 18 September, 1289.

⁸⁵⁷ See e.g. Jackson 2005, p. 205; 14 June 1285: Fejér Vol. 5/3, p. 301; MRES Vol. 2, ch. 177, p. 197.

⁸⁵⁸ MGH SS Vol. 9, p. 718 (*Continuatio Vindobonensis*): "1295. Eodem anno secunda dominica post pasca, consecratus est chorus in Sancta Cruc, cum altariis circumstantibus et capella infirmorum, a venerabilibus Berenhardo Pataviense....Seccoviense episcopis. Eodem anno tanta inundatio aquarum facta est, ut aqua Wienna hospitale civium et fontem ante hospitale situm transcederet, ita út infirmi in lctulis naturae et vix afugere viderentur; et ivus qui Satelpach dicitur ad Sanctam Crucem per totum claustrum et ante liberariam usque ad gradum ecclesie intravit." As a copy, same text transcribed appears in the *Eberhardi Archidiaconi Ratisponensis Annales* (MGH SS Vol. 17, p. 595).

⁸⁵⁹ ÁÚO Vol. 10, ch. 156, pp. 240-241: "... Cursus autem metarum huius terre Zeuoboogh vocate, prout homo noster Andreas sacerdos Ecclesie Sancte Crucis de villa filiorum Comitis Ladislai filij Cleti Kereztr vocata ad petitionem utrarumque parcium illuc transmissus, et ad nos reuersus, partibusque presentibus ibidem nobis dixit, talis est: Incipiendo scilicet in vna meta terrea in littore fluuij Karaso erecta commetaneitate terrarum Magistri Benedicti de Saagh, tendit ad partem septemtrionalem, et cadit ad aquam viminosam Kathaplesa vocatam; per cuius aque medium eundo exit ab eadem ad vnam metam terream; deinde proceditur ad arborem magnam berekunya vocatam terra cumulatam cruceue consignatam vice mete, vbi cadit in aquam Neulenya vocatam, et per medium eundo huius aque circuit versus villam Saagh vocatam; exeundo ab eadem aqua Neulenya dicta venitur ad tres arbores ilicum vicinanter extantes, ab vno trunko vel radice procedentes, terraue cumulatas, ferroque consignatas vice mete; abhinc ad vnam metam terream angularem, in qua est arbor ilicea; vbi cadit in magnam viam de Saagh decurrentem ad ecclesiam Beate Marie de Luka, per quam diuertit ad partem orientalem ad duas arbores ilicis et quercus terra cumulatas, vbi est fouea seu fossatum Kaista dictum, aquosum ex inundacione pluuiarum, aliquando autem arridum siue siccum, vbi commetaneitas terrarum predicti Magistri Benedicti terminatur, et incipit tenere commetaneitatem cum terris filiorum Dauid et Samsonis de genere Harazth, adhuc per eandem magnam viam procedendo venitur ad aliam foueam vel fossatum simile predicto fossato;.... "

charter contains a previous charter, similarly issued in 1296 by Queen Tomasina, and then the perambulation itself.⁸⁶⁰

As we could see above, in the relevant section of the charter, during the perambulation a ditch or bed called *Kaista* was described which held water in the time of flood caused by rainfall, but otherwise it was dry. In itself this would not be a proof of any wet period with floodwater around; however, based on the word order of the text it seems likely that at the actual time of the perambulation there was water in the the ditch/bed ('*fouea seu fossatum Kaista dictum, aquosum ex inundacione pluuiarum, aliquando autem aridum siue siccum*').

9.3.8.2 Temporary waterflow leading rainwater: perambulation in Slavonia, 1300

Connected to the division of the landed possessions *Tulman* and *Lanka*,⁸⁶¹ located in medieval Valkó county, a decision over the debate as well as a perambulation was described in the charter, dated to 1300. In one part of the perambulation process, a water body, a water or swamp, but referred to as a stream ('*aqua seu stagnum Zelezpotok*') was mentioned, existing merely because of a flood caused by rainwater. Since the charter was issued on 30 April ('*septimo die Beati Georgij martiris*') and the order was made on 2 April ('*Sabbato proximo ante dominicam Palmarum*'), one can expect that the perambulation took place between these two dates.⁸⁶²

Based on local geographic and water-body names, the above-mentioned area was located in medieval Valkó county, later belonged to medieval Verőce county. Both landed possessions were deserted, but their former location is known: in the neighbourhood of Kórógy (Korod-Hr).⁸⁶³

⁸⁶⁰ ÁÚO Vol. 10, ch. 144, p. 228. Names of landed possessions: *terre Zeuoboogh, villa Kereztur, villa Saagh, ecclesiam Beate Marie de Luka, terrarum Magistri Benedicti, terris filiorum Dauid et Samsonis de genere Harazth, terre filiorum Dauidis et Samsonis, terre Magistri Johannis et fratrums suorum – filiorum Comitis Ladislay, possessionem Scynork. Waters: fluuius Karaso, aqua viminosa Kathaplesa, aqua Neulenya, fouea seu fossatum Kaista* (in which the water stands now), *aqua Keresua, aqua Begyamalaka, aqua Zugousuk.*

⁸⁶¹ Water bodies: *fluuius Wolkow/Wlkou, fluuius/aqua Lazar, aqua/fluuius Karagh/Korogh. Lands, settlements: possessio/villa Tulman, possessio Lanka, villa Karachna, terra Lugrech, villa Bechefolua.* Legal bodies mentioned in the charter: *Conuentus Waradiensis, Capitulus de Posoga, litteris Capitulorum Quinqueecclesiensis et Boznensis.*

⁸⁶² ÁÚO Vol. 10, ch. 254, pp. 385-387: "...., et alijs nobilibus Regni per dominum Regem ad expediendum ipsum negocium specialiter deputatis, uisis et perfectis omnibus litteris super eisdem causis processis et confectis: ipsum Mark in facto principali, videlicet in destruccione ville ipsius Magistri Johannis Karachna uocate in uigilia Beati Laurencij martiris quatuor annis iam elapsis irrogata, dampno sexaginta marcarum in ablacione equorum et aliorum animalium, Mete autem predictarum terrarum, sicut in litteris Capituli Quinqueecclesiensis contineri uidimus, hoc ordine distinguntur: Incipiendo scilicet in fluuio, et a fluuio Wolkow uocato, et incipit tenere commetaneitatem cum terra Lugrech filij Logreth de genere Zenthemaguch;, et uenitur ad biuum prope villam eiusdem Logrech (sic!) Bechefolua vocatam;, et peruenit ad illum locum, in quo quidem loco hyc fluuius Wlkou (sic!) recipit in se alterum fluuium Lazar uocatum; siquidem vbi transito fluuiio Wolkow (sic!); itaque per eandem aquam Lazar uocatam uadit usque dum peruenit ad alteram aquam Karagh dictam, vbi commestaneitas terrarum Cruciferorum predictorum de Dopza (sic!) terminatur, et incipit tenere commetaneitatem cum terris Magistri Laurencij et fratrums suorum filiorum Magistri Philpus Korogh uocatis; abinde diuertit ad partem septemtrionalem, et eundo per prata fluuij predicti Korogh uocati, in magno spacio eundo in hoc prato contingit terris filiorum Ehnee, exeundoque ab eodem prato in commetaneitate eorundem filiorum Ehnee uadit ad angulum cuiusdam silue filiorum Ehnee ligueth vocate, vbi sunt tres arbores ilyce (sic!) magne crucibus consignate ferro vice metarum; ubi uertit ad partem meridionalem, et per quandam magnam viam uenitur ad quandam aquam ex inundacione pluuialis aque se stagnantem wlgo Zelezpotok dictam; quam quidem aquam transit, et in commetaneitate terrarum supradicti Dionisij itur ad quandam magnam viam memoratam; intrans in villam Tulman uocatam, in qua est ecclesia in honore Sancti Michaelis Archangeli,"

⁸⁶³ Csánki 1890 Vol. 1, p. 328 (Lanka-today deserted land), p. 357: *Tulman/T(h)olman* (deserted land in the area of Kórógy).

9.4 Flood events recorded in the 14th century

Few of the flood references of the 14th century, discussed here, were already mentioned in publication.⁸⁶⁴ Nevertheless, in the forthcoming chapter floods and inundation events of the 14th century are discussed on the basis of a much larger database and in much more detailed way than in the short previous publication.

The 14th century, compared to the scarce documentation of the previous centuries, seem to be a real 'flood century'. This is true partly due to the great number of flood reports, and partly because of the detailed information available in charter material. Thanks to the great number of legal processes, as it is visible on *App. 1b*, not only temporal but also spatial patterns provide a (much) more representative picture.

9.4.1 Floods of the period 1301-1310: Frequent flood(s) of the Hron river prior to 1309

In a charter, issued on 24 June ('*in festo beati Johannis baptiste*'), the official complain of the nobles in *villa Lehatha* (Horná Mičiná-Sk)⁸⁶⁵ to the archbishop of Esztergom was described in detail. According to the content of this official letter, neither the nobles nor their serfs can usually reach their parish church in *Rodona* (Radvaň nad Hronom-Sk) without difficulties, due to the great distance and the frequent flood of the *Goron* river (Hron-Sk).⁸⁶⁶ The above-mentioned complains were found reasonable and got accepted by the archbishop, who gave permission to the nobles to build their own chapel with cemetery in the above-mentioned village. As we will see later in the 15th century, having difficulties to reach the parish church could cause immense problems: for example, people could not practice their Christianity properly in the case of urgent matters etc. Cemetery with a sacrificed place was a very important basic facility of a *villa*. Thus, it is not very surprising in the first decade of the 14th century that a settlement on the still-appreciated '*villa*' level wished to possess such facilities.

From our present viewpoint their reasoning, thus, background information has great importance. It is interesting to note that for the second time, flood-problem mentioned as the '*inundatione fluvii memorati*' which can be on the one hand simply understood as the charter refers back to the above-mentioned ('*propter frequentem inundationem fluuii Goron*') frequent previous flood(s). On the other hand, it seems also rather likely that they as well refer

⁸⁶⁴ Kiss 1999a, pp. 51-64.

⁸⁶⁵ For localisation of placenames, see: AOkl Vol. 2 (Gyula Kristó), ch. 676, p. 296.

⁸⁶⁶ DL 63903. With some small misreadings a shortened version is published in Latin: Fejér Vol. 8/1, ch. 151, p. 351. Hungarian regesta: Kristó AOkl Vol. 2, ch. 676, p. 296. Due to the importance of each sentence and shortness of charter, exceptionally a full Latin transcription (corrected from the original) is presented: "Thomas miseracione diuina archiepiscopus Strigoniensis eiusdemque loci comes perpetuus Significamus vniuersis omnibus presentes hostendentur que comes Myke, magister Johannes Martinus Desk filij eiusdem comitis Myke nobiles de Folio ad nostram accedentes presenciam nobis cum instancia supplicarunt. Quod quia ipsi et iobagiones ipsorum de villa Lehatha, propter distanciam loci ac frequentem inundationem fluuij Goron, ad ecclesiam beate Marie de Rodona matricem et parochyalem, sine ipsorum difficultate, accedere nequirent, vt deberent; in predicta villa ipsorum Lehatha uocata, Capellam facere fieri, cum Cimiterio seu loco sepulture, eisdem concedere dignaremur. Nos enim considerantes petitionem predictorum comitis Myke, et filiorum suorum Juri consonam, et consentaneam rationi, et quia de distanca loci predicti ac eciam inundacione fluvij memorati, per ueridicos viros nobis ueritas constitit euidenter, in prefata villa ipsorum Lehatha nominata, Capellam construendi, cum Cimiterio, seu loco sepulture, eisdem duximus concedendam. In cuius rei memoriam perpetuamque firmitatem eisdem concessimus. Sigilli nostri appensione communitas. Datum Strigonii in festo beati Johannis baptiste. Anno domini Millesimo Trecentesimo nono."

to a certain, 'memorable' flood event of the river or its results what are very well-known by the (reliable) people of the archbishop ('per veridicos viros nobis veritas constitit evidenter'), and this knowledge is convincing enough to be an evident proof. Therefore, it is possible that there was at least one memorable flood event not long before with visible consequences, and probably some more in the previous period of years on the Hron river. Thus, the archbishop asked for proof, ordered his own reliable people to check whether everything happened according to the description, and when they took him the proof, then he decided to give the permission.

Since it was located downcourse of the Hron river, south to one of the main industrial (gold, silver mining and processing) districts of the country at that time (Lower Hungarian mining district), we cannot exclude the presence of human intervention either. However, this circumstance is not mentioned in the charter, and seemingly noone was directly or indirectly blamed for these problems, at least not in the documented course of the petition process.

9.4.2 Floods of the period 1311-1320

9.4.2.1 Flood(s) in 1316

Without specification on the location, the *Chronicon Aulae regis* mentions great abundance of waters and destructive flood of waters in Austria, Poland, Hungary and Moravia (*Misna*), caused by continuous (summer) showers ('ex continuatis imbribus'). Great damages occurred: hay and sowings were destroyed, there was great shortage of food and hay, lots of people died. According to the same Czech chronicle, this event and shortage of food were followed up by a severe winter with much snow and very cold weather.⁸⁶⁷ While concerning the flood event exact geographical locations are provided, namely that flood occured in the above-mentioned areas, no such direct information is available whether continuous rains occurred in all the areas mentioned above.⁸⁶⁸

More information is available, probably connected to the same flood wave, concerning Styria and Bavaria. In Styria the Mura river destroyed 13 bridges (without indication on the season), while in Bavaria, among others, the Salzach river flooded and there was also flood in Salzburg (caused by rainwater). The Danube flooded not only in whole Austria but also in Hungary: in several parts complete villages with their people submerged.⁸⁶⁹ According to the

⁸⁶⁷ For more information on weather and flood events, see: Brázdič-Kotyza 1995, pp. 111-112.

⁸⁶⁸ FRA SS Vol. 8, Liber 1, Cap. 128, p. 379 (*Chronica Aulae regiae*): "Iste annus domini 1316 tot in se pestilentias et miserias continet, quod eas audire auris refugit, mens stupescit; in hoc anno, ut supra diximus, cometa quaedam in parte aquilonari apparuit, quae disponente deo plurima pericula nuntiavit; aestatis namque tempore contra naturam huius temporis facta est ex continuatis imbribus tam copiosa aquarum habundantia, quod more diluvii in locis pluribus subverteret aedificia, muros et castra. In partibus Saxonie tantum Albea fluvius excrevit, quod quadringentas et quinquaginta villas aquae vicinas cum hominibus et pecoribus pariter delevit. In Austria, Polonia, Ungaria et Misna de hoc diluvio omnium hominum quaerimonia nuntiabat infinita pericula esse facta. Haec aquarum inundatio campos et valles cooperuit, fenum et segetes distruxit, secumque plura, quae rapuit, deduxit. Subsecuta est lacrimosa mors hominum et tantum mors praevaluit, quod in plerisque villis et civitatibus foveae profundae fierent, quae mortuorum insimul plurima corpora velut morticiania operirent. Bladum, fenum deficit, deficiunt et pascua, ut esurire et interire incipient homines et iumenta. Retulit nobis dominus Petrus Maguntinus archiepiscopus, quod infra dimidii anni tempus in civitate solum Metensi quinques centum millia hominum mortua sunt, nihilominus equos, oves et boves et universta pecora campi necuit pestilentia huius anni, oves enim plures quam mille exceptis aliis animalibus praemortuis, quae ad Aulam regiam pertinuerunt, in grangiis perierunt. Aestatem hanc fluminibus non fructibus fertilem hiems aspera subsequitur, adducens nivis copiam, frigorisque rigorem." See also: Pautsch 1953, pp. 57-58; Rohr 2007, pp. 223-226.

⁸⁶⁹ Zahn 1865, pp. 33-34 (*Anonymi Leobensis Chronicon*): "Anno ab incarnatione domini M. ccc. xvi. a nativitate Christi usque post purificacionem sancte Marie apparuit cometa non longe a maris stella causam perlucidam post se trahens. Hic quamvis per mundum plura significauerit tamen duo manifestissima nobis memoriter recognoscere

Continuatio Zwetlenses (III) the Danube flood, together with other surplus waters (due to rainfall), caused great infertility and famine in Austria.⁸⁷⁰

9.4.2.2 The same or another: flood in 1317?

The same or a different, separate flood event was reported under the year of 1317 in the *Annales Mellicenses*, which also meant to have happened in Hungary.⁸⁷¹ In the *Annales Mellicenses* only under this year alone was flood mentioned, affecting Gallia, Bavaria, Bohemia and Hungary, and no flood-indication was included for the previous year. Due to the lack of 1316 flood-reference, in this case it is more likely that the 1316 flood event was mentioned under the year 1317. Nevertheless, since also the *Continuatio Zwetlenses* (III) mentioned that the winter of 1317 was not only cold but also rather snowy in Austria,⁸⁷² we cannot completely exclude the possibility that a 1317 flood event (which can easily happen after a cold and snowy winter) occurred in Hungary. Merely on the basis of the *Annales Mellicenses*, this 1317 (probable) flood event cannot be included as a separate event.

9.4.3 Flood of the decade 1321-1330

9.4.3.1 Flood in 1325

In a charter issued on 21 February ('*feria quinta proxima post diem Cinerum*') in 1325 the testimony of a prorogation remained to us (*litterae prorogatoriae*). According to the content of the charter, coming from *Voya* (Vaja) landed possession, the introduction of the owners to *Veteis* (Vetiş-Ro) landed possession was postponed to Thursday after the 31 April, due to the decision of both parties, but especially due to the great flood of waters ('*propter nimiam inhundacionem aquarum*').⁸⁷³ Although no information is available on the exact day of the perambulation, based on the issue date the flood was presumably a winter flood event. Veteis is located at the Szamos river not far from Szatmárnémeti (Satu Mare-Ro), while Vaja is close to Bakta and Lórándháza, on the southeastern side of the sandy Nyírség area.

quod in eodem anno per lura regna peccora bouina ualde communiter morirentur (morerentur), et inundaciones inaudite et inopinate sunt orte ita quod in terra Stirie Mura fluuius xiiij. pontes destruendo euertit et nisi in Leuben cum paucis aliis remansit. In Bawaria uero diuerse aque mala inaudita operabantur ita quod fluuius Salzach prope circa Werffen in clausula ubi foramen munitionis existit in petra ibidem, idem fluuius predictam clausulam exundacione repleuit supra usque ad solam scalam per quam intratur prenotatum foramen, clausulam obruendo lignis ita quod post torrentem inundacionis uia eadem permansit inmeabilis donec per longum tempus ab hominibus terre purgaretur. Eademque aqua pontem ab hominibus in Saltzpurga euertit ac ciuitatem in magna parte intrando plures stratas ac domos repleuit sentina. Eademque aqua in Lauffen pontem ac turrim lapideam cum multis hominibus eiecit. Diuerse uero aque in Danubio congregate a Pataua per totam Austriam et Ungariam maxima dampna fecerunt in pluribus partibus integras uillas cum omnibus suis hominibus submergendo deduxerunt." See also Pautsch 1953, pp. 57-58; Weikinn 1958 Vol. 1/1, p. 177.

⁸⁷⁰ MGH SS Vol. 9, p. 666 (*Continuatio Zwetlensis* III): "1316. Item rex Fridericus stiuram a civibus de omnibus que habebant, sub iureirando accepit; et inundatio maxima Danubii ac omnium fluviorum, tam ex pluviis quam eruptione venarum terre, quam nix maxima et nimis diurna subsecuta omnia sata destruxit."

⁸⁷¹ MGH SS Vol. 9, p. 511 (*Annales Mellicenses*): "1317. Facta est inundacio aquarum per totam Almaniam, Ungariam, Bohemiam et Galliam." See also: Pautsch 1953, p. 59; Weikinn 1958 Vol. 1/1, p. 177; Rohr 2007, p. 225.

⁸⁷² MGH SS Vol. 9, p. 666 (*Continuatio Zwetlensis* III): "1317. Fames et sterilitas inaudita ex nive preteriti anno omnia sata destruente."

⁸⁷³ DL 96117 (21.02.1325). For Hungarian regesta, see: AOkl Vol. 9 (Lajos Géczi), ch. 58, pp. 42-43.

9.4.3.2 1329 – flood or not?

The owner did not dare to take with him for his travel an earlier (forged) charter, dated to 1260, because he was afraid of unexpected situations, such as floods, hostile attack or many other possible dangers. Therefore, on 13 January in 1329 the chapter of Székesfehérvár transcribed the charter (*privilegium*). The charter, dated to 1260 was most probable forged in the early 14th century.⁸⁷⁴ Since the owner of the charter should have travelled many hundreds of kilometers to Slavonia (debated possession: *Glaunicha*), even in case of an original charter unexpected problems during his travel could have occurred any time.

In this case it is more probable that the charter mentioned flood as a possible, general problem which has a chance to occur (or not occur). However, only the probability and not a clear flood case is raised in the 1329 charter and thus, this case is not included in later robust analysis.⁸⁷⁵

9.4.4 Floods of the period 1331-1340

9.4.4.1 Spring flood in 1334

In a charter (*litterae relatorie*), dated 14 April, 1334, the chapter of Eger reported to the King that, according to the letter/charter of *Paulus*, judge of the royal court (*iudex curie*), together with the King's men tried to carry out the perambulation at the landed possessions of *Thasala* (Tašul'a-Sk) and that of (*oppidum*) *Paloch* (Pavlovce nad Uhom-Sk) on the '22nd day of the stay of the royal army' ('*vicesimo secundo die residencie exercitus vestri*'). Nevertheless, neither neighbours nor the nobles of Ung county could attend the legal process because of the great flood event ('*nimia inundacio aquarum*'): water flooded the above-mentioned landed possessions.⁸⁷⁶ Both villages are located west and northwest of Ungvár (Ужгород-Ua), close (5-8 km) to the Ung (Uh) river, in historical Ung county.

9.4.4.2 Flood reports from 1335

Mid-spring flood event in Ung county

On 26 April in 1335, affected parties, eleven noble judges (taken by the affected parties) appeared at the (office of the) convent of Lelesz (Leles-Sk) concerning the legal case related to *Pynchouch* (Pinkóc; Pinkovce-Sk) and *Kyustornoch* (Tarnóc; Тарнівці-Ua) landed possessions

⁸⁷⁴ Szentpétery Vol. 1/3, ch. 1251, p. 382.

⁸⁷⁵ Smičiklas Vol. 9, ch. 367, p. 451: "Nos capitulum Albensis ecclesie tenore presencium significamus quibus expedi vniuersis, quod magister Andreas filius comitis Merklini ad nostram personaliter accedendo presenciaam exhibuit nobis priuilegium domini Bele serenissimi quandam regis Hungarie felicis recordacionis super donacione cuiusdam possessionis Gleunicha vocate, petens nos cum instantia, vt tenorem ipsius priuilegii pro eo, quia dictum priuilegium in specie idem magister Andreas propter inundaciones aquarum, insidias inimicorum et aliarum causarum plurimarum portare et exhibere coram iudicibus non valeret, de uerbo ad uerbum transscribi faceremus et sigillo nostro consignari." For Hungarian regesta: AOkl Vol. 13 (Tibor Almási), ch. 24, p. 21. A good harvest year with no special events ('quiet') was mentioned in Czech sources. See Brázdič-Kotyza 1995, p. 113.

⁸⁷⁶ DL 102897 (14.04.1334): " in dicto termino, videlicet vicesimo secundo die residencie presentis exercitus vestri ad faciem prefatarum possessionum Thasala et Paloch vocatarum accessissent,propter nimiam iundacionem aquarum in dicto termino ad faciem dtarum possessionum accedere nequiuissent, cum per eo cum et ex eo, quia ipsa nimia inundacio aquarum easdem possessiones operuisset ob hoc ipsi nichil depremissis per agere potuissent." Connecting charter (without mentioning the flood event): Károlyi Vol. 1, p. 96 (1334; remained in transcription: 1493/1500).

in Ung county. Whereas the original charters of the first possession were there, the original documents related to the second possession were not taken because of the flood (*impetus aque*). In this case '*impetus aque*' clearly means an ongoing flood event, which probability can be supported by the testimony of the next charter and flood evidence. Since the judges could not decide in the lawsuit (without seeing all original documents), decision was postponed to 25 May. All this information was included in a charter, issued on the same day of 26 April.⁸⁷⁷

Whole Ung county is under water? Memory of (the same?) extraordinary spring flood, 1335

In a charter issued on 30 April, a perambulation was described, carried out on 29 March ('*in octavis medii Quadragesime iam preteritis*') around the landed possession of *Zelemech* (Мали Селменці-Ua and Vel'ké Slemence-Sk), *Ruzka* (Ruská-Sk) and *Barcha* in the upper Bodrogköz region, in historical Ung county.⁸⁷⁸ They should have reported back the results of estimations by 23 April ('*ad octavas Pasce domini*'). Due to the flood of extraordinary magnitude in the area and in Ung county, the estimation and perambulation could not be fulfilled.⁸⁷⁹ In the charter the names of several waterflows are mentioned (e.g. *fluvii Bachoueurene, Zemechenpataka, Wsusckwyze, Nogzabamel, Isen*), still the importance of mentioning the *magnum fluminum Lothorcha* (Latorica-Sk/Ua: concerning runoff it is really bigger than the Ung) and the *Unghwyze* (Uh-Sk) as the two major rivers of the area have to be especially emphasised.

This charter and the flood event itself are especially important: on the one hand this flood is significant due to its great extension and extraordinary great magnitude and discharge, on the other hand the charter itself is also important from a methodological viewpoint.

In the charter the flood as a reason is mentioned altogether four times: in three cases it is mentioned as a great flood (*nimia*). These four mentions contain rather detailed information about the extraordinary situation:

1. The officially invited neighbours approached the Szelmenc landed possession by several boats due to the great flood/inundation of waters ('... *ad faciem dicte possessionis Zelemech accessissent, eandem dictorum vicinorum et commetaneorum eiusdem universorum legitimis convocationibus factis in navibus propter nimiam inundacionem aquarum....*').
2. Due to the fact that the whole Ung county, where the landed possessions are located, was covered (! *cooperuisset*) by the inundation of waters, they could neither measure nor even estimate the given area of land ('*tamen quia totum comitatum Vngh in quo*

⁸⁷⁷ DL 31227 (26.04.1335). AOklt Vol. 19 (Gyula Kristó-Ferenc Makk), ch. 210, p. 97.

⁸⁷⁸ For the medieval environmental and hydrological conditions, see: Engel 1985, pp. 942-1005.

⁸⁷⁹ AO Vol. 3, pp. 159-162: "..... in dictis octavis medii Quadragesime ad faciem dicte possessionis Zelemech accessissent, eandem dictorum vicinorum et commetaneorum eiusdem universorum legitimis convocationibus factis in navibus propter nimiam inundacionem aquarum per antiquas metas fluviales et arboreas infradeclarandas reambulassent, prefati vero vicini et commetanei dictarum possessionum ipsis partibus in facto dictarum metarum litigiosarum in nullo contradicentes apparuissent; et licet ipsi annotatam terram litigiosam inter circulaciones eet discursus metarum prescriptarum existentem iuxta formam predictarum literarum nostrarum regali mensura iuxta regni consuetudinem mensurare et deo pre oculis habito estimare presto fuissent et parati, tamen quia totum comitatum Vngh in quo dicte possessiones existunt inundacio aquarum cooperuisset, obhoc ipsi nec mensurare et estimare propter nimiam inundacionem aquarum eo quod totum comitatum Vngh in quo ipse possessiones continerentur inundacio ipsarum aquarum cooperuerit, non potuerint, sicut ad hoc litere vestre nos docebant, pro hominibus domini regis adducere assumserunt, in quindenit Penthecostis nunc venturis ad faciem dicte particule terre litigiose accedant eo quod partes premissae littere vestre propter inundacionem aquarum regali mensura mensurare non posse exprimebant vicinis et commetaneis ac aliis robis viris ibi convocatis deo habito pre oculis prout visu metiri poterit diligenti consideracione prehabita debeat condigno suo precio et valore estimare, et seriem ipsius estimacionis dicte particule litigiose cum sua estimacione domino regi ad octavas nativitatis beati Johannis Baptiste nunc venturas....rescribatis; ..." For Hungarian regesta, see: AOklt Vol. 19, ch. 159, pp. 76-77, ch. 226, p. 103.

dicte possessiones existunt inundacio aquarum cooperuisset, obhoc ipsi nec mensurare nec eciam estimare potuissent terram litigiosam prenotatam').

3. (The King's men and other honest men) could not measure or estimate (the land) according to the kingdom's tradition since there was such a great inundation in the county of Ung, including those lands, which were covered by the inundation of waters ('*iuxta regni consuetudinem regali mensura mensurare et estimare propter nimiam inundacionem aquarum eo quod totum comitatum Vngh in quo ipse possessiones continerentur inundacio ipsarum aquarum cooperuerit, non potuerint*').
4. And, finally, how it was concluded in the final document after receiving all information about the events (previously included in the charter: see No. 1-3): on the forthcoming 17 June they will (have to) go to the area of land which (as stated in their letter) could not be measured with the royal measure due to the flood of waters ('*in quindenis Penthecostis nunc venturis ad faciem particule terre litigiose accendant eo quod partes et premisse littere vestre propter inundacionem aquarum regali mensura mensurare non posse exprimebant*').

Thus, after all the 'flood-troubles' they postponed the next land perambulation and measurements to a presumably safe date, 17 June, after which date the charter had to be issued by 1 July.

First it is clearly a basic fact that there was great flood of waters ('*nimia inundacio aquarum*') in the area of Szelmenc and Ruska. Moreover, this great flood or inundation was the actual case: the 'entire county' was covered by the same waters, which suggests the presence of not only a great but an extraordinary event with an extremely great discharge. In the medieval period (apart from some Austrian sources) this is the only source in Hungary which refers to an inundation event of such large extent, even if over the 'entire county' probably meant only the inhabited parts (which meant lowland and lower hilly parts the county, while the rest was forested hilly/mountainous area).⁸⁸⁰

The other important point that appears in the charter is methodological: first we received the information that in late March there was such a great ongoing flood event in the area of Szelmenc that neighbours visited the land by boat. Then the perambulation process was described together with the names of waterflows: interestingly enough, nothing in this description of the landscape really referred to the fact that there had been any flood or inundation. So, based on the perambulation description, we did not even realise that there was any inundation at all in the area. And then we came to the measurement and land estimation question: this is the point when it transpired that not only these lands but the whole county was greatly affected by the problem. What is more, the rest of the (inhabited parts of the) county was probably even more affected (it was said to be 'covered' by water). This fact was reported in a letter which was later included in the charter.

Our final piece of information is that a new visit and measurement of the land were ordered, which had to take place in the summer. In this case the reason for the previous, unsuccessful attempt is described, but at this time 'only' flood or inundation (without mentioning the magnitude) appeared in the text. Thus, based on this last piece of information we can only conclude that there was a flood (of simple or unknown) magnitude. Based on the perambulation description no sign of a greater magnitude can be presumed. The point where one might get suspicious is the fact that not only the measurement but also the estimation of the land was not possible. The next important point is the appearance of the word '*nimia*' in the text. A clear sign of an even higher level of magnitude is the fact that neighbours reached the piece of land by boat (which in itself might not necessarily mean too much, but together with

⁸⁸⁰ According to Engel, at the end of the 14th century, still approximately 94% of the population lived on the plain, while the northern and eastern (hilly, mountainous) parts were practically uninhabited. See: Engel 1985, pp. 989-990.

'nimia' it does). The most important item which refers to the extraordinary great extent of the inundation is, without doubt, the information that practically the entire county is under water. Thus, the overall conclusion is that a charter in general does not necessarily document the magnitude of a flood event: a simple flood event can be as well a great flood in reality (even if not mentioned as great), not just those marked with special words (e.g. *nimia*, *maxima*).

9.4.4.3 Muddy pasture in the Žitny ostrov area in 1336

In a charter issued in 1341, another charter, dated 1 August, 1336 ('*in die ad vincula Beati Petri Apostoli feria quinta*') can be found, in which a perambulation process is described, which took place on 31 July in 1336 ('... *quarta proxima post festum Beati Iacobi nunc proxime praeteritum*').⁸⁸¹ Walking along the boundaries of *possessio Poukafelde* (Pókafölde) in Pozsony county, in the Csallóköz district, when they reached the pasture (*pratum*) called *Sarrete* (Sárrét=muddy pasture), it was so muddy that they could enter and reach it neither on foot nor on horseback ('*eo quod lutosum est nimis, equites vel pedites introire nequivissent*').⁸⁸² It is interesting to note that the charter describing the perambulation was issued in Pozsony (Bratislava-Sk), only one day after the perambulation took place in the Csallóköz (Žitný ostrov-Sk) area.

Based on the local geographic names mentioned in the charter,⁸⁸³ the medieval Pókafölde was clearly located in the medieval Csallóköz island (Žitný ostrov-Sk). One neighbour was *villa Zerdahely* (Dunajská Streda-Sk). In the vicinity, a certain *Dyonisio de Karch* was mentioned, which *Karch* landed property is preserved in the name of several villages (Kračany-Sk). Similarly, the names *Nemesabony* (Vel'ké Blahovo-Sk), *Sikabony* (Malé Blahovo, part of the town of Dunajská Streda) preserved the name of the land and castle of *Abany* (Abony), and for the village of *Kurth* (Ohrady-Sk) appears in the neighbourhood. *Kisudvarnok* and *Nagyudvarnok* (Dvorníky na Ostrove-Sk) presumably located at the same land as the land and castle of *Feluduarnuk* (Feludvarnok), mentioned in the charter. Based on all these information, we can state that the medieval landed property of Pókaföld could be located in the direct neighbourhood of what is today Dunajská Streda in the central (higher) part of the Csallóköz island, presumably to the south-southeast.⁸⁸⁴

⁸⁸¹ Fejér provides a date of 28 July for the day of the perambulation, based on transcription '... *quarta proxima post festum Beati Iacobi nunc proxime praeteritum*'. However, the word before *quarta* cannot be detected (in the original), and thus, theoretically it can be *feria* or maybe *die*. Usually, in case of such dating *feria* would be more probably applied, which suggests 31 July as the day of the perambulation. Moreover, 28 July, the fourth day after St. Jacob (25 July) was Sunday (*Dominica*); which is again less likely as a day of perambulation. Therefore the perambulation may have taken place on Wednesday, 31 July.

⁸⁸² Due to possible mistyping, Fejér gives the year 1340 as the issuing date of the charter. Nevertheless, in the charter published clearly 1341 is the issue date. See: Fejér Vol. 8/4, ch. 253, pp. 488-489: "1340. (1341!): Praeterea populi Castrenses de Chukarabanya, item Andreas, filius Petri, et Paulus, filius Ladislai, ac alii Nobiles de Zerdahely dixerunt: quod in prato Sarrete dicto, esset portio, seu pars ad ipsam terram Clementis, filii Pouka pertinens, in quod quidem pratum, eo quod lutosum est nimis, equites vel pedites introire nequivissent; cuius quidem partis seu portionis a parte superiori ipsi Castrenses de Abany, sed a parte inferiori ipsi Nobiles de Zerdahely forent commetanei et vicini; quam quidem portionem, licet ibi accedere nequivissent, tamen sine omni contradictione eidem Magistro Thomae libere ad statuendum permisissent. Et e conuerso ipsis populis et Nobilibus eorum portiones in dicto prato Sarrete saepedictus Magister Thomas asserens se nequaquam intromittere portionibus de eisdem, ipsis pacifice reliquit et dimisit. Datum in die ad vincula Beati Petri Apostoli feria quinta. Anno Domini MCCCXXXVI."

⁸⁸³ Local geographic names (neighbours), mentioned in charter: *possessio/terra Poukafelde*, *castrum Abany*, *possessio Karch*, *villa Szeredahel*, *terra Ecclesiae Sancti Georgy*, *terra Chukarabanya*, *terra Clementis*, *lacus Hunur*, *lacus Hunarus*, *terra (castri) Feluduarnuk*, *possessio Hodus*, *possessio Kurth*, *vallis Dungoholmaya*, *pratum Semlek*, *terra Tarnuk*.

⁸⁸⁴ Házi 2000, pp. 372-375.

Thus, the land located in the low-lying area of the medieval Csallóköz, a large island of the Danube. *Sarrete* (Sárréte) located around the boundaries of *Poukafeulde* (Malá Paka-Sk), closest to Blahovo and Dunajská Streda. In itself it is not a 'big deal' that there is a muddy pasture in the anyway low-lying extensive island of the Danube, even if it was so muddy that neither on horseback nor on foot reambulators could enter it. A low-lying pasture could be sometimes muddy, and even a wetland sometimes could be used as a pasture. Nevertheless, it also means that this pasture was sometimes (more or less) dry when it could actually function as a pasture used for grazing or mowing. Thus, the period when the perambulation took place was probably a wet one: since the perambulation of boundaries took place on 31 July, right in the middle of the driest summer period, it presumes a relatively wet previous period (of unknown duration). Both the name 'Sárrét' and the existence of mud suggest a low fraction soil type, a clayish soil acting as an impermeable layer and keeping back water. Thus, the water can be of two types of origin: it can be the result of the actual (high) groundwater table under the direct influence of the Danube, or precipitation which was kept by an impermeable (clayish) soil layer (therefore, it is not included in direct flood analysis).

9.4.4.4 Floods reported in 1338

Earlier flood event destroyed a mill: a case from Bihar county

A mill in *Bolchhyda possessio* (Bócsida; located south of Berettyóújfalu)⁸⁸⁵ was destroyed by the (preceding) flood ('per inundacionem ipsi aque') of the Berettyó (*Berekyo*) river, at an unknown time before 20 January 1338 ('Quindena Epiphanie'). Myko, son of Lewkus complained in a charter on his brothers who did not pay their part in the reparation costs; and, in general, they do not take part in the maintenance of their Bolcshida landed possession.⁸⁸⁶

Late winter flood in the North: 1338

After a very long legal process, finally on 25 February ('in quindenis diei cinerum') a perambulations of boundaries in the area of *possessio Trochan*, *possessio Cherosyna* and *Remethe*, in Sáros county. However, perambulators were rather unlucky at this time: due to the flood of waters and snows in those areas, and so that waters and snows in those areas were really great, it was impossible to distinguish the mentioned landed possessions, to settle landmarks or separate the boundaries.⁸⁸⁷

In this case, first of all the great flood of waters is important from our point of view. Nevertheless, the reason of this great flood is provided, too: there was great (deep) snow in the area, but some time before mild weather arrived, because melting (and or rain) was needed to have suddenly a larger amount of water for the great flood event. Since *possessio Trochan* (Tročany-Sk) is located in the eastern part of Sáros county, the perambulated area was mainly located here, among others, around the area of *fluvius Topul* (Topl'ou-Sk) and *fluvius*

⁸⁸⁵ In historical Bihar county. See: Rácz 2007. pp. 56-57.

⁸⁸⁶ DL 62697 (20.01.1338): Preserved in the charter dated 29.03.1338.

⁸⁸⁷ Latin edition: Fejér Vol. 8/4, ch. 176, pp. 362-363: "... Tandem idem Capitulum ad ipsas octauas Domino regi rescripsit eo modo: quod praefatus Ioannes de Echy, homo regius, vna cum Blasio, Sacerdote de Choro ipsorum Agriensi, et testimonio eorumdem, in dictis quindenis diei cinerum proxime praeteritis, ad faciem dictarum possessionum Trochan, Cherosyna, et Remethe vocatarum, in Comitatu de Sarus existentium accedendo, easdem praesentibus vicinis et commetaneis earum vniuersis, cum omnibus ad eas pertinentibus per veras earum metas et antiquas, infra declarandas, reambulando modo praemisso, Et quia in illis partibus habundantia aquarum et niuum tunc extitisset, et ipsae aquae ac niues ipsas partes nimium praeualuisserent, ideo ipsi easdem diuis - ipsarum possessionum distinguere et per metarum erectiones ab inuicem separare nequiuissent, sed metae, quibus saepe dictae tres possessiones a vicinariis possessionibus distinguuntur et separantur, ..."

Koproncha (Koprivnica-Sk).⁸⁸⁸ It is also interesting to note that this late February flood and melting date for a montaneous area in the northern Carpathians (on the eastern edge of the western Carpathians by definition) might suggest the late-winter arrival of mild air masses.

Another late winter flood in the North: 1338

Following the order of King Charles (Robert) I issued on 16 January in 1338 ('sexta feria proxima post octavas festi Epiphanie'), a member from the chapter of Várad was sent together with the King's man to *Rechegey* (Recsege/Reszege; Resighea-Ro) in Szatmár county⁸⁸⁹ where they were informed about the ownership conditions of the landed possession. The landed possession was then given to the new owners, but the perambulation could not take place due to the flood of waters ('*inundacionem et corrositatem aquarum*') and the (large) size of reed and grass ('*arundinum et graminum altitudinem*'). All the information was documented in the charter of the Várad chapter issued on 8 March ('*in dominica Reminiscere*') 1338.⁸⁹⁰ Thus, it was most probably a winter flood event (observed during field survey between 16 January and 8 March), but the mentioning of large (sized) grass in winter, even in late winter time, is also a rather interesting fact.

9.4.4.5 Flood prior to autumn 1339

During the noble congregation of Gömör county ('*congregatione generali universitati nobilium Gumuriensi*'), namely on 31 August ('*ante festum beati Egidii abbatis in villa Gumur*'), *Paulus de Cholto* complained that due to some previous floods the *rivulus Halbokapataka/Holboka pataka* changed its course. As a result, an arable land which belonged to the *Cholto*-side (Čoltovo-Sk), now is located on the *Leklene*-side (Bohúňovo-Sk), in the use of *Nicolaus* and *Andreas de Fargach*.⁸⁹¹ After the official visit of the area, the complain was accepted and the *Fargach* (Forgách) brothers could possess the land only by paying the appropriate price of the property. Thus, in this case previous (natural, instead of the earlier-claimed artificial) flood events of the *Halbokapataka* ('*per inundaciones aquarum*'), near to *fluvius Sayo* (Sajó), were recorded without dating.⁸⁹² Most probably, the last flood which

⁸⁸⁸ Geographic names, and names of water bodies mentioned in the perambulation: *fluuius Kuchym, fluuius Topul, fluuius Koproncha, fluuius Tolunpotoka, possessio Doslawycha, villa Kablafalua*.

⁸⁸⁹ Csánki 1890 Vol. 1, p. 484.

⁸⁹⁰ 1338: DF 253427: ".... quod ipsa possessio Rechegeij olim petri et johannis filiorum dominici castrensum homini sine herede decedentium propter inundacionem et corrositatem aquarum ac arundinum et graminum altitudinem per metas eandem reambulare nequivissent" I am grateful to Ferenc Piti who warned my attention to this data (AOkl Vol. 28, in press).

⁸⁹¹ AO Vol. 3, ch. 394, p. 597: (04.09.1339; remained in transcription of the charter dated 11.10.1339).

⁸⁹² Latin edition: AO Vol. 3, pp. 597-598: Charter issued on 11 October (in octavis festi sancti Michaelis archangeli), 1339: "... Capituli ecclesie Agriensis per utramque partem ibidem exhibete quandam rivulum Holboka pataka vocatum pro meta assignatum inter possessionem eorumdem filiorum Nicolai Leklene vocata et inter possessionem eiusdem Pauli Cholto predictam incipiendo a metis filiorum Scaruh usque ad fluvium Sayo vocatum separantem lucide exprimebant, prefatus vero Andreas filius Nicolai prefatum rivulum Halbokapataka vocatum de suo antiquo meatu per eundem Paulum in alium cursum dimissum et eandem particulam terre intra suas metas scilicet intra verum et antiquum meatum eiusdem rivuli esse allegabat, et Dominicus filius Tyba homo noster unacum Philippo filio Pangracii de Iwanusy uni ex vobis quatuor iudicibus nobilium ad videndam inter partes super premissis veritatem per nos transmissi, redeundo retulerunt requisiti, quod predictus rivulus Halbokapataka descendens de medio quorumdam moncium in declivio quarundam terrarum arabilium per inundaciones aquarum de suo antiquo meatu per quandam supplicationem suam ati in alium cursum operacionem, sed per proprium cursum declinasset, ipsaque particula terre litigiosa inter antiquum meatum sue cursum eiusdem rivulo Leklene vocatam remaneret et usque nunc iidem filii Nicolai usi extitissent," Hungarian regesta: AOkl. Vol. 23, ch. 529, pp. 250-251. DL 102905 (04.09.1339) (remained in the charter: DL 58505: 11.10.1339).

finally changed the main watercourse of the stream did not occur long time before, since the original owners most probably did not want to loose incomes. Thus, they most probably did not wait years for claiming the price of the land since in that case, apart from loosing the opportunity of harvesting, lawsuit would have developed to a more complicated debate due to necessary further calculations on grain harvest results. According to usual practice, such complains were announced immediately at the closest general noble congregation of the county, and thus, not much more than one or two months after the actual problematic event took place.

9.4.5 Floods of the period 1341-1350

9.4.5.1 Floods in 1341

Flood in mid-spring

In a charter issued on 6 May, a *mandatum*, dated to 25 March was included, in which a perambulation and land estimation of *Bascha/Boscha/Bossca* (Bazza/Bosnya; today Božčice, part of Parchovany-Sk) in Zemplén county⁸⁹³ was ordered by the bishop of Eger to be done (by two priests from the neighbourhood) on 15 April (*in octauis passce domini*). All the parties affected were present and they did make the perambulation on 15 April. Nevertheless, even if they wanted to renew the landmarks, they could not, due to the great flood which prevailed in those areas at that time (*in illis partibus magna in undacio aquarum fuisse*). The affected parties agreed concerning the location of the first landmark; the rest of the duties they postponed to 10 June.⁸⁹⁴ The lands of Božčice are located in the area where the Ondava river enters the Topoly (Topl'a-Sk) in present East-Slovakia.

Autumn flood of 1341 in Gömör county

On 8 November (*in predictis octauis omnium sanctorum*) 1341 the King's man and the rector of the Vác chapter visited *Harmach* landed possession, located in medieval Gömör county (Chrámec-Sk). Due to the flood and bad/ugly weather conditions (*propter temporis vilitatem et inundacionem aquarum*) they could only estimate the size of the land (4 plows, located in the central part of the possession), and could not measure the land with the royal measure.⁸⁹⁵

Harmac is in the vicinity of the Rima catchment (tributary of the Sajó river, flowing into the Tisza). Chrámec is today located at the Hungarian borderline, north of the village of Hangony (today in Hungary), also mentioned as a neighbour in the charter (close to the town of Ózd). Chrámec is in the immediate vicinity (on the banks) of the Rima river.

⁸⁹³ Csánki 1890 Vol. 1, p. 342.

⁸⁹⁴ DF 268345, 268346. For Hungarian regesta, see: AOklt Vol. 25 (Ferenc Sebők), ch. 290, p. 137.

⁸⁹⁵ Original charters in which the 1341-charter is included (with the full transcription of the perambulation and land estimation): DL 41062 (1347), 42334 (1385). Critical Latin edition: DH p. 162 (pp. 160-171): "..., in predictis octauis omnium sanctorum, ad faciem predice possessionis Harmach vocate, vicinis et commetaneis suis universis legitime conuocatis, accedendo, et ipsi presentibus, medianam partem eiusdem possessionis, cum omnibus suis vtilitatibus, idem dominus Ladislaus prepositus recipiua fecisset et cum idem homo regius ipsi domino Ladislaeo preposito eandem statuere voluisset perpetuo possidendam, idem Petrus, filius Deseu, nemine alio contradictore apparente, contradictor extitisset, quam quidem particulam prohibitam, propter temporis vilitatem et inundacionem aquarum, regali mensura mensurare non potuisset, sed quantum visu considerare vnam alys probis viris potuissent, ad quatuor aratra sufficere decreuissent, cuius contradiccionis rationem idem dominus Ladislaus prepositus se scire velle allegarat ex parte Petri, filii Deseu memorati." Hungarian regesta: AOklt Vol. 25, ch. 781, p. 375.

The legal debate around the landed possessions of *Harmach* (Chrámec-Sk) and *Welez* (Velezd in Hungary) lasted for several decades, during which period several negotiations (some of them with perambulations and land estimations) took place, for example, in 1344, 1347, 1385 and 1391.⁸⁹⁶ Out of these charters, the one issued in 1347 (the first one) contains the most detailed information: during this perambulation, for example, not only a detailed picture about the landscape conditions of the area is provided, but it is clear that at this time the perambulation was not obstructed by any problematic natural circumstances like in 1341.

9.4.5.2 The year of floods: 1342

Winter-flood in the Central Northeast: a case study from the Sajó river

Concerning this flood, the first perambulation process of *possessio Deta/Deycha* (Déta) and *possessio Kork* in Borsod county were ordered to take place on 9 February. It is mentioned in the description that perambulators tried to go out to the area on 9 February in the appropriate time and as well on the next day (10 February), but because of the great flood of waters ('nimia aquarum inundatio') they could not proceed. Thus, they again had to go on the next day (11 February), when the perambulation finally could take place around *Deta* and *Kork* possessions. Nevertheless, even if in this case they could walk along the boundaries, they still could not make measurements with the royal measure due to the extraordinary great flood or inundation of waters, but only estimated the size of half of the lands belonging to *Deta*.⁸⁹⁷ Connected to the same legal debate, another charter was issued on 30 May in Visegrád, counting all important previous charters as well as the legal procedures previously taking place in 1342. In this description, again the information, already issued in the first charter, appear concerning the 9-11 February perambulation problems.⁸⁹⁸

The land of Déta, deserted in the 15th century, today as a '*puszta*' (meaning: deserted land) can be found in the broader area southwest of Sajólád (about 10 km SE of Miskolc), thus at the Sajó river.⁸⁹⁹ More detailed information is known based on another perambulation carried out in 1323: according to the description of this charter, the Hejő, Szinva and Eer streams (all mentioned as *fluvius* in the text), within a short distance all flowing into the Sajó river, were located near to the land of Déta. There is, however, information as well on the specific (former) location southwest of Sajópetri, since the name of Déta was preserved as a bulk in the area of Kistokaj (southeast of the village), and in the area of Mályi. According to Györffy, in the 13-14th centuries the land of *Kork* was located somewhere in the vicinity of Ónod (and Déta), along the Szinva stream (*fluvius*), close to the Sajó river.⁹⁰⁰

Since the great flood or inundation of waters took place in the close neighbourhood of the Sajó river (some 2-3 km distance), there is a chance that under the general description of

⁸⁹⁶ MHH Vol. 2/1, 1347: ch. 106, pp. 155-160; 1341, 1344, 1347: ch. 107, pp. 160-171; 1385: ch. 174, pp. 310-311; 1391: ch. 186, pp. 336-343.

⁸⁹⁷ DL 75835 (13.02.1342): ".... primo accessissent ad faciem Possessionis Déta praenotata et eandem praesentibus aliquibus Nobilibus Comprovincialibus, qui per ipsos inibi convocari potuissent, per suas veras metas, et antiquas reambulassent, reambulatamque quia ipsi ob nimiam aquarum inundationem dictam Possessionem Déta regali mensura mensurare nequivissent, ides ipsi duntaxat visu considerando eandem totalem Possessionem Déta ad quatuor aratra juxta Consuetudinem Regni sufficere debere perspexissent, ac considerassent, ipseque Consideratione peracta, rectam dimidietatem ejusdem cum suis Utilitatibus quibuslibet, et pertinentiis, eidem Johanni, filio Petri actori, sine praejudicio Juris alieni, prout sibi pertinere dinosceretur, nullo Contradictere apparente, statuissent perpetuo possidendam," For Hungarian regesta published: AOklt Vol. 26, ch. 52, pp. 81-82.

⁸⁹⁸ DL 3448 (30.05.1342). Hungarian regesta: AOklt Vol. 26, ch. 261, pp. 210-212.

⁸⁹⁹ Györffy Vol. 1. 1987, p. 770.

⁹⁰⁰ Györffy Vol. 1. 1987, p. 783. See also: Wolf 1986-1987, pp. 189-202.

'the great flood of waters' not only the above-mentioned streams but also the Sajó river can be understood. On the first two days of 9-10 February, due to floods of waters, perambulators could not go to the above-mentioned possessions. Unfortunately, there is no information where on the day of the perambulation they came from, we only know that the owners, the delegate of the chapter of Eger, the King's man, neighbours, and out of them three men, whose names were provided in the charter, participated in the legal process. One of them was *Olnad-i István*, who presumably came from Ónod, about 5 km downstream at the western side of the Sajó river. Since usually for such a perambulation of local importance people came from the neighbouring areas of some villages distance (8-10 km), this flood definitely affected the above-mentioned streams, but due to the very short distance, there is a chance that the Sajó might have been in flood, too.

Present location of the medieval Deta land can be detected between Kistokaj, Sajópetri and Mályi. Due to the fact that the Szinva stream was regulated, its watercourse cannot be found in this area any more; today it flows into the Sajó more to the north, in the area of Miskolc.

Early spring (or late winter?) flood on the Upper-Tisza

On 6 March, the division of the landed possessions of Berkesz, Bodony⁹⁰¹ and Harabur in Szabolcs county would have taken place, but was obstructed by the great floods of waters, which occurred in those areas ('nimia aquarum inundacio').⁹⁰² Since Bodony was located at the Upper-Tisza, the great flood of waters could most probably refer to the Tisza and partly to its upper tributaries. This early spring observation is either still connected to the February flood wave, or another, separate flood wave.

Spring flood along the lower sections of the Danube: a case study from the South

In a charter issued on 23 May 1342 ('feria quinta proxima post octavas festi Resurreccionis domini proxime nunc preteritas') in Visegrád, a legal debate and a perambulation of estates in Scenthmarton/Scenthmartun (Szentmárton, today deserted land in Serbia) and Aranyan located Bodrog county,⁹⁰³ along the Danube was described. The perambulation of the lands took place on 11 April ('feria quinta proxima post octavas festi Resurreccionis domini'). Due to the abundance and great amount of waters ('propter abundanciam et multitudinem aquarum') they could not perambulate and measure the land along its old and real boundaries and with its rights and properties.⁹⁰⁴ In medieval Bodrog

⁹⁰¹ The settlement of Bodon or Budun was located along the Tisza river, while Berkez or Berkes was northeast to Nyíregyháza and Bogdány (roughly in the same area). See: Csánki 1890. p. 511.

⁹⁰² DL 31242; published regesta: AOklt Vol. 26, pp. 202-203.

⁹⁰³ Landed properties near to Aranyan, mentioned in the debate: Chentey, Scenthmarton/Scenthmartun.

⁹⁰⁴ Latin critical edition: AO Vol. 4, ch. 138, pp. 219-223: "... tandem ipsum capitulum Bachiene regie maiestati rescribebat eo modo, ut predictus Nicolaus filius Mark homo regius presente magistro Cosma succentore et testimonio eiusdem capituli, feria quinta proxima post octavas festi Resurreccionis domini proxime nunc preteritas, ad faciem eiusdem possessionis Aranyan vocate accedendo, vicinis et commetaneis suis universis legitime convocatis et eisdem ac Johanne filio Laurencii de Dorozlou sufficienti procuratore pro predicto magistro Thoma presentibus, cum predictam possessionem videlicet totalem porcionem possessionarium eiusdem Petri filii Michaelis in eadem possessione Aranyan vocata habitam, eo quod propter abundanciam et multitudinem aquarum per suas metas antiquas et veras ac distinciones metales cum suis....pertinenciis reambulare et cum aliis nobilibus et probis viris estimare nequivissent, solummodo visu considerando, eandem predicto magistro Thome statuere modis predictis voluisset, nobilis domina genitrix eiusdem Petri filii Michaelis personaliter illic accedendo, huiusmodi statucionem fieri prohibuisset, asserendo quod eadem porcio possessionaria que in eadem possessione Aranyan vocata eundem Petrum filium Michaelis filium suum quandam tetigisset, totalis" DL 58509. Hungarian regesta: AOklt Vol. 26, pp. 200-202.

county (today's northwest Serbia),⁹⁰⁵ Aranyan was located in the area of Zombor (today Sombor-Srb) and Monostorszeg (Bački Monoštor-Srb). According to Györffy, *possessio Aranyan* was an extensive landed property in the high medieval period with several settlements. Geographically, its area at present belongs to Apatin (Srb) southwest of Sombor, at that time located between the Danube and the lands of the Báta monastery.⁹⁰⁶

During the perambulation only one part of Aranyan, belonging to a specific owner, was reambulated. Even if the exact location of this part within the regions belonging to *possessio Aranyan* is unknown, the whole land with its several fishponds, receiving water primarily from the Danube, was documented to be located directly on the banks of the Danube. Thus, when the 'inundations of waters' are mentioned in the charter, without doubt these waters are in direct connection with the Danube which has primary influence on waterlevel-conditions, and we can presume that the charter as well refers to the flood of the Danube. And probably beyond: since the Drava river entered and still today enters the Danube only a few kilometres south of the landed property, there is a fairly good possibility that the Drava was in flood or at least had high water level at that time, too.

Nevertheless, merely the flood of the Danube river has in this case already special importance: since, apart from the Drava river, north of Apatin no significant waterflow reaches the Danube at its middle (here only the rather mediocre Sár river flows into the Danube) and lower sections. This also means that, regardless of the question whether or not the Drava was in flood at that time, to have such a flood event still at the lower sections, the Danube had to be in flood throughout its upper sections in most of Hungary, north of Apatin. We have no information about beginning or the end of the flood event, so it could start short or much earlier than 11 April, but on 11 April there was a flood/inundation in the area of Aranyan.

Spring flood of waters in the North: an example of the Zsitva river

In a perambulation charter, the lands of *Besseneu* (Bešeňov-Sk), *Lot* (area of Vel'ké Lovce-Sk) and *Ohay* (Dolný Ohaj-Sk), all located along the Zsitva river (Žitava-Sk), a northern tributary of the Danube in southwest Bars county, were determined. On 25 April ('secundo die festo beati Georgii martiris proxime preterito') after the perambulation process started and people reached the *Sitwa* (Žitava) river, here they could not proceed due to the flood of a water ('propter inundacionem aque'), and so they only provided an estimation concerning the debated land, located between Bešeňov and Ohaj.⁹⁰⁷ Based on this evidence, we can state that the flood of a water also means that the Žitava river was in flood in those days.

Spring accumulation of waters in the Great Plain: a case study from Central Hungary

Preserved as a transcription in a charter dated to 1434, on 5 May ('tercia die octauarum festi beati Georgii martiris nunc preteritarum') in 1342 another perambulation process took place in the northeastern part of the Great Plain by the Tisza river. At *possessio Ladan* in

⁹⁰⁵ In my paper (Kiss 1999) I erroneously mentioned Aranyan as a land belonging to Bács county instead of Bodrog. Although Aranyan was located just on the border of Bács county, it was still without doubt (and according to the text of the charter) in Bodrog county.

⁹⁰⁶ Györffy 1987 Vol. 1, pp. 706-707.

⁹⁰⁷ DL 3535. Regesta based on the original charter: AOkl Vol. 26, ch. 652, pp. 431-432. Charter issued on 7 December in 1342, in Visegrád. Latin critical edition: AO Vol. 4, ch. 174, pp. 287-291: "... deinde parum procedendo in eiusdem vallis latere ad unam metam devenissent, quam prenimonati nobiles de Ohay eorum esse asseruissent, sed vicini et nobiles de Looth nec ipsorum nobilium de Ohay esse nec dicti monasterii, sed eorum esse affirmassent, de qua quidem meta per unum rubetum Harazt vocatum transeundo usque ad fluvium Sitwa ad unum dumum piri pervenissent, et abhinc ulterius procedere propter inundacionem aque nequivissent, ex eoque regales metas se ostendere non posse asseruissent, quia per manus potenciarias eandem detinuisse allegassent, contradiccionis obstaculo obviassent; quamquidem particulam terre litigiosam per eosdem nobiles de Ohay statuere non comissam, visuali consideracione ad alterum dimidium aratrum sufficere deliberantes, iuxta formam iudicariam eiusdem Willermi palatini, pro quatuor marcis et media estimassent regni consuetudine requirente. ..."

Szabolcs county, due to the accumulation of waters and swamps (*'propter paludes et terras inhabitabiles propter multitudinem aquarum'*), it was not possible to separate the actual land from the others by settling landmarks, but only marked the actual parcels/fields (*loca sessionalia*).⁹⁰⁸ Since in the charter it is explicitly mentioned that the landed property called *Ladan* (Ladány) is located in Szabolcs county, only one medieval *Ladan* is known to be fulfilling this location requirement: Mezőladány formerly located at the main watercourse of the Tisza river.

Mezőladány is still today located in the close vicinity of the Tisza river in Szabolcs-Szatmár-Bereg county: at the oxbow of the Tisza which formerly was the main watercourse of the river. Thus, when talking about the accumulation of waters and swamps, this is clearly referring to the direct hydrological influence (low floodplain) of the Tisza river. We may well count with the presence of inland excess waters (e.g. high groundwater table). In this case, therefore, we can presume that the Tisza was in flood, or inundated the lands at that time.

Summer or autumn flood? Case study of a flood/inundation in the Southwest

On 15 September 1342 (*'in predictis octavis festis Nativitatis virginis gloriose'*) the perambulation process of the lands *Harazty* (Haraszti) *Woyzlou* (Vajszló), *Kuhyrith/Kuhyreth* (Hirics) and *Lusuk* (Luzsok) took place in Baranya county, between the nunnery of the Rabbit Island (*Insula Leporum*; today Margit island in Budapest) and the chapter of Pécs. On 15 September they made the perambulation and described the boundaries in the charter, but because of the swampiness and flood of waters (*'propter paludinositatem et inundacionem aquarum'*) they could not make measurements using the royal measure,⁹⁰⁹ so they only estimated the size of the debated land.⁹¹⁰

⁹⁰⁸ Issued on 16 August in 1342, Visegrád. Hungarian regesta: AOklt Vol. 26, ch. 435, pp. 307-308. Remained in transcription: DL 105741 (24.02.1434): ".... in eadem Ladán contingentem per antiquas metas reambulando vbi potuissent cum suis vitilitatibus et pertinencijs vniuersis specialiter cum Jure primatus ecclesie sub honore beate virginis ibi fundate in duas partes coequales diuisissent et facta diuisione rectam medietatem eiusdem porcionis aparte orientis habitam statuissent prenominate domine Margarethe filie ipsius Johannis filii Nicolai et per ipsam prefato demetrio dicto Ogh filio pauli sponso eiusdem Johannis eo Jure quo ex vigore prescriptarum litterarum dicti Conuentus facti Stephani de promontorie waradiense dinoscitur pertinere saluo Jure alieno perpetuo possidendum nomine contradictere apparente Sed propter paludes et terras inhabitabiles propter multitudinem aquarum ipsam medietatem metis de nouo apponendis ab alia medi(eta)te nequissent sequestrare nisi per signa communiter per partes composita in locis sessionalibus dictauerat superassent...."

⁹⁰⁹ For the size of royal measure see, for example: 1294: ÁÚO Vol. 8, 102; see also: Wellmann 1965, pp. 236-244.

⁹¹⁰ The description of the 1342 perambulation charter is included in a charter, issued in 1347 (DL 3861). Hungarian regesta: AOklt Vol. 26, ch. 515, pp. 353-354. The 1342 charter was also included in another one dated to 1346 (DL 3863): the placenames were: *Weremus*, *Harazty* and *Woyzlo*; *Kwhynch* and *Lusuk*. In the charter issued in 1347 placenames were: *Beremus*, *Harazty*, *Woyzlo*, *Kyhyrech* and *Lusuk*. At that time debated land portion was located between the land of Nanán comes, forest of the church of Okur, the forest called Harazth and Malaca water. Latin text is published in a charter dated to 20 May in 1347 (DL 3861): AO Vol. 5, ch. 30, pp. 66-78 (details from the 1342-charter): "...., quod predicti homines ipsius Wyllermi palatini sub testimoniis ipsius conventus Saxardiensis in predictis octavis festis Nativitatis virginis gloriose accessissent ad facies possessionariorum porcionum Beremus, Harazty, Woyzlo, Kyhyrech et Lusuk vocatarum, vicinisque et commetaneis earumdem legitime convocatis, vicinisque et commetaneis earumdem legitime convocatis, promi iuxta continenciam literarum privilegialium ipsius domini Bele regis per Nicolaum dictum de Kosuk pro dictis dominabus astantem inibi exhibitarum, demum iuxta continenciam literarum predicti conventus Pechwaradiensis patencium per magistros Martinum archidiaconum de Baranya, Petrum decanum et Johannem concanonicos ecclesie Quinqueecclesiensis predicte pro eodem capitulo Quinqueecclesiensi in facie memoratarum possessionum exhibitarum, per plurimas et diversas metas in literis dicti conventus Saxardiensis dicto domino Wyllermo palatino rescriptionalibus contentas et de eisdem in nostras literas memoriales seriatim rescriptas reambulassent, ipsasque possessionarias porciones inter partes litigiosas, licet propter paludinositatem et inundacionem aquarum regali mensura non potuerint mensurare, tamen visu oculorum ad octo aratra sufficere considerassent;"

Vajszló, Hirics and Luzsok settlements exist today, mainly in or at the edge of the Drava floodplain or the at banks of the Drava river itself. In this area several smaller streams and wet meadows can be found, flowing towards the Drava river. Since in the charter the flood of waters and the swappiness of the same waters were mentioned which is presumably due to the flood, we can presume that these smaller waterflows, leading towards the Drava, and probably also the Drava itself were in flood. It is interesting to note that on the same day at the northwestern parts of the country, in the lowland area north to the Danube a perambulation could not succeed due to the magnitude of snow and hard weather conditions.⁹¹¹

Concerning the floodplain under investigation it has to be noted that one can find clear signs of earlier river branches of the Drava river, especially in the area between Luzsok and Hirics. In fact, Hirics directly locates at one of the former oxbows of the Drava river.

Autumn flood event in the Northeast: a case study from the Tisza river

In a charter issued on 3 December in Visegrád (by *Nicolaus*, the new palatine), another perambulation process was described, referring to *possessio Maraza* (Maráza), in Zemplén county. The perambulation took place on 11 November ('*in predicto festo beati Martini confessoris*'). Nevertheless, perambulators could not make measurements on the questioned *possessio Maraza* with the royal measure due to floods of waters ('*aquarum inundaciones*'), but by eyes they estimated it to 2 plows (worth for 6 marks). To this land, some fishing waters, a fishpond, captures and fishing equipments as well belonged, and their incomes were also estimated, except for the fishing equipments (*zege*), derivated from the riverbed of the Tisza. In these later cases perambulators did not make an estimate due to the fact the fishing equipments were not valueable.⁹¹²

Thus, it is clear that the above-mentioned landed property of 2 plows, or at least part of it, was under floodwater on 11 November. From the description of the charter it comes clear that Maráza was located right at the Tisza river, and had several fishing places and thus fishing rights there, much more valueable than the land portion of Maráza itself (e.g. the land was estimated to 6 marks, while the annual income of its fishing places for 27 M). Similar to the previous perambulation, which took place on 8 May ('*in quindenis festi beati Georgii martiris*'), perambulators could walk along the boundaries on 11 November, so flood did not obstruct them in finding the necessary landmarks. Nevertheless, they were not able to make proper land areal estimations due to the fact that the flood indeed obstructed them in using the royal measure.

The settlement of Maráza in medieval Zemplén county remained under the same name until 1619 when it was deserted due to the fact that its inhabitants all moved to the neighbouring settlement of Kistárkány (Vel'ké Trakany-Sk). Today one of the bulks in the area

⁹¹¹ AO Vol. 4, ch. 173, pp. 282-287. For more information, see Kiss 2009c, pp. 38-39.

⁹¹² Hungarian regesta: AOklt Vol. 26, ch. 625, pp. 411-413. AO Vol. 4, ch. 172, pp. 278-282 (charter dated to 3 December, 1342 in Visegrád): "...; predicti Andreas filius Andronici Johannes filius Aba de Abahaza homines dicti palatini per utrasque partes ad premissa peragenda adducti, prout ex tenoribus literarum prescripti capituli Scepsiensis rescriptionalium informabamur, presentibus....magistris Thoma dicto de Zagrabia et Demetrio de Heusy canoniscis ipsius ecclesie Scepsiensis per ipsum capitulum partibus in testimonio concessis, in predicto festo beati Martini confessoris ad prememoratam possessionem factis accedentes, eandem iuxta formam iudicariam dicti palatini eisdem impositam per metas in dictis ecclesie Waradiensis capituli literis contentas reambulassent, sed propter aquarum inundaciones mensurare nequivissent regali cum mensura, visu tamen considerando ipsam pacificam terram ad duo aratra sufficere posse agnoscentes in sex marcis visa sua utilitate estimassent; locum autem piscature mortue piscine, quatuor thanyas et dimidiam in se habentem, diligenter inquisitione ab incolis ipsius possessionis et aliis vicinis et commetaneis prehabita et investigata, ipsius piscacionis utilitatem excentibus ac ipsa piscacione mortue piscine utentibus diligenter sciscitantes, ad viginti septem marcas annuatim lucrum eiusdem et valorem valere estimassent; quandam eciam clausuram zege vulgariter vocatam ac tres clausuras in tribus alveis de Tycia derivatis in eadem possessione Maraza invenientes propter earum inutilitatem et infructuositatem estimare noluissent;"

of Kistárkány, between Kistárkány and Ágcsernyő (Čierna-Sk), preserved the name of the former land and settlement.⁹¹³ This fact might suggest that, even if it is not mentioned as an extraordinary flood event, it occurred in the closest vicinity (directly along the banks) of the Tisza river. Since this area is clearly under the primary influence of the Tisza river at any time, these floods or inundations of waters (so, not even one) had to be the result of Tisza floods.

9.4.5.3 Floods in 1343

Winter flood of the Tisza river in 1343

The first, winter case was observed on 11 February (and the days after) near the Tisza river. The perambulation, taking place around the medieval landed possession of Endes,⁹¹⁴ had to be stopped at a fishing place, since perambulators could not cross water due to the flood of waters ('*aquarum inundacio*'). Beyond this place, the whole area was only estimated by 'eye-observation'.⁹¹⁵

Mid-spring flood at the Upper-Tisza

The next, spring flood case was observed at the end of March and beginning of April, when – in order to put in a possession of a land in the Gelénes⁹¹⁶ in medieval Szatmár county – not all the affected parties could reach the area due to an ongoing great flood event ('*nimia aquarum inundacio*'). Due to the location of the settlement it is the most likely that the Upper-Tisza and probably also some of its tributaries were involved in the flood event. Those who could attend the field survey, were waiting for the others between 30 March and 2 April, yet without any success.⁹¹⁷ This suggest a flood event of regional importance, in which case presumably several waterflows were in flood.

Early-May flood in the Upper-Tisza (tributary or branch?)

Another spring flood was observed on 1 May and the following four days, during the perambulation process of Szalóka (Соловка-Ua) and Eszeny (Есень-Ua)⁹¹⁸ landed possessions, formerly located in Szabolcs county (today in Ukraine) at the Tisza river. The debated land portion at the *Zomua/Zomaua* waterflow could not be surveyed due to the floods of waters ('*inundaciones aquarum*'), and thus, the size of the land was only estimated.⁹¹⁹ With the application of plural ('*inundaciones*'), there is a chance that the charter refers not only and ongoing flood event, but also to at least one previous flood wave – presumably the great flood

⁹¹³ For more detail, see Csanki 1890 Vol. 1, pp. 345, 364.

⁹¹⁴ Located in Szabolcs county, along the Tisza river: Csánki 1890 Vol. 1, p. 513. Endespuszta is located at a Tisza-oxbow, in the neighbourhood of the previously-mentioned Mezőladány.

⁹¹⁵ DF 209593: "... feria tercia et aliis diebus ad id sufficient per suas veras metas et antiquas reambulassent,... metas autem quibus dicta possessio ab alys possessionibus distinguir() et separatur pro ut ydem vester et noster homines intrat In quandam piscinam Nekchethowa vocatam, Bowijhegy vocatas, intrat in ipsum fluvium thijchye Ita tamen quasi propter aquarum (inunda)ciones predictam piscaturam Nekchethowa transire nequivissent, vel ab ipsa piscina vsque ad dictum fluvium eiusdem dionisij registrassent,". Published regesta: AOklt Vol 27, pp. 90-91.

⁹¹⁶ Csánki 1890 Vol. 1, p. 475: Csánki described it as a deserted settlement. Today this small settlement is located between the Csaroda and the Déda-canal, at the Beregi-Tisza-ridge.

⁹¹⁷ DL 85252; published regesta: AOklt Vol. 27, pp. 240-242.

⁹¹⁸ Eszeny: Csánki 1890 Vol 1, p. 514. Located in Szabolcs county along the Tisza river, at the side of Bereg county (right banks). Today it is Есень in Ukraine, still located close to the Tisza river, near the Csaronda and Szernye waterflows. Szalóka: Csánki 1890 Vol. 1, p. 525: similarly located in Szabolcs county along the Tisza river, at the Bereg side – sometimes the village belonged to Bereg county. Today it is Соловка in Ukraine.

⁹¹⁹ DF 233635; published regesta: AOklt Vol. 27, pp. 271-272. See also: DF 233634; published regesta: AOklt Vol. 27, pp. 486-488.

described concerning late March-early April also appeared and had an impact in the area of Szalóka and Eszeny.

Even if the Zomua waterflow is mentioned as closest waterflow, the area is located very close to the Tisza and thus, it is basically under the hydrological impact of the Tisza. Even if we do not know much about the Zomua waterflow, the area was criss-crossed by Tisza-related beds of waterflows, and maybe one of these was a watercourse named as Zomua. Thus, this event was most probably the flood of the Tisza.

Same or another? Early-May flood in the Tisza flooplain, Central Great Plain: 1343

Described in a charter dated 24 May, on 8 May ('in quindenis festi beati Georgii martiris') the perambulation process of *possessio Kumleu* in the county of Hevesújvár (today Kömlő, Heves county) took place. However, due to the inundation/flood of water and because of the numerous difficulties it was not possible to perambulate the boundaries ('*propter inundacionem aque et densitatem gravaminum reambulare nequivisset*').⁹²⁰ This also means that not only the perambulators were unable measure the land, but they could not walk along the boundaries, could not settle landmarks and thus, they had to face with so many difficulties that could not even start the whole perambulation.

Although not directly on the banks, it is located in the open inundation area (floodplain) of the Tisza river, 13 km east of the town of Heves, close to Tiszánána. Before the water regulation works, this low-lying area was a subject to flood events of the slow Tisza river. Thus, due to the hydrological conditions of the area, a general flood or inundation of waters had to be connected to the Tisza river. It is, however, again remains as an open question when actually this flood occurred, and whether or not we met here only a longer-term result of an earlier flood(s).

Summer flood at the Northeast: case study from the Sajó river: 1343

The summer flood of the Sajó river was recorded in two charters (DL 57079, DL 96237) with the same content, both issued on the same day of 21 July in 1343. The perambulation process between *possessio Scenthalberth* (Szentalbert)⁹²¹ and *Kerench* villages in Borsod county took place on 13 July, 1343. However, it was not possible to perambulate these boundaries in between, due to floods of waters. Located close to the borderline of Zemplén county, Szentalbert in Borsod county was flooded ('*propter inundacionem aque*') at its borders with Gerencs so much that it was not possible even to walk along the boundaries(!). But still, the owners (chapter of Esztergom, and György of *Kerench*) made an agreement upon the mill and borders in question.⁹²²

⁹²⁰ 1343: DL 3590. Hungarian regesta: AOkl Vol. 27, ch. 342, pp. 229-230. Critical edition of the Latin text available in: AO Vol. 4, ch. 206, pp. 341-343: "... in predictis quindenis festi beati Georgii martiris ad faciem predice possessionis Kumleu vocate, vicinis et commetaneis suis legitime convocatis et presente magistro Dook procuratore domini episcopi accedendo, in transcripto domini Philippi palatini tenorem privilegii domini Beke regis contento per predictum magistrum Dook procuratorem domini episcopi ibidem exhibito, eandem possessionem Kumleu a possessionibus dicti domini episcopi quibus vicinaretur per metas in tenore ipsius privilegii domini Beke regis repertas, quibus eodem possessiones domini episcopi ab eadem possessione Kumleu separari dognoscerentur, propter inundacionem aque et densitatem gravaminum reambulare nequivisset, nec ad metam capitaneam ire nec iuxta easdem novas metas erigere et cuique parti possessionem seu possessiones suas relinquere potuisset, ...".

⁹²¹ Csánki 1890 Vol. 1, p. 179.

⁹²² For Hungarian regesta, see: 1, (DL 57079: 21.07.1343): Borsa-Ila 1993, ch. 39, p. 38. (DL 57079-published, DL 96237): AOkl Vol. 27, ch. 502, p. 315. For Latin edition, see: MRES Vol. 3, p. 505 (21.07.1343): "Nos capitulum capitulum ecclesie Wachiensis, memorie commendantes tenore presencium significamus, quibus expedit universis, quod cum iuxta continenciam litterarum excellentissimi principis, domini Ludouici, illustris regis Hungarie reambulatoriarum, una cum homine ipsius domini regis Petew de Osgyat, nostrum destinassemus hominem, videlicet Paulum presbiterum de choro nostro, pro testimonio fidedignum; qui tandem ad nos premissa

Kerench is called Girincs at present, located in the low-lying floodplain area of Zemplén county close to the borders of Borsod county, along the banks of the Sajó river.⁹²³ The village locates hardly more than 10 km from the place where today the Sajó enters the Tisza river. It is interesting to note that Györffy did not mention any of the two settlements in high medieval Borsod county.⁹²⁴

Fearing waters and dangerous roads in early autumn

Related to a land purchase, on 6 September ('*Sabbatho proximo ante festum Nativitatis Virginis gloriosae*') a number of old charters were transcribed by the convent of Kolozsmonostor (Cluj-Mănăstur; today part of Cluj Napoca-Ro). It happened due to the fact that the owner (*Pethew* from *Neema*; *Nima*-Ro) of the landed possession (*Beeke* or *Beche*) did not dare to carry the originals with him. Among the reasons the dangers of roads, obstructive waters and other matters ('*propter viarum discrimina, aquarum impedimenta et hospitiorum incendia*') were mentioned.⁹²⁵ The above-mentioned settlements are all located in Central Transylvania, in the vicinity or along the Kis-Szamos river (*Someşul Mic*-Ro). It is difficult to tell whether in this case obstructive waters were mentioned as a direct or a general problem which might happen, or was happening in that time.

Autumn flood in Zemplén (or Ung): 1343

Our next case is important not only due to the fact that it provides a clear proof of another flood event in October in the Tisza catchment, but also because reports on later perambulations (without problems) give testimony on the conditions same area, twice in 1344.⁹²⁶ On 6 October ('*in octavis festi beati Mychaelis archiepiscopis*') in 1343, a perambulation took place concerning a debated land portion between the landed possessions of *Humok* (Холмок-Ua) and *Kwturden* (Розівка-Ua) in former Ung county: the land could not be measured (only estimated) with the royal measure due to flood of waters ('*propter invndacionem aquarum*'). Although two more perambulations took place some months later, the first on 13 January and another on 1 May in 1344, flood was not mentioned and processes

reambulacione facta reversi, nobis taliter retulerunt: quod in festo beate Margarete virginis et martiris proxime preterito, ad faciem possessionis Scenthalberth vocate, capitulo ecclesie Strigoniensis, in comitatu Borsodiensi accessissent, vicinis et commetaneis dice possessionis ad faciem eiusdem legitime convocassent et presentibus, a parte possessionis Kerench reambulare, juxta litteras ipsius domini regis voluissent, propter in undacionem (sic!) aque, predictam possessionem reambulare nequivissent;"

⁹²³ Csánki 1890 Vol. 1, p. 348.

⁹²⁴ Györffy 1987 Vol. 1, pp. 736-818.

⁹²⁵ DL 27829 (06.09.1343): ".... Nos Conventus Monasterii Beatae Virginis de Culusmonostra memoriae commendamus tenore praesentium significamus quibus expedit universis quod magister Pethew de Néma ad nostram personaliter accedens praesentiam exhibuit nobis quoddam privilegium Capituli Ecclesiae Transylvanae super facto venditionis cuiusdam particulae terrae Beeke vocatae confectum, ex quasdam Litteras serenissimi Principis Domini Caroli Dei gratia olim Illustris Regis Hungariae felicis memoriae quasdam litteras Thomae quondam vayvoda Transylvani confirmantes petent nos cum instantia, quod quam ipse ipsum privilegium cum dictis Litteris Regalibus propter viarum discrimina, aquarum impedimenta et hospitiorum incendia secum deferre non auderet tenorem earundem nostris litteris patentibus inferi, et nostro fecerimus sigillo consignari, cuius quidem privilegii primo tenor talis est: Datum Sabbatho proximo ante festum Nativitatis Virginis gloriosae ani millessimo trecentesimo quadragesimo tertio." For Hungarian regesta, see: AOKt Vol. 27 (Ferenc Piti), ch. 596; Jakó 2008 Vol. 3, ch. 163, pp. 84-85. A somewhat shorter transcription is available: Diaconescu 2004, p. 39.

⁹²⁶ 1343 (1344): DL 69670: ".... in dictis octavis festi beati Mychaelis archiepiscopis ad faciem dicte particule terre de ipsa possessione kwturden ... vicinis et commetaneis eiusdem vniuersis legitime conuocatis et presentibus accedendo permetas suam ostensionem memorati Nicolai reambulasset reambulataque eidem statuere voluissent prelibatus Ladislaus filius Gabrielis eosdem non areambulacionem sicut astatucionem prohibuisset quamquidem particulam terre litigiosam propter invndacionem aquarum ambulare et regali mensura mensurare non potuissent"

were not obstructed, apart from the fact that they could not find landmarks there any more. It is interesting that, according to the other party who actually lived there all the time, those old roads and other landmarks mentioned by one of the affected parties (who left the area in his childhood), all disappeared.

9.4.5.4 Floods/inundations in 1344

Winter flood at the Northeast: 1344

On 9 February 1344 (*'in octavis festi Purificationis beate virginis proxime preteritis'*) a perambulation took place in the area of the landed possessions of *Thyba*, *Ryche*, *Symunhaza*, *Zalacha* and *Jezenew*, in Ung county. The perambulation was carried out by the chapter of Szepes (Spiš-Sk). When reambulators reached the area of the Kamaráserdő (*Camaras*) and the swampy Feketepatak waterflow, then the river *Zerethyua/Serethyua*, here the two neighbours could not agree on the course of the boundary, and since a land was standing in between, perambulators wanted to measure this debated part of land. However, due to the floods/inundations of waters (*'propter inundaciones aquarum'*), they could not measure it with the royal measure, but estimated it to 2 plows.⁹²⁷ Thus, the debated land portion was at (or in?) the flooded/inundated area itself. It is an important fact that on 1 May another perambulation process took place in the same area. However, no flooded area, but actually dry lands were mentioned in the (same) charter at this time.

Thyba (Tibava-Sk), *Ryche* (Vel'ké/Blatné Revišťia-Sk), *Zalacha* (Zalužice-Sk) and *Jezenew* (Jasenov-Sk) in the former Szobránci district, Ung county – today all located in eastern Slovakia, on the southern slopes of the Vihorlat mountain. Thus, the perambulation process described a rather extensive area and the floods of waters probably referred to the waterflows coming from the Vihorlat mountain and flowing into the Ung river from the north. The highest peak of Vihorlat is 1074 m; however, even the rather extensive ridge of the mountain is mainly under 900 m. While these elevations are enough to force air masses (rich in water) to rise, due to the moderate elevations, mild air can cause rapid melting on the entire slope-system. Thus, a warm front coming from the south-southwest (probably also with rainfall) could cause (rapid) melting of snow, and seems to be the most likely reason for an early-February flood event in an area rich in waterflows.

Flood in March: the Lower Danube

Following the order of the King, two interesting perambulations took place in the direct neighbourhood of the (lower sections of the) Danube, on 23 and 25 March in the year of 1344, in the area of Szeremle⁹²⁸ and Bátmamonostor. In the case of the first perambulation, on 23 March, perambulators presumably proceeded from the south towards the north, on the way roughly along a larger branch of the Danube. Among the names of landmarks of settlements

⁹²⁷ Sztáray Vol. 1, (pp. 172-178) p. 174: ".... ut testimonio vestro, in predictis octavis festi Purificationis beate virginis proxime preteritis, ad facies memoratarum possessionariarum portionum quarum prima inciperet in paludine tenderet versus partem septemtrionalem per competens spatium per arbores pro metis non longe tempore signatas, et inde versus ad fluvium Zerethyua supradictum ipsas metas currere asseruissent, sed tamen ipsum cursum actu demonstrassent; et quia partes in cursu dictarum metarum concordes non fuissent, particulam litigiosam inter dictas metas existentem, idem homo regius presente nostro testimonio, unacum aliis probis viris inibi abductis, cum regali mensura propter inundaciones aquarum mensurare nequivissent, sed visu considerando ad duo aratra regalia iudicassent, quam visis suis utilitatibus, in silvis et aliis usibus ipsius, regni consuetudine exigente, ad novam marcas estimassent;"

⁹²⁸ Although the village of Szeremle changed its location several times in the early modern period, even from one side of the Danube to the other side and vice versa, in the Middle Ages its site was clearly located at the eastern side of the Danube (Bárth 1989, p. 358).

mentioned in their way,⁹²⁹ at present we can follow their way from Hercegszántó, through Csát(alja) and Nagybaracska to Bátonostor. Here they had to stop because of the great floods/innundations. Two days later, however, they could carry out the remaining part of perambulation concerning the boundaries between Bátonostor and Lak (Szeremle area).⁹³⁰

Since the area is located in the lower floodplain and thus, under the direct influence of the Danube, the great flood reflects on the high water level or flood of the Danube. Some information is also available related to the magnitude and extension of this flood/inundation: it is known as a 'great flood'.

The area belongs to the lower floodplain of the Danube, but apparently the areas south of Bátonostor were not so severely affected by this flood event what would have made the perambulation impossible – as it did in the Bátonostor area and beyond. Moreover, the fact that two days later it was possible to finish the perambulation in the Bátonostor area suggests that this flood (at least in the way of the perambulators) passed away soon. Thus, this is such an exceptional case when the end of the flood event can be approximately defined.

A charter, issued in 1393, provides us with more details concerning the contemporary landscape conditions of this area.⁹³¹ Accordingly, the area between Bátonostora and Szeremle was quite rich in waters: a lake called *Gekenesto* (Gyékényestő), the *Vayas* or *Assuanfoka* (waterflow dependent on the water-supply of a larger natural waterflow),⁹³² a stream called *Saar patak* or *Sebesfok* (dependent on other waterflow) acting as an outflow of the lake of *Meegtou* were located there, all in the (higher) inundation area of the Danube.

Swampy and smelly lands of the Kalocsa archbishoprix: more than accidental?

This charter is not directly about a flood event, but its importance can probably be traced much more beyond the significance of a single flood event. In 1344 the archbishop of Kalocsa, who actually became the archbishop hardly more than a year before and came from the rich Slavonia (former bishop of Zagreb),⁹³³ wrote a letter to the pope, complaining about the fact that the lands around Kalocsa are swampy and surrounded by dirty and 'smelly' waters. Additionally, Tatars and other pagans devastated lands and churches. Therefore, he asked the pope to give the fortress of *Petri Varadini* (Petrovaradin-Srb), located on a 'hill' (possession of Cistercians, '*mons boni et competenteris aeris*'), as a possible place for refugees in case Tatars were to attack the area again.⁹³⁴ On the one hand this description suggests a relatively low

⁹²⁹ Local geographic names: lands: *Dwsteleke*, *Helgteleke*, *Nemety*, *Dws*, *Zantow*, *Dayboch*, *Barathka*, *Zath*, *Zeche*, *Lypolchfelde*, *Bark*, *Kayand*, *Benye*, *Toty*, *Meger/Megere*, *Dauch/Dawch*, *Megyes*, *Tarnuk*, *Bothmonostura*, *Eld*, *Laak*, *Zeremlyen*. Lakes: *Belsewsar*, *Kylsewsar*, *Gykynus*, *Jobhozya*, *Dobor*. Waterflows: *Duna*, *Borfok*, *Kakarafok*.

⁹³⁰ 1344: DL 87162. Györffy 1987 Vol. 1, p. 723 (medieval Bodrog county).

⁹³¹ Zichy Vol. 4, ch. 418, pp. 519-521. See also: Kőfalvi 2006, pp. 225-226; ZsO Vol. 1, ch. 3104, p. 440.

⁹³² According to Andrásfalvy, the long branch of the Danube called Vajas, following the Danube along its eastern shoreline in the area of Kalocsa and Baja was an artificially made canal. His opinion clearly can be supported by the present charter, since the name *Assuanfoka* was also applied for this waterflow. See: Andrásfalvy 2007, p. 440.

⁹³³ The former bishop of Zagreb, Ladislaus was not particularly happy to leave comfortable Zagreb for the poorer and smaller archbishoprix of Kalocsa (which otherwise he already knew because he was the provost of Titel before going to Zagreb), where really chaotic conditions prevailed at that time. After his arrival to Kalocsa, it seems that he more or less immediately started complaining to the pope and such neighbouring bishops as the ones of Pécs and Bosnia about the bad conditions. Interestingly enough, in these cases seemingly the magnates and powerful nobles of the area caused more (current, actual) problems to Ladislaus archbishop than the destructions and depopulation caused by the former Tatar attack. Ladislaus was not ruling/serving in Kalocsa for a long while: in early March 1345 Ladislaus died. See: Katona 2001, pp. 205-207.

⁹³⁴ Bossányi 1916, ch. 159, pp. 82-84: "Significat... Ladislaus archiepiscous Colocensis, quod terra, in qua Colocensis ecclesia situata existit, paludibus et diversi aquis immundis et fetidis circumdata, quodque per Tartaros et paganos alias eadem ecclesia et tota terra ipsius, nec non ecclesia Bachiensis, eidem ecclesie Colocensis canonice unita, desolata et devastata extitit hactenus, nec non quamplurima instrumenta, munimenta et privilegia Colocensis et Bachiensis ecclesiarum predictarum super diversis iuribus et libertatibus a Romanis Pontificibus,

(compared to previous periods) actual level of management in the inundation area with 'dirty and smelly waters', which actually cannot be really supported by contemporary charters. Contemporary (14th-century) descriptions of landscape conditions rather suggest the general existence of a well-organised landscape with river branches (systemn of wateflows mainly artificially maintained).⁹³⁵

The mentioned Tatar (and pagan) attack is part of the struggles, which took place during the (later years of the) reign of Khan Özbeg. The Golden Horde (even if probably with less force than expected) was still dangerous enough to attack Polish and Hungarian areas which resulted the famous 'crusades' carried out on a regular basis both by Polish and Hungarians from the 1340s onwards.⁹³⁶ The time of the attack was not documented in the charter, this actual (major) attack, affecting the lands of the Kalocsa archbishoprix, could come from the south-southeast. In the scientific literature, either in Hungary or abroad, there is not much written about such a major intrusion into the lands of Hungary in the early 1340s or so.⁹³⁷ However, Özbeg died in 1341 and the great disputes over his succession (i.e. Khan Tinibeg was killed in 1342, and then Janibeg succeeded from 1342) might have obstructed the Golden Horde to start larger campaigns immediately around and afterwards, at least towards the West there were seemingly no great campaigns.⁹³⁸ Thus, from political circumstances 1340 or 1341 seem to be the most probable years for a (major) Tatar military attack. Moreover, the contemporary Swiss chronicler, *Johann von Winterthur* provides a rather detailed description about the attack when Tatars entered the country along the Danube (that could clearly happen only from the south) and caused significant damages in 1340.⁹³⁹

This Tatar attack clearly meant the loss of people which probably was also responsible for the decrease in management of the Danube inundation area which the lands of the archbishorix mainly belonged to. Additonally, one can of course argue that this was 'always' a problematic inundation area, and decreasing management (e.g. people captured or escaped due to Tatar attack) conditions could lead by themselves to this situation anyway. 18th-19th-century parallels, however, more suggest that this is only true in wet periods: namely periods with great flood events and/or more floods (combined with a decreased management) in general.

nec non a Regibus Ungarie eisdem concessis, per paganos deportata ac etiam abolita extiterunt. Unde prefatus Ladislaussupplicat.....quatinus cum in diocesi sua sit quidam mons boni et competentis aeris et melioris, quam in aliqua parte dictae diocesis, nec in tota eadem diocesi sit locus ita aptus pro tuicione personarum et bonorum supplicantis predicti, in quo quidem monte est situatum fortalicium, vocatum castrum Varadini Petri, quod in totum pertinet ad Abbatem monasterii Belefontis Cisterciensis ordinis, Colocensis diocesis, quod nunc est grangia predicti abbatis, eidem archiepiscopo concedere dignemini, ut ecclesia et edificiis, que ibi sunt, remanentibus," I am grateful to Ferenc Piti, who raised my attention to this important document.

⁹³⁵ See, for example, Andrásfalvy 2007, pp. 28-47.

⁹³⁶ See Jackson 2005, p. 213. Khan Özbeg (1312-1341) was rather active towards the west in the last years of his reign – this especially means Poland, Constantinople and Bulgaria which later one was at that time still a 'property' of the Golden Horde.

⁹³⁷ See, for example Kristó 1988, 294 p. In his book, Kristó does not mention this Tatar military campaign either.

⁹³⁸ Jackson 2005. pp. 202-206, 210. A recent Hungarian paper, discussing the military campaigns agants Tatars during the reign of Lajos I (1342-1382) does not 'know' about any campaigns (either carried out by the Tatars or against the Tatars) before 1345. See: Vásáry 2006, pp. 17-29.

⁹³⁹ MGH SS rer. Germ. NS Vol. 3, p. 183 (*Chronica Iohannis Vitodurani*). I wish to thank Christian Rohr who suggested me to check out the chronicle of Johann von Winterthur concerning Hungarian matters.

Beyond the description of Johann von Winterthur, the exchange of letters between the pope and Tinibeg, even if only indirectly, also suggest not only general, but actual (military) problems between the Hungarian (and Polish) kings and kingdoms and the Golden Horde, since the pope himself asks Özbeg's oldest son, Tinibeg in 1340 to stop the conflict(s), and he also promised to ask for the same the Hungarian and Polish kings (the delegate between the two rulers was a Hungarian monk). See: AOKlt Vol. 24 (Ferenc Piti), ch. 490-492, pp. 228-230.

9.4.5.5 Floods/inundations reported in 1346

Spring flood at the Middle Tisza area: 1346

For the order of King Lajos I (15 April), a charter about the fulfilled task of perambulation was issued on 23 April. The perambulation took place on 20 April ('*feria quinta proxima ante festum beati Georgy martiris proxime preterita*'):⁹⁴⁰ the great flood of waters ('*ibi propter inundacionem aque nimiam*'), due to which the boundaries could not be distinguished and divided at this part, occurred at the boundary of Poroszló and Megyer. Thus, a great spring flood took place at the middle section of the Tisza river.

Southwest revisited: floods and wetlands extended in 1342 and 1346

Following the order of the palatine,⁹⁴¹ for a new perambulation of the landed possessions mentioned in 1342, perambulators went out again some time before 3 May in 1346 (when the charter was issued: DL 3842) to the debated land in the area of *Wemes*, *Harazthy* (deserted lands near Vajszló), *Woyzlo* (Vajszló), *Kukyrkthy* (Hirics) and *Lusuk* (Luzsok). When, on 1 May ('*in octauis festi beate Georgij martyris proxime preteritas*') they were already at the debated land belonging to the chapter of Pécs called *Okur*,⁹⁴² the procurator of the chapter presented that, due to the ongoing inundation (flood), the landmarks of the debated land are covered by water and thus, the perambulation procedure had to be postponed.⁹⁴³

In this case it is difficult to define the exact location of the debated land '*Okur*'. There was a land called *Okur* in the close neighbourhood, northwest of Vajszló, but this *Okur* was not directly located in the area of the mentioned 3-4 lands and settlements with clear location, and no any possession of either the nunnery of *Insula Leporum* (Margit Island in Budapest) or the chapter of Pécs is known there.⁹⁴⁴

If we keep ourselves to the original fact that the land *Okur* was located in between the mentioned lands, then the flood is most probably (again) the result of surface waters in direct connection of the Drava river or the flood of the Drava river itself. In any case, the present charter proved that the aquiferous land, described throughout the legal debate, was the (same) one located in the vicinity of the Drava river.

⁹⁴⁰ Károlyi Vol. 1, ch. 110, pp. 164-167: ".... in Borsodiensi et Heveswyuar comitatibus, inde procendendo versus orientem caderet in aquam Egurvye vocatam et ipsa aqua per suum cursum separaret dictam possessionem Puruzlo a possessionibus Luev Tyle et Negyes vocatis que sunt in comitatu de Borsod, ita quod medietas ipsius aquae a parte meridionali ad possessionem Puruzlo pertineret et medietas ad alias possessiones, inde de dicta aqua Egervye curreret versus meridiem et caderet in aquam Tycia vocatam, et inde iret circa eaandem aquam scilicet Tyciam, veniret ad silvam Tyzaerde vocatam et illa silva cum alys utilitatibus scilicet feneta nemora piscine insule lacus terre firmate et campestres usque possessionem Ewren vocatam ex utraque parte Tycie pertinerent ad possessionem Puruzlo, et inde veniret usque possessionem Megyer vocatam et ibi propter inundacionem aque nimiam metas et terminos ipsius possessionis Puruzlo reambulare et distinguere non potuissent."

⁹⁴¹ See DL 3842 and DL 3863, both issued in 1346.

⁹⁴² Csánki 1894 Vol. 2, pp. 491, 504, 533.

⁹⁴³ DL 3842 (03.05.1346): "..... in octauis festi beate Georgij martyris proxime preteritas termino videlicet In eisdem litteris uestris expresso, ad facies possessionum wemus, harazti, woyzlo, kuhijriich et lusuk uocatarum, et terrarum inter easdem partes litigiosarum accessissent, et easdem iuxta seriem Judici nostre magnificencie prout in predictos litteris nostris seriose contineret primo videlicet a duabus metis terreis ... ostendisset discretus vir magister Mych(aelis) canonicus predicte ecclesie Quinqueecclesiensis pro eodem capituli deinde ubi alias metas scilicet terreas arboreas et in aqua ostendissent similiter easdem predictis pro.... ipsius, capituli fore allegassent in tota litera capituli supradem econuerso autem vbi porcionem eiusdem capituli ecclesie Quinqueecclesiensis aliquibus metas ubique locorum ostendissent, porcionem earundem religiosarum dominarum fore allegasset in tota terra earundem religiosarum dominarum et quia viam et commetanei possessionis vtraque partem permisso reambulacionem et exequionem omnes inter esse non potuisset secundo ipsi continencias predictarum litterarum nostrarum minime exequi potuisset" For Hungarian regesta see: Kőfalvi 2006, p. 132.

⁹⁴⁴ Györffy 1987 Vol. 1, pp. 351-351. Csánki 1890 Vol. 1, p. 512 (*Okor/Okur*).

Former floods of the Danube in the West-Northwest – 1346

In a charter issued on 29 November in 1346 a problematic perambulation is described: due to the fact that a previous flood destroyed the landmarks of *possessio Welk*, the course of the boundaries were debated. According to Tamás, son of *Cheztwe* (who took a perambulation charter of the same land dated 30 November in 1260) the other landowner Domonkos, son of Mihály did not show the proper place of the original landmarks, taken by the floods. Finally, the parties agreed before taking the oath (i.e. Tamás could not prove his right without doubt).⁹⁴⁵ Thus, there was debate on the location of landmarks, but both parties agreed on the fact that those landmarks were taken by flood ('*inundacio aquarum destruxisset*'). It is also interesting to note that they still used the charter dated to 1260 to find and (re-)locate the landmarks, as if no significant changes or greater events would have occurred since that time (or the locations of landmarks had not changed at all, always renewed in at the same place, since then).

The lands of *terra/villa Welk* (Vök)⁹⁴⁶ was located in the vicinity of *villa Kurth* (Ohrady-Sk) and *villa Samud de Chollokuz*. Based on this information, the village and land of *Welk* was located in the Csallóköz area in Pozsony county, close to Dunaszerdahely (Dunajská Streda-Sk). Any floods of this area directly reflect on floods of the Danube.

9.4.5.6 Flood in 1347

According to a charter issued in between 22 February and 6 March 1347, a flood again obstructed perambulation process close to the Sajó river, almost in the same area as it occurred in 1343. On 22 February ('*in crastino octavarum diei Cinerum*') great flood of waters ('*nimia inundacio aquarum*') was currently going on in the area of *possessio Hydwegh* (Hídvég) and *possessio Olnad* (Ónod) in Borsod county, located at the Sajó river, 3 km south-southeast of Miskolc. Due to this great flood event perambulation could not take place in the area. Since in the text '*et quia tunc in illis partibus*' is mentioned by *Paulus iudex curie* (thus, the judge of royal court), we can presume that this flood event affected an area well beyond the boundaries of Hídvég and Ónod.⁹⁴⁷

⁹⁴⁵ DL 3794 (29.11.1346): ".... quod ipsi sabbato uidelicet incrastino festi beati Michaelis archangeli, ad faciem predicte possessionis velk accessissent vicinis et commetaneis conuocatis ipsis presentibus ... tenorem privilegij prenotati loca metarum perlustrassent et in primo loco vbi uidelicet priuilegium predictum tres metas esse nominassent ibi reperissent unam metam nouam de qua partes ambe contente fuissent, de de hinc vltierius processissent, deinde autem cum fluum transire voluissernt tam quod Thomas predicti per uoce dixissent quod vltima mete non apparuissent quia inundacio aquarum destruxisset deportasset metas ibique existentes."

⁹⁴⁶ Házi 2000, pp. 530-534.

⁹⁴⁷ Latin critical edition: AO Vol. 5, ch. 55, pp. 118-124: "..., in crastino octavarum diei Cinerum predictarum accessissent ad faciem quarumdam particularum terre et loca piscaturarum in duabus angulacionibus vulgo Zygeth vocatis....existencium, per adducionem et demonstracionem magistri Dok literati, legitimi procuratoris dicti domini episcopi Agriensis, et easdem vicinis et commetaneis ipsarum legitime convocatis et eisdem presentibus, specialiterque coram Andrea et Emerico famulis et Andrea villico prefati Stephani filii Pauli de Olnad, ipsas particulas terre et loca piscaturarum scilicet dimidietatem antiqui meatus fluvii Sayo, quas idem magister Dok procurator ipsius domini episcopi intra metas possessionis Hydwegh asseruisset, recaptivasset, recaptivatasque cum ipsis easdem nomine iuris dicte ecclesie Agriensis ut terras et piscaturas ad prefatam possessionem Hydwegh pertinere debentes prenominato domino Nicolao episcopo in persona sua idem magistro Dok literato statuere voluisse,; et quia tunc in illis partibus in quibus predice possesiones Hydwegh et Olnad haberentur, nimia inundacio aquarum prevaluisse, ob hoc ipsi pretactas particulas terre et piscaturas nec reambulare nec mensurare nec eciam estimare potuissent, iuxta adjudicationem nostram prenotatam; retulisset eciam idem homo regius, quod olim versus meatus aque Sayo, que fuisse meta earumdem durarum possessionum Hydwegh et Olnad discurrentis, versus ipsam possessionem Olnad suas circulaciones post sese invicem vulgo Zygeth vocatas fecissent in suo cursu, que quidem aqua nunc primum meatum in eisdem duabus circulacionibus relinquendo, rupisset sibi meatum directe inter metas et limites possessionis Hydwegh prenotatae." Hungarian regesta: AOklt Vol. 31 (Ferenc Sebők), ch. 131, pp. 93-94. See also: AOklt Vol. 31, ch. 862, pp. 445-446.

According to the description, perambulators could not even go to the debated land and thus, they could not see any boundaries and landmarks: even could not start the perambulation process. Since the debated land called *Zygeth* (sziget=island in Hungarian) as well as fishing places were located in the Sajó river, it looks quite clear the Sajó had to be in flood. Another important detail is that the flood was not a simple one, but '*nimia*' and thus, a flood great in magnitude. For Austria, the *Annales Zwetlenses* mentioned cold and rainy weather concerning the summer of 1347.⁹⁴⁸

9.4.5.7 Transylvanian flood event in 1348

Autumn flood in Eastern Transylvania in 1348

According to the charter dated 22 October, 1348 ('*feria quarta proxima ante festum Sancti Demetrii martyris*'), the Kis-Küküllő river (Târnava Mică-Ro) was in flood around 19 October ('*in dominica proxima post festum Sancte Luce evangeliste*') 1348 the perambulation process of *Dombow/Dombo* (Dombó; today Dâmbău in Romania) occurred in medieval Küküllő county in Transylvania.⁹⁴⁹ The perambulation took place on 19 October, and a charter containing the description of the perambulation was issued three days after the process. According to the description, Dombó was located right on the banks of the Kis-Küküllő river: the perambulation process started at the river where landmarks should have been resettled. Nevertheless, due to the inundation of the water (*inundatio aque*), it was not possible to sign or settle the landmarks. Other parts of the land, however, were perambulated where no other difficulties were mentioned any more.⁹⁵⁰

9.4.5.8 Flood and mud in 1349

Flood at the Northeastern Great Plain, at the Tisza river

In a charter issued on 16 March in 1349, it was reported that on 13 January ('*in dictis octavis Epiphaniarum domini iam preteritis et aliis sequentibus diebus ad id sufficientibus*') and the following days the King's man and the delegate of the chapter of Eger, together with the (new) owners, had to visit *possessio Keer* (Szamoskér) in Szatmár, and *possessio Bodolou* (Bodoló/Badaló; Бодолово-Уа) in medieval Bereg counties. This visit would have taken place, similar to their other possessions in Szabolcs and Szatmár counties, in order to introduce the owners to their new properties and estimate the value of lands. It does not necessarily mean that any perambulations would have been needed. In this case, however, the extraordinary flood was already a well-known obstacle in the whole area ('*propter nimiam aquarum*

⁹⁴⁸ MGH SS Vol. 9, p. 684 (*Annales Zwetlenses*): "1347. ... Eodem anno tota estas ita frigida fuit pluviosa, ut omnes fructus terre tardius provenirent et colligerentur, et per consequens omnes fructus inmaturi. Nam et fructus vineaum, videlicet botri, ita duri erant, ut non solum non comedere, sed et vix quis gustare posset. Similiter et vina ita acria fuerunt, sicut meminit aliquis homo, fuitque annus iste similis anno secundo post iubileum, in quo etiam tunc talia vina acria et tardi fructus et inmaturi provenerunt."

⁹⁴⁹ Latin edition: Jakó 2008 Vol. 3, ch. 484, pp. 191-192 (DL 30383: 22.10.1348): ".... Quod ante omnia circa fluvium Kis-Kekuellewu vocatum incipit inter duas arbores, ubi quia propter inundationem aque meta erigi facere non poterat, ideo una ipsarum duarum arborum, videlicet superior, a parte orientali existens pro meta eiusdem possessionis Dombo est ordinata; de qua ascendendo per rubetum ad unam magnam viam, quam transeundo venit ad duas metas terreas novas ... a parte superiori erectas, quarum una, existens ab oriente, separat ipsam villam Dombo a villa Kyralfalua vocata."

⁹⁵⁰ Neighbouring villages, mentioned in the charter: *villa Kiralyfalva*, *villa Herepe*, *villa Ozd*, *Bardfalva*, *villa Babaholma*, *villa szent Marton*.

inundanciam, qui in illis partibus tunc sit refertur nimium prevaluisset) where the two lands were located, so they could not even reach Kér and Bodoló.⁹⁵¹

The charter provides several pieces of important information concerning this early spring period. The two flooded lands, mentioned to be located in an area generally affected by flood of extraordinary magnitude, can be found relatively far from each other. Moreover, they are located at two separate rivers, primarily influencing the hydrology of an extensive lowland (floodplain) area: Bodoló is located at the Tisza, while Kér at the lower section of the Szamos river. The catchment area of the two rivers at this section primarily means central and northern Transylvania. The mid-January flood of the two rivers in around the same time suggests a previous period (at least couple of days) of rapid melting, and an appropriate amount of snow (melted) and/or rain.

In order to make special emphasis on the importance of magnitude, the scriptor has placed there an extra explanation with mentioning it for the second time that the flood or inundation event was indeed a great one (*nimia*). Moreover, it seems that they could not even approach the landed possession due to the great flood, so the legal process was not even started.

New church, new place: change in building practice and/or environmental conditions?

On 20 March in 1349, the archbishop of Esztergom gave permission of building a new chapel, at this time made of stone in *villa Ponyth* (Gömörpanyit; today Gemerská Panica in Slovakia). The village was located in historical Gömör county along the Sajó river, in the close vicinity of the 1339 flood site: Csoltó and Leklene. The speciality of this event is that in this village a chapel had already existed by that time, and the new chapel was planned to replace the previous one. However, the place where the old chapel was located happened to be very muddy and swampy, and therefore, the new stone building had to be placed in another part of the village. What is even more important, a cemetery also accompanied the older church/chapel.⁹⁵²

Naturally, it is difficult to draw firm conclusions in this case. Nevertheless, it sounds rather strange that not only a chapel, but also a cemetery would have been originally placed in an area which is too muddy and swampy to hold a new building. Cemeteries usually were placed to areas less-endangered by floods or high groundwater table. In this case, we might account with a longer-term change (increase) of the groundwater table.

Change in riverbed – not a flood report?

No flood was directly reported in the next case. Still, due to the fact that the Poprad river changed its bed in this case, we can presume that the last phase of this complete change was accompanied (and directly caused) by a flood event.

On 14 September and 5 October 1349 the investigation concerning a recent change of riverbed of the Poprad river was reported by the chapter of Szepes (Spiš). The investigations

⁹⁵¹ Latin critical edition: AO Vol. 5, ch. 137, pp. 263-267: "..., dixit eciam homo vester prenotatus, quod licet pretaxatus Thomas de Biry ipsum et dicta testimonia nostra ad facies memoratarum duarum possesionum Ker et Bodolou simili modo ad premissa perficiendum adducere voluisset, tamen ipsi propter nimiam aquarum inundanciam, qui in illis partibus tunc it refertur nimium prevaluisset, accedere nullo modo potuissent, sed tamen ipsi, volentibus ambabus partibus, in singulis porcionibus possessionariis eiusdem Thome dicto Andree statutis, in facto estimacionis talem distincionem fecissent pro cautela" See DL 4032, DL 51512. Hungarian regesta: Kállay Vol. 1, ch. 976, pp. 224-225 (charter issued on 16 March, 1349).

⁹⁵² AO Vol. 5, ch. 140, p. 271 (20.03.1349): "....dixerunt bonis in hunc modum, quod cum in quadam villa ipsorum Ponyth vocata in comitatu Gumuriensi capellam et cimeterium cum sepultura haberent consecratam, ubi nunc lapideam ecclesiam divine pietatis nutu et auxilio, ad honorem beate Anne vellent et intenderent edificare, sed quia propter nimiam lutositatem et paludositatem commodo ipsa ecclesia construenda in ipso loco fieri non valeret, petentes nos....ut in eadem villa ipsorum alium locum pro ipsa ecclesia lapidea eidem construenda concedere dignaremur; nos itaque....propter predicti loci paludositatem et aquositatem predictam ecclesiam lapideam in eadem villa ipsorum in alio loco ubi voluerint eidem concessimus construendam; salvo semper loci ipsius prioris cimeterii cum sepulture sepibus aut lignis circumdato cum sua capella remanente."

took place after the King's (Lajos I) order, issued on 5 July ('*die dominica ... ante festi beatorum Petri et Pauli apostolorum*') in Buda. The change of riverbed could have resulted some debate over land ownership, since the Poprad formed the borderline between *Orlow* (Orlov-Sk) and *Lebeten/Lybytyn* (L'ubotín-Sk) landed possessions (with different owners), but it changed its riverbed entirely towards the region of *Lebeten*. In order to avoid further problems, master *Rykolph* (owner of *Lebeten*) asked for inspection and realisation of the (original) land boundaries, which took place in autumn.⁹⁵³ The two settlements are today located along the Poprad river, close to the Polish border, east of Stará L'ubovňa at the slopes of the High-Tatra Mountains.

9.4.6 Floods of the period 1351-1360

9.4.6.1 Great (flash-?)floods destroyed a village some 40 years prior to 1395

All coming from Sáros county (today in NE-Slovakia) in front of the bishop of Eger, the parish priests of *Eperyes* (Prešov-Sk), *Zeben* (Sabinov-Sk), *villa Berthold* (Bertotovce-Sk), *Zempeter* (Petrovany-Sk), *Kend* (Kendice-Sk) and *Zynie* (Svinia-Sk) took an oath on the following testimony. The village called *Mahnya* (Chmiňany-Sk) of the *Hrapko* (Hrabkov-Sk) monastery in the small valley of the waterflow called *Zynieuize* ('*in quadam vallicula penes fluvium Zynieuize vocatum primitus sita fuisset*'). In this village there was a church devoted to Saint Stephan protomartyr. However, due to the great and frequent (dense) floods of waters ('*per nimias et crebras(!) inundationes aquarum*') the village together with its church completely diminished, and thus, its inhabitants moved (descended) to a certain mound (little hill). From this time on, already for around 40 years these people went to the church of *Wyfalu* (Szinyeújfalu, today Chminianska Nová Ves) devoted to Saint Paul, and also burry into the cemetery of this church. In 1395 the prior (abbot) of *Hrapko* monastery claimed the right for the possession of its own village, blaming the parish of *Wyfalu* for taking away these rights (in the past, for about 40 years).⁹⁵⁴

The testimony was asked by the parish priest of *Wyfalu* to prove that the change was caused by repeated great flood events, and the inhabitants of *Mahnya* (Monyhád) village, after loosing their own parish church and village, chose the neighbouring *Wyfalu*, downstream along the Szinye waterflow, as a parish church and its cemetery to burry there after death. The testimony of 6 distinguished parish priests from settlements of the neighbouring areas,⁹⁵⁵ invited by their colleague, provided clear proof that these causes and events fitted the reality. Since the events happened some 40 years before, it might have been still based on the knowledge of some contemporary eye-witnesses, but presumably also on collective memory.⁹⁵⁶

⁹⁵³ DL 68895 (5.07.1349). See also: DL 68894 (05.10.1349).

⁹⁵⁴ DL 50193 (*tercie die celebrationis sancte synodi nostre*): "...Mahnya vocato in quadam vallicula penes fluvium Zynieuise vocatu primitus sita fuisset et in eadem ecclesia sancti Stephani prothomartiris constructa fuisset, per nimias et crebras inundationes aquarum ... in quodam monticulo condescendissent moraturi pro divinis audiendis et sacramentis ecclesiasticis percipiendis,, quartas integras frugum et omnium bladorum in specie ad instar aliarum villarum in comitatu Saros existentium plebano seu sacerdoti parochiali ipsius ville Wyfalu aministrassent, nunc [ver p]rior claustrum de prelibata Hrapko in detrimentum sue salutis et ingens priudicium et dampnum memorare ecclesie sancti Pauli da Wyfalu pro se usurpasset." Hungarian regesta and partly Latin transcription: ZsO Vol. 1, ch. 4213, pp. 461-462. See also: DL 70194.

⁹⁵⁵ For the location of (Szinye)Újfalu, see: Csánki 1890 Vol. 1, p. 314.

⁹⁵⁶ With a broader, countrywise analysis on the background conditions of medieval and early modern villages with changing (and changed) patronym, also referring to this particular case, see Fekete Nagy (1937, pp. 417-431). This very interesting case was also referred by Maksay (1971, p. 61).

Located in a mountaneous area presumably gained by forest clearance,⁹⁵⁷ since both the church and village houses were taken by the floods, it is quite possible that these floods went together and resulted morphological changes (e.g. lands taken by flash-flood) in the valley. This idea might be strengthenned by the fact that village people did not stay in the valley, but finally moved to a higher place, a '*monticulum*' (small hill, mound) where floods could not reach them any more. Since the village centre together with its 14th-century church (dedicated to St. Michael) is still today located in a place which looking like a small hill in the landscape, we can quite clearly locate the place where the village moved to.

It is, however, still an open question why the monastery of Harapko, located very near to *Mahnya*, waited for about 40 years in the realisation of this problematic matter (e.g. lost ownership). Naturally, there is a possibility that there were earlier sections of the legal debate or other problems, but no information was included in the charter suggesting that any earlier evidence is available on the lawsuit (and, based on the textual content, it is less probable). Nevertheless, in this case medieval legal practice has to be considered: according to Werbőczy (the *Tripartitum*), in the case of ecclesiastical properties, loosing the right to a landed property occurred only after 40 years of (uninterrupted) possession of a given land or a right. Up to this duration of 40 years, the ecclesiastical body as previous owner could claim back the land any time.⁹⁵⁸ Therefore, Harapko monastery appeared with the claim just in time: within one or two years, they would have lost all rights to get back village taxes and ownership. It was clearly as a 'bad luck' of the *Wyfalu*-parish – even if no further information is available on the final results of the lawsuit.

It is, therefore, an interesting point (a bit of a contradiction with the *Tripartitum*) that when the (Augustinian) prior of Hrapko took back the taxation rights, the parish priest of Újfalu wanted to get back these rights for Mohnya, and claimed his parish had possessed them for 40 years. Thus, 40 years at that time was already a reason for applying to the responsible ecclesiastical court (bishop of Eger).

9.4.6.2 Floods in 1356

Flood of the Mura river in 1356

In a charter dated 2 December, 1356 an attempt to divide up a piece of land was made, but due to the wet weather conditions (rain?) and flood of the Mura river perambulators could not fulfill their task (*'propter aquositatem temporis et in inundatione aque Mure dividere nequivissent'*).⁹⁵⁹ The perambulation was carried out at the boundaries of *Nagkorog* (Krog-Sl) and *Radistinch*, partly along the Mura river.

⁹⁵⁷ Not only the elevation, but also the name of the neighbouring medieval settlements, such as Jakabvágása, Andrásvágása (the Hungarian word 'vágás' means cut, clearing) suggest that major forest clearance took place on the slopes and along the upper sections of the Szinye waterflow in the area around the village of Monyhád.

⁹⁵⁸ *Tripartitum* Pars I, Titulus 78, § 2, p. 152.

⁹⁵⁹ DL 98399 (02.12.1356): "... in qvindenis festo beati Martini confessoris proxime preteritis ad facies possessionum Nagy-Korogh, et Radiscinch vocatarum accedendo, vicinis et commentaneis earundem universis legitime convocatis, ... primo ipsam possessionem Nagkorogh vocatam, demumque predictam possessionem Radistinch modo simili in duas partes diuidiendo unam rectam medium partem ejusdem scilicet duas curias ab aqvilone in platea a parte orientali habita existentes, et tertiam curiam ex opposito earundem duarum curiarum ab occidente habitam predicto Nicolao, filio Simonis, reliqvac vero eqvalem medium partem ipsius videlicet tres curias a meridie a parte fluvij Mura, et qvartam ab occidente in platea ab aqvilone habita statuisserint,, terras autem arabiles possessionum prescriptaru, propter aquositatem temporis, et inundationem aque Mure eisdem neqvivissent, sed easdem eisdem partibus inter se ad singulas curias, seu sessiones prescriptas in dicta divisione ipsis cessas eqva lance diuidere, aliasque utilitates earundem possessionem, scilicet loca pascualia, aqvasm nemora, prata, seu fenilia, et alias qvaslibet ad easdem spectantes communi utensioni partibus premissis commisissent " See also: Imrédi-Molnár 1966, p. 266.

'Bono modo hoc considerare nequivissent' – Great early winter flood in the Northeast

In a charter issued on 11 January in 1357, an unsuccessful attempt on 7 December ('*in octavis festi sancti Andree apostoli*') was made to visit and observe the area concerning the legal debate over the Noska-ér, a branch of the Ung river. This 'legalising field trip' attempt was obstructed by a flood of waters ('*propter aquarum inundanciam*'), which was great in magnitude and prevailed in the whole area at that time ('*que tunc in illis partibus nimium prevaluisset*'). Thus, the official visit of the Noska-ér (*rivulus*) in Sysloch (Sislóc; today III.шлівці in Ukraine) was postponed to 13 January in 1357. Based on the description of the charter it seems that certain nobles of Sislóc (10 years before) made a new (illegal) cut, a ditch or canal, diverting the water of the Ung river towards the Noska-ér (brook). This happened 10 years before, and the traces of this work had to be investigated and (possibly) recognised (if existed) at this time, in late 1356.⁹⁶⁰ The actual flood event, as a predominantly natural phenomenon, suggests milder (and wet) early-winter conditions in the area.

Sislóc, today in Ukraine, is located about 5 km south from the Ung river and about 15 km southwest of Ungvár. Since Sislóc is located in the floodplain of the Ung river and in the charter an area (*in illis partibus*) in a somewhat broader sense is mentioned, we can presume that the flood event is most probably connected to the Ung river and its tributaries. This theory can be also supported by the text of the charter, where Noska-ér (*rivulus*) is described as a waterflow coming from the Ung river ('*ad quendam rivulum Noska-Er nuncupatum, ubi idem rivulus de fluvio Wngh exiret ac decurreret*') and thus, can be treated as a (probably artificial) branch of the Ung receiving its water supply from the river itself. As such, a flood in the area most probably means a flood of the Ung river, too.

9.4.6.3 Floods or inundations of waters in spring and summer in 1357?

Great flood/inundation in spring 1357 in the Northeast

The next case occurred not far from the previous, early December 1356 flood event, in the former neighbouring county, Bereg. Due to a legal debate, a great flood in the area of *possessio Darauch* (Beregdaróc) was reported in three charters.⁹⁶¹ The perambulation procedure, described in the first charter dated 7 May ('*in festo beati Stanislay, Episcopi et martyris*'), occurred on 1 May ('*in octauis festi beati Georgy martyris Jam elapsis*'). The land division and perambulation of boundaries could not take place (could not even start) due to the great flood or inundation of waters ('*tunc temporis ex nimia inundacione aquarum*

⁹⁶⁰ AO Vol. 6, ch. 331, p. 527: ".... aliis absentibus homines vestri in octavis festi sancti Andree apostoli partibus eciam vel earum legitimis procuratibus presentibus, vicinorum et commetaneorum suorum legitimis convocationibus habitis ad quendam rivulum Noska-Er nuncupatum, ubi idem rivulus de fluvio Wngh exiret ac decurreret, accidentes, viderent conscienciose ac diligenter considerarent, utrum super dicto exitu ipsius rivuli aliqua perfossio a decem annis hucusque existerit vel existat, demum vero ab eisdem vicinis et commetaneis nobilibusque comprovincialibus necnon aliis hominibus quibus fieret opportunum, deum et eius insticiam pre oculis suis habentes, ad fidem eorum deo debitam fidelitatemque domino regi et sue regie sacre corona observandam super eo, utrum ad scitum ipsorum vel auditum prefati nobiles de Sysloch in loco exitus ipsius rivuli Noska-Er nuncupati aliquam exfissionem fecissent aut facere procurassent nec ne, scirent et inquirerent omnimodam veritatem, et post hec nos seriem omnium premissorum ad octavas festi Epiphanie domini proxime affuturi vobis amicabiliter rescriberemus Dicta autem testimonia nostra concorditer referebant, quod ipsi propter aquarum inundanciam, que tunc in illis partibus nimium prevaluisset, bono modo hoc considerare nequivissent, si in dicto loco suffosio fuisset vel haberetur aliqualis, sed tamen ipsi dictas arbores in exitu ipsius rivuli Noska-Er existere vidissent modo prenotato"

⁹⁶¹ Settlements where some of the participants of the perambulation(s) were coming from (mentioned in the four charters); *Tereche, Bala, Warada/Varada, Takus* (Tákos), *Machala* (Macsola), *Bulch* (Bulcsu), *Gyulahaza/Gywlaháza, Homok* (Mezőhomok).

prestitissent'), and the difficulties caused by wetness/moisture and great mud ('*propter grauitatem inaquositatem et lutuositatem ipsam possessionem darouch*').⁹⁶² Beregdaróc, with its 14th-century Gothic church in centre, still today is located at the same place as in the late Middle Ages.

Floods/inundations in 1357 in the same northeastern area: the late summer case

Later, in further parts of the lawsuit this problem (with the same text) was repeated in other charters referring back to the same date of 1 May as the day when the great flood or inundation was observed at Daróc. As a continuation of the lawsuit, a new date was given for a new perambulation, namely 22 August ('*in octavis festi assumptionis virginis gloriose*').⁹⁶³

In the last, but equally interesting charter the impressions of the next attempt for perambulation were described. According to their task, the perambulators went again to Daróc on 22 August and then, and they had to issue a report to the royal court on 15 September (in Visegrád). On 22 August the perambulators approached Daróc, but they again were unable to do anything concerning perambulation due to the floods or inundations of waters and the 'density' (solidity, compactness) of pastures ('*propter aquarum inundaciones et pratorum densitatem*'). At the end of the charter, caused by the (mentioned) difficulty ('*grauaminis cause*').⁹⁶⁴

It is yet an open question whether the same flood, as a long-lasting inundation, observed on 1 May extended to late August, or new flood(s) occurred in the same time. Since concerning the 1 May perambulation '*inundacione aquarum*', thus flood in singular was mentioned, and then connected to the 22 August perambulation '*inundaciones aquarum*', floods or inundations in plural was mentioned, it seems more likely that the presumable spring flood was followed up by another or other flood(s) up to late August.

⁹⁶² Zichy Vol. 3, ch. 42, pp. 60-61: ".... Qui tandem exinde ad nos reuersi, requisiti nobis consona voce retulerunt, quod ipsi In octauis festi beati Georgy martyris Jam elapsis, accessissent ad faciem prelibate possessionis darouch Et licet eandem resentibus partibus et vniversis vicinis et commetaneis suis In octo partes, prout in sepeditis litteris Comitis Nicolai haberi dignoscitur diuidere voluissent, beneuole ambabus partibus acceptantibus, Tamen quia tunc temporis ex nimia invndacione aquarum Terre seu loca plurima impedimentum prestitissent, non modicum, Ideo ipsi homines, scilicet vestre celsitudinis et nostra testimonia, propter grauitatem inaquositatem et lutuositatem ipsam possessionem darouch reambulare diuidere et abinvicem metalibus signis sequestrare nullo modo valuissent, partes autem prenotate si ipsa diuisio fieri potuisset inter ipsos, se contentas in dacione et accepcione particularum prescripte possessionis darouch per uiam diuisionis et sequestracionis deuoluendarum, presentibus ipsis reddidissent,"

⁹⁶³ Zichy Vol. 3, ch. 46, pp. 65-68; ch. 63, pp. 90-95. See also Zichy Vol. 3, ch. 45.

⁹⁶⁴ Zichy Vol. 3, ch. 82, pp. 128-129: ".... Item Gregorius filius Alexandri de Takus pro parte Johannis filii Stephani et Ladislai filii sui in causam attractorum homines regy (sic!) in octauis (22 Aug) festi assumptionis virginis gloriose (15 Aug) proxime preteritis ad faciem possessionis darouch vocate vicinis et commetaneis suis legitime conuocatis Tandem ipsis octauis (szept. 15) festi nativitatis virginis gloriose (8 Sep) termino videlicet reportacionis seriei premissorum adueniente Andreas filius Stephani de vychka pro prefato Nicolao filio Johannis actoris cum procuratorys litteris vestris ab una ac predictus Ladislaus filius Johannis prose personaliter et pro eodem Johanne patre suo similiter ... in quibus inter cetera premissam possessionariam reambulacionem et statucionem ac metarum ereccionem in ipsis octauis festi assumptionis virginis gloriose, per predictos regios et vestros homines propter aquarum inundaciones et pratorum densitatem fieri nequiuuisse conperimus euidenter vnde quia ad premissam possessionariam reambulacionem et statucionem ac metarum ereccionem modo prenotato faciendam homines regy et vestra testimonia pro ipsis partibus necessario nobis et nobilibus reegni (sic!) nobiscum in Judicio, sedentibus transmitti debere videbantur. die termini prenotati Anno domini Mo CCCo lmo octauo. Ipsi eciam partibus liberam concessimus concordandi facultatem dummodo nos Juxta extensionem grauaminis cause ipsorum tanquam Judicem eorum ordinarium de Judicio habite pacis in eodem termino valet complacare. Datum vt supra."

9.4.6.4 Floods of waters obstruct reaching parish church in 1358: A Transylvanian case

On 24 February in 1358 an application was sent to the pope asking for a full status of parish church for the church in the village of *Scarwad/Szarvad* in the Transylvanian diocese. It was necessary since, according to the explanation of the applicants, the neighbouring parish church was far, and due to the floods of waters, the great number of believers remained without baptism and had to die without taking the sacraments.⁹⁶⁵

The medieval settlement of Szarvad was located in the area between the Tasnd and r waterflows in (Közp-)Szolnok county;⁹⁶⁶ today part of Tsnad in Northwest-Romania.

9.4.6.5 Flood in 1359

The church of *Iaszow* (Jsz; Jasov-Sk) wanted to resettle the boundaries of its lands in the Upper-Bdva valley, historical Abaj and Szepes counties and thus, a perambulation took place on 22 November ('*feria sexta proxima ante festum Beati Clementis Papae proxime praeteritum*').⁹⁶⁷ As neighbours, the delegates of such towns as *Smulniczia/Szomolnok Banya* (Smolnk-Sk), *Gulniczia* (Gelnic-Sk), *Ida-Banya* (Zlata Ida-Sk) and *Sepsi* (Moldava nad Bodvou-Sk) were also present. They successfully perambulated and settled new boundaries at the lands of *Sepsi*, *Debreg* (Debrad'-Sk), *Somogh* (Drienovec-Sk), *Nyhazateleke/Nyhaza telek*, *Aj* (Hj-Sk) and *Thorna* (Turna nad Bodvou-Sk). But when they took their way towards the lands of *Szomolnok Banya*, after settling a new landmark the church of *villa Meczeness* (Medzev-Sk) at the *Piwunya* river (*fluuius Piwunya*), they could not proceed due to the great rains, floods of waters and the dense fog ('*propter nimias pluuias et inundationes aquarum et densitatem nebulae*'). Thus, they could not perambulate the upper boundaries of Jsz church ('*vlteriores metas possessionis ipsius Ecclesiae reambulare nequiuissent*'); namely the boundaries with the towns of Szomolnok, Glnic and Idabnya, all located west, north and northeast of Jsz.

Although the Bdva river is mentioned a couple of times in the charter connected to the perambulation process, there was no indication that flood would have obstructed there the perambulation. Thus, apart from the fact that there was great rainfall and dense fog in the Mecenzf area and on the eastern, northeastern boundaries over the lands of Jsz church, the

⁹⁶⁵ Bossnyi 1918 Vol. 2, ch. 124, pp. 323-324: "Item supplicat, quod cum nobilis vir Petrus Johannis armiger Transilvanensis diocesis, qui cum dicto milite in subsidium ecclesie semper fuit et est nunc cum domino Abate, unam ecclesiam in villa sue in Svarwad, qui locu[m] a parochiali ecclesia sua bene distat, per quartam partem dicte kegalis cum tam propter dictam distanciam, quam inundaciones aquarum multi sine confessione et aliis sacramentis, ac pueri sine baptisme pluries sepelirentur, de bonis a Dei sibi collatis construi fecerit et suis bonis oropriis dotaverit eandem, quatinus dictam ecclesiam erigere in parochialem et ei omnia iura ... et omnes decimas infra limites illius parochialis ecclesie obvenientes, quarta diocesano reservata, assignare, deputare et concedere dignemini" Hungarian regesta: Jak 2008 Vol. 3, ch. 986, p. 349. As for location, Bossnyi suggests Szarvas in Bks county (located outside of Transylvania).

⁹⁶⁶ Csnki 1890 Vol. 1, p. 563. Csnki (concerning the 15th century) knows about two settlements named as Szarvad: (Tasnd)Szarvad and Peleszarvad/Kisszarvad. However, the later one usually appears together with Pele- or Kis-.

⁹⁶⁷ Fejr Vol. 9/3, ch. 40, pp. 91-95: "....; et cum terram seu terras ad ciuitatem Szomolnok Banya occupatas videre seu conspicere voluissent, praedicti homines regii et noster tandem Iudex scilicet Dulenuch et quidam ciues de eadem ciuitate venientes, eisdem in quibusdam locis prope villam Ecclesiae praedictae Meczeness vocatae, iuxta fluuum Piwunya metam terream demonstrassent, et licet dicta regia Maiestas in ipsis litteris suis vniuersas metas ipsius Possessionis Ecclesiae de Iaszow reambulare et vbi contradictum non fuerit, nouas metas erigere eisdem hominibus suis praecepisset, tandem ipsi propter nimias pluuias et inundationes aquarum et densitatem nebulae vlteriores metas possessionis ipsius Ecclesiae reambulare nequiuissent. Datum feria quarta proxima post festum S. Catharinae Virginis et Martyris, Anno Domini M. CCC. LIX."

waters were as well in flood which would suggest a prolonged wet period, at least in the previous days in the upper tributary of *fluvius Piwunya* (or the Bódva river). In general, rain and foggy-wet conditions with floods suggest rather mild conditions for this area in late November. The *Continuatio Zwetlensis* (IV) mentioned floods in summer 1359, but no indication of autumn conditions are available in the neighbourhood.⁹⁶⁸

9.4.7 Floods of the period 1361-1370

9.4.7.1 '*...aqua et luto obstantibus*' – West-Hanság: spring 1361

A series of perambulation processes took place in the wetland area in (roughly) directly west of the basin of Lake Fertő.⁹⁶⁹ During this process first, between 3 March and 11 April, but (logically) closer to the previous date it was not possible to carry out the perambulation due to the frosty weather and great snow ('*propter gelida tempora et nivium habundanciam*') and thus, this part of the perambulation was postponed.⁹⁷⁰ It seems likely that this information has direct connection to the, from our viewpoint significant next, high water-level case which appears in the charter right after the previous information.

During the process which took place on 11 April at one point of the perambulation, close to the water of the Fertő (*lacus Ferteuvize*), the process was obstructed by water and mud ('*ulterius autem aqua et luto obstantibus in erectione metarum procedere tunc temporis nequivissent*'), this part of the perambulation at one particular meadow could not be carried out at that time. The division of pastures and the lake portion in Fertő was postponed to winter (freezing) time when perambulators planned to reach the meadows and the lake portion on ice (*tempore glaciali*). Thus, they calculated with the possibility that

1. probably up to winter time water would stay on (the same?) meadows;
2. in winter time water (and mud) would get frozen enough to finish this last portion of the perambulation process.

It is an interesting addition that finally the new land division, which supposed to take place up to 9 February, was postponed.⁹⁷¹

No direct evidence is yet available about the exact location of some of the landed possessions mentioned in the charter. However, due to morphological conditions, there are some areas between Sarród and Pomogy (Pamhagen-A) where such landed portions as *Balenteleke*⁹⁷² or *Posateleke* (both names refer to a shortly-existing proper names) could be located with their relatively small arable lands and possibly more extensive meadows, wetland and water portions.

Based on early 18th-century (and partly modern) information we can say that the extension of pastures/meadows in this particular area was especially sensitive on the water-level conditions of Lake Fertő. However, there were areas of higher location, especially along the land possession boundaries and the road which led towards Pomogy/Pamhagen: based on

⁹⁶⁸ MGH SS Vol. 9, p. 688 (*Continuatio Zwetlensis* IV): "... Inundaciones pluviarum per totam estatem eruperunt."

⁹⁶⁹ This important document was first published in: Fejér Vol. 9/3, pp. 323-331. Recently, the charters (with texts and datings separated) included in one charter, issued on 16 June 1362, were (re)published in: MCP Vol. 1, ch. 111-114: pp. 118-122, ch. 116-117: pp. 123-127. I am greatful for András Vadas who has warn my attention to the Pannonhalma publications of the charter.

⁹⁷⁰ MCP Vol. 1, p. 121.

⁹⁷¹ MCP Vol. 1, p. 123.

⁹⁷² Bálen(t)telke: Csánki Vol. 3, p. 599 – probably located around Sarród. Pósatelek(e): Csánki Vol. 3, p. 625 – presumably located west to Pomogy/Pamhagen. The later one is today probably part of Pamhagen, while Bálementelke migh belong to Sarród.

the perambulation, at the moment the most likely place for the location of *Balentelke* is the present Lászlómajor area (at present belonging to the village of Sarród and forms part of the central areas of the Fertő-Hanság National Park). Another rather likely option is Nyáros where one can also find the former triple landmark of Sarród, Pomogy/Pamhagen and Süttör villages (Gáncshalom), and also could be found in the 18th-19th centuries.⁹⁷³

9.4.7.2 Floods in 1366

Spring flood in 1366

On 18 March ('in octavis diei medij xle proxime preteritis') one third of the lands of *Chente* in Bodrog county was perambulated. Although the perambulation could take place, perambulators could not measure the one third with the royal measure because of the waters ('*propter aquas et prata ac eorum firmitates eandem regali mensura mensurare nequiuissent*'), so only an eye-estimation (60 Marks) could take place. According to the same charter issued in 1366 (*litterae relatoriae super aestimatione*), there were also other perambulations of the same areas around September-October and November 1364: seemingly, at this autumn time there was no problem during those processes.⁹⁷⁴ The (deserted medieval) village of Csente was a fishing village along the banks of the (Lower-)Danube in Bodrog county.⁹⁷⁵ (Long-lasting) water cover on a piece of land (with meadows) where perambulators wanted to make measurements might mean in the direct neighbourhood of the Danube either remnants of a Danube-flood or inland excess water (often occurring also around floods, even if origin is either groundwater-table change or rainfall). Since, however, the area is rather clearly located in the inundation area of the Danube and thus, waters are not independent of the actual water level of the Danube, there is a high probability of a preceding Danube flood/high water-level event.

Flood along the tributary of the Ipoly river: (early and?) mid-spring 1366

Documented in a charter dated to 17 July in 1368, after a long legal debate, affected parties made an agreement over the boundaries of *Eghazasgerge* (Egyházasgerge) and *Forrou/Forou* (Forró) in Nógrád county,⁹⁷⁶ which was followed by a perambulation process. This perambulation process, however, could not take place until 1 May 1366 ('*infra octavas festi sancti Georgy martiris*') due to the flood of waters and mudiness ('*propter lutositatem et aquarum inundanciam*') in the area of the boundaries in question.⁹⁷⁷ Caution was clearly

⁹⁷³ For an overview of historical environmental conditions of the Sarród area in case of low, medium and high water-level conditions, see, for example: Kiss 2005a, pp. 39-49.

⁹⁷⁴ 1366: DL 58575: " ad faciem eiusdem possessionis Chente in octavis diei medij xle proxime preteritis accedendo eandem possessionem iuxta priorem reambulationem vndique perambulasset in qua propter aquas et prata ac eorum firmitates eandem regali mensura mensurare nequiuissent Ideo vnam eisdem vicinis et commetaneis ac alijs quidpluribus probis hominibus visu considerando reuisis prius quibuslibet suis vtilitatibus terciam partem predicte possessionis chente et quarumlibet eius vtilitatum in sexaginta marcis estimasset de qua estimacione dicte partes contente exitisset "

⁹⁷⁵ Györffy 1987 Vol. 1, p. 716.

⁹⁷⁶ Egyházasgerge is today located north to the town of Szécsény, along the Dobroda stream. The site of the deserted settlement of Forró today belongs to the area of Kisgerge (Györffy 1998 Vol. 4, p. 241; Csánki 1890 Vol. 1, p. 98)

⁹⁷⁷ 1368: Károlyi Vol. 1, ch. 193, pp. 293-309 (p. 295): ", igitur prefatus Gregorius medietatem dictarum novem marcarum annotato Nicolao filio Johannis infra octavas festi sancti Georgy martiris tunc venturas vel in eisdem reddere et persolvere, possedisset, rehabita eadem pecunia absque exaccione frugum decimalium iobagionum suorum in eadem terra iam tunc seminatarum remittere et resignare deberent et tenerentur; preterea quia propter lutositatem et aquarum inundanciam metas possessionum suarum iuxta continentiam literalium suorum instrumentorum in locis necessary erigi et renovare ad tunc non valuissent, igitur easdem similiter infra

necessary in this question since, as later it is clear from the perambulation, the boundary was partly located along the stream.⁹⁷⁸

Since Egyhásasgerge is located along the Dobroda stream (tributary of the Ipoly river), and the landed possession of Forró, later deserted, had been located northwest to Egyhásasgerge, the spring flood, which passed away until 1 May, might have been caused by the Dobroda stream (mentioned as *Dubrapataka* or *Dobravada* in the charter) and/or the waters of its immediate catchment.

9.4.7.3 Winter flood in Transylvania, in 1367

In two charters, issued on 8 May and 4 July with practically similar content the steps of another lawsuit were recorded: a perambulation of *possessio Chergeud* and *possessio Munera/Monera* was obstructed by contradiction of abbot Alardus from the *Egrus* (Egres, today Igriş in SW-Romania),⁹⁷⁹ who claimed the rights of the monastery over one part of a landed property called *Monera*. *Monera* (Monora; today Blaj in Romania) and *Chergeud* (Magyar-/Bolgárcserged; today Cergău Mare/Mic in Romania) were both located in former Alsó-Fehér county in Transylvania. The situation got more complicated on 13 January ('in octavis festi epiphaniarum'), when the abbot brought only copies of charters supporting the abbey's right over the debated land portion, due to the reason that the most important, precious 13th-century charter(s) would have been in danger because of the ongoing flood. Taking actual natural conditions into account, the legal court of the duke of Transylvania accepted the excuse and postponed the lawsuit and allowed him to show the relevant originals on 1 May. Since it turned out that no originals are available, Alardus' application was refused.⁹⁸⁰

His accepted reasoning (e.g. travel obstructed by flood) most probably refers to the rivers the abbot should have passed while traveling. The Cistercian monastery of Egres (Igriş-Ro) is located at the Maros river (medieval Temes county; today in SW-Romania), while the place where the charter was issued (Szentimre at Kolozsmonostor) situated at th Kis-Szamos (Someşul Mic- Ro) river. Travelling to Transylvania, the abbot first had to cross the Maros (Mureş-Ro) river, and then also other waterflows. Concerning the location of Igriş and the travel direction, it seems to be quite likely that (some of) the waterflows of the southwestern

predictas octavas vel in eisdem octavis coram testimonio loci alicuius testimonialis quod ad hoc communi voto ducerent eligendum, erigere et renovare tenerentur;"

⁹⁷⁸ See, for example: Károlyi Vol. 1, ch. 193, p. 298.

⁹⁷⁹ The existence and content of this charter contradicts with the statements concerning the non-existence of an abbey in Egres (probably as a *filiale* of Kolozsmonostor in historical Kolozs county). See: Csoma 1911, pp. 223-232.

⁹⁸⁰ DL 30394 (08.07.1367). Latin edition: US Vol. 2, ch. 897, pp. 293-297: " Ipsisque octavis festi epiphaniarum domini ccurrentibus praedicti magistri Johannes de Kykullou, Nicolaus de Zonuk et Ladislaus de Hagacha archidiaconi cum sufficienti procuratorio in persona eiusdem capituli prout actores ab una et idem dominus Alardus abbas de Egrus parte ex altera veluti in causam attractus ad nostram accedendo praesentiam quosdam quaternos in uno volumine compressos seu ligatos tenores instrumentorum literalium ipsius monasterii de Egrus continentem coram nobis exhibere curasset, quarum unius literae domini Andreae quondam regis Hungariae registri anno dominicae incarnationis Mmo. CCmo quinto emanatae tenoris metas ipsius possessionis Monera et aliarum quarundam possessionum ipsius ecclesiae de Egrus comprehendendo declarasset. Cuius quidem registri tenore reviso et continentis eiusdem plenissime perfectis ipse dominus Alardus abbas retulisset eo modo, quod dictas literas ipsius domini Andreae regis cum aliis literarum munitamentis scilicet copiam seu originale ipsius registri iam exhibiti pro eo tunc ad praesens exhibere non valuisse, quia propter inundationem aquarum secum ferre ausus non fuisse timens, ne per huiusmodi accidentiam et ipsum factum dictae ecclesiae suae in destruendis ipsis instrumentis in successu temporum periclitaretur, et ad exhibendum eadem instrumenta ulteriore terminum sibi per nos adhuc assignari postulasset." See also: DL 5980 (08.05.1367).

Carpathians, more exposed to the wet and mild south-southwestern air masses in autumn and winter, were in flood those days.

Spring flood at Hosszúmező in 1367

In the area of the chapter of Lelesz a land division and perambulation process was not carried out along the boundaries of Hosszúmező landed possession on 1 May due to the fact that there was great flood of waters.⁹⁸¹ Unfortunately, based on the available information it is rather difficult to determine in which of the several Hosszúmező possessions, located in the extensive legal authority area, the great flood took place. It is however clear that the great flood of waters occurred somewhere in the northern, northeastern cathment area of the Tisza river.

Another charter (DL 96425), discussing the same problems might as well help in the identification: the medieval town of Hosszúmező (Câmpulung la Tisa-Ro) along the Upper-Tisza in the Maramureş Basin. Connections in content between the two charters provide the possibility that this certain Hosszúmező was mentioned in the 1367 flood charter.

9.4.8 Floods of the period 1371-1380

9.4.8.1 Flood in 1372

On 2 July ('*feria sexta ... quinto die congregationis*'), namely on Saturday, the fifth day of the noble congregation ('*feria secunda ... post festum Natiuitatis B. Iohannis Baptiste*': 28 June) in 1372, perambulators went to a land portion near *Civitas Albensis* (Székesfehérvár), located between the church of Saint George and *villa Szarzabody* (Sárszabadi; today part of Székesfehérvár). The perambulation also reached a great swamp, proceeded along; and then when perambulators wanted to enter an island in this swamp (presumably the Sárrét), it was not possible to go there (to the island), because of the flood/inundation of waters ('*inundatio aquarum*').⁹⁸²

It is also possible that in this case it was an inundation caused by a somewhat earlier flood event. Since Sárszabadi was located at the Sárvíz river,⁹⁸³ and the swampy area of the Sárrét was mainly supplied by the Sárvíz, this inundation was presumably caused by the flood of the same river.

9.4.8.2 Floods in 1374

Floods of waters in early 1374

Tithe collector of the pope, *Petrus Stephani de Auinione*, while travelling from early December 1373 until 12 March 1374 in the country collecting the papal tax, spent quite much

⁹⁸¹ 1367: DL 96425.

⁹⁸² See also: Fejér Vol. 4/4, ch. 259, pp. 449-451.

Károly 1898, p. 682: "..., quod ipsi feria sexta videlicet quinto die congregationis nostrae praedictae ad faciem cuiusdam particulæ terræ prope civitatem Albensem inter Ecclesiam B. Georgii martyris et villam Sarzabady adjacentis accessissent, ac ipsam hoc ordine remabulassent: Quod primo incepissent a quadam valle a parte meridiei existente quae esset prope magnum paludinetum; dehinc ipsum paludinetum saliendo versus aquilonem processissent, et ibi in quadam insula dictorum Dominorum de praedicto Capitulo Albensi quandam metam fore extruxissent, sed ad ipsam propter inundacionem aquarum ire non valuisent; ab hinc circa dictum paludinetum ad plagam orientalem tendendo ad quoddam magnum fossatum prope Civitatem Albensem habitum devenissent et in eodem fossato procedendo usque ad quandam pontem in quadam luto constitutum devenissent, et quosque ad eundem pontem devenissent,"

⁹⁸³ For medieval location of Sárszabadi, see Györffy 1987 Vol. 2, p. 404.

money due to high prices ('*propter magnam caristiam*') and flood of waters ('*propter inundationem aquarum*'), which waters he had to cross.⁹⁸⁴

A spring flood of 1374

In a charter dated 15 October, 1374, an unsuccessful perambulation attempt was described referring to the landed posession of Nagymihály (Mihalovce-Sk), dated to 12 April ('*quarto die octavarum festi Pasche Domini*'), in the same year.⁹⁸⁵ Due to the great flood of waters ('*nimia aquarum inundatio*'), neither the perambulation nor land estimation could take place there. Since Mihalovce is located at the Laborec river, most probably the great flood of this river and/or other waterflows can be blamed for the fact that the legal action was postponed in mid-spring.

9.4.8.3 Floods in 1377

Inundated area in Somogy as a sign of inland excess waters?

The next case, unlike most of the other cases, is not a clear flood event. In the course of the perambulation process of Szenterzsébet, Simonfalva, Szániszló and other landed possessions, was carried out without any problems or obstructing circumstances. Nevertheless, a flood of waters at the meadow of *Baranya Mezeye* is a clear sign of either high groundwater table, or rainwater kept by a close-to-surface impermeable (clayish) soil layer. In any case, it refers back to a precipitation surplus in the preceding period (even if, being not a clear flood event, it is not included in robust analyses).⁹⁸⁶

Summer flood along the Danube - 1377?

In a charter dated to 8 July ('*octava die Octavis festi Natiuitatis B. Iohannis*'), issued by the chapter of Kalocsa, a perambulation occurred a week before on 1 July ('*in ... octauis festi Natiuitatis B. Ioannis Baptistae*') was included. On that day people went out to two lands both called *possessio Halaz* (Halász), but one of the King's men and the neighbours were not present. moreover there was flood of waters ('*inundacio aquarum*'), so, it was not possible to perambulate the land.⁹⁸⁷

⁹⁸⁴ MVH Vol. 1/1, p. 461: "Item die VII. Decembris anni LXXIII, quia tunc noviter fuerat commissum michi per dominum Heliam, de recipiendo decimam regni Ungarie, tam pro dicta decima, quam pro mediis fructibus beneficiorum per sedem apostolicam collatorum recipiendis, arripui iter meum pro circuendo ecclesias catedrales et collegiatas regni Ungarie. Unde redii ad Calidas Aquas ad domum domini Cardinalis die XII. Mártii anni LXXIII. Expendi tam propter magnam caristiam, quam propter inundationem aquarum et transitus ipsarum, in IIIIxx. XIII. diebus CLXVII. florenos et quartam. / Item pro uno equo, qui fuit mortuus in via, XV. florenos auri."

⁹⁸⁵ Sztáray Vol. 1, ch. 250, (pp. 414-422) p. 416: "...; qui demum ad ipsum capitulum reversi, eidem concorditer retulissent, quod ipsi quarto die dictarum octavarum festi Pasche Domini proxime tunc preteriti, accessissent ad faciem possessionis Nagmihal supradicte, et licet ipsi primo portionem possessionariam dictorum nobilium in causam attractorum in eadem Nagmihal habitam, demumque alias portiones ipsorum, prefatis in causam attractis id benigne annuentibus, reambulare et mensurare et estimare presto extitissent et parati, tamen propter nimiam aquarum inundationem, dictas reambulationem, mensurationem et estimationem facere nequivissent, et sic absque perfectione aliquali ad idem capitulum reversi extitissent."

⁹⁸⁶ 17 April 1377: DL 6418, 6419. Published regesta: Borsa 1999, pp. 34-36.

⁹⁸⁷ DL 106183 (08.07.1377). Latin edition: Fejér Vol. 9/5, ch. 94, pp. 180-182: ".... nobis vnumittere retulerunt: quod ipse homo vester, praesentibus dictis testimoniis nostris, in praescriptis octauis festi Natiuitatis B. Ioannis Baptistae ad facies quarumdam possessionum Halasz actoris, et alterius possessionis similiter Halasz vocatarum,, accessissent, ac cum ipsis possessiones reambulare voluissent, propter absentiam hominis vestri, ac vicinorum et commetaneorum eiusdem actoris, per ipsum inibi adducendorum, etiam quod ipse frater Baudo in facie eiusdem possessionis existens, praemissa facere propter inundationem aquarum non posse retulisset, ...; et sic ydem vestri

According to Györffy, the two Halász-s were located at the boundary of Fejér és Bodrog counties, very close to the Danube, in the inundation area of the river.⁹⁸⁸ Thus, the inundation or flood of waters had to be directly connected to the Danube. In this case it is also not evident whether it was because of an actual flood event of the Danube, or an inundation caused by a Danube flood somewhat earlier than the time when the perambulation took place. Nevertheless, due to the fact that most of the King's men and even the neighbouring owners – for whom such a perambulation process is always of outmost importance – did not come, it seems more likely that an ongoing flood event obstructed travel in the area.

9.4.8.4 Flood in 1378

According to the charter of the Pécs chapter, issued on 23 June in 1378, the perambulation between *Chele* (Csele) and *Zekceun* (Szekcső), thus close to the Danube, could not be fulfilled due to the density of forests and flood/inundation of waters ('*propter densitatum silvarum et inundationem aquarum*').⁹⁸⁹ In the 1270s (later deserted medieval) Csele landed possession (similar to Szekcső) was located in the immediate vicinity of the Danube, north of Mohács, at the inflow of the Csele stream.⁹⁹⁰ According to Györffy, in the immediate vicinity of Szekcső, still belonging to Csele, there was a forest called 'Cselő or Csele-forest.' Thus, the charter most probably mentions this inundation forest which can and could be found along the Danube. An inundation in this area should mean the direct influence of the Danube water level.

9.4.9 Floods of the period 1381-1390

9.4.9.1 Flood in 1381

On 4 March ('secunda ... post dominicam Inuocauit') in 1381, according to the charter of the Lelesz chapter (*litterae prorogatorie*), perambulators were about to go to the boundaries of *Rozuag* (Rozvág) and *Zygan* (Cigánd). However, there was such a bad weather and flood that the perambulation seemed to be not possible on 6 March, so they postponed the perambulation to 15 days after Easter.⁹⁹¹ Thus, already on 4 March the conditions were so bad that they did not have a hope for perambulation two days later.

The neighbouring lands and settlements, and both Rozvág (today Kis-, and Nagy-Rozvág) and Cigánd, were located in Zemplén county, in the northeastern part of the low-lying Bodrogköz area (between the Tisza and the Bodrog rivers). While Cigánd is located close to the Tisza river, Rozvág is at the edge of the low-lying floodplain of the Tisza, north of Cigánd. This also means that a relatively extensive area belongs to the region, potentially affected by flood. Nevertheless, most of the areas of Rozvág are also located in the low-lying area of the Bodrogköz (between the Bodrog and Tisza rivers). Since the two lands had their common boundaries right in the middle of the low-lying area under the primary hydrological

et nostri homines propter absentiam alterius hominis vestri per ipsum Fratrem Baudonem illic adducendi, absque determinatione recessissent ..."

⁹⁸⁸ Györffy 1987 Vol. 1, p. 719; Vol. 2, p. 424.

⁹⁸⁹ DL 6547 (23.06.1378): "... In quindenis festi pent(ecosti)s proxime preteritis et alys diebus ad id aptis, ad facies possessionum Chele et Zekcheni vocatarum ... accedendo homines dictarum possessionum et terre litigiose reambulationes metarum earundem erectiones esimaciones et statuciones propter densitatum Siluarum et invndacionem aquarum iuxta commissionem facere non potuisset." See also: Imrédi-Molnár 1966, p. 266.

⁹⁹⁰ See, for example: DL 8004 (17.05.1276). Györffy 1987 Vol. 1, pp. 293-294.

⁹⁹¹ DL 96560 (04.03.1381): "... metas inter possessiones Rozuag et Zygan vocatas ... propter intemperanciam aeris et aquarum invndacionem ipsam possessionum reambulatum bonomodo fieri non valuisse..."

influence of the Tisza and its branches, in this case we can presume that the flood affected at least the Tisza, and possibly also the Bodrog river.

9.4.9.2 Spring flood in the North, in 1383?

Rather exceptionally, we have a contemporary Polish evidence on a flood event occurred in historical Hungary, collected by Malewicz.⁹⁹² According to the (15th-century) Długosz chronicle, when queen Elisabeth (widow of King Louis I) travelled with her daughter, princess Hedvig (Jadwiga), they could not continue their journey towards Poland, so they had to stop for a while at Kassa (Košice-Sk), because of the floods of waters.⁹⁹³ Since they stopped at Kassa, at the foothills (lower, hilly part) of the northern Carpathians, it seems rather likely that the floods as well affected the highland area.

In their further journey to Poland, they should have proceeded along the Hornád river, since most probably they would have taken the main trade route towards Prešov, with Cracow destination, up in the valley of the Tarca (Torysa-Sk) river. Thus, there is a good chance that the Tarca river was in flood as well. According to Malewicz, this occurred around 10 May in 1383, in late spring time. Nevertheless, Hedvig was crowned in Poland only in autumn 1384, which theoretically allows the possibility of dating the event later than May 1383 (e.g. 1384), too.

The Polish history of Długosz was written in the second half of the 15th century and thus, it is not a contemporary source for the late 14th century. Still, due to the fact that the author applied several such (also high-quality) narratives which perished later, this data is definitely worth to include in the flood database. In such case, usually the main problem which might occur is misdating.

9.4.10 Floods of the period 1391-1400

9.4.10.1 Flood prior to late 1393

In 1393 a charter of prohibition, issued by the chapter of Pozsony for the parish priest of Pispuky (Püspöki; today belongs to Bratislava), was addressed to the castellan of Owar (today Mosonmagyaróvár), who annexed a forested island of the Danube to *possessio Orozwar* (Rusovce-Sk). This could happen due to the fact that (previous) floods of the Danube ('*per inundationes aquarum Danubii*') it 'got closer' to the lands of *Orozwar*. However, the greatest urgent problem at that time was that the people of Oroszvár started to exploit ('cut and destroy') the forest.⁹⁹⁴

Located at the edge of Moson and Pozsony counties, the boundaries of Oroszvár and Püspöki as well meant the border between the two counties. Nevertheless, this borderline was

⁹⁹² Malewicz 1980. p. 116.

⁹⁹³ HP Vol. 10, p. 80 (*Historia Polonica*): " ... (about 10 V, 1383) Aduentum Elisabeth Reginae Hungariae Ludouici relictæ, & filiae illius Heduigis, de quo per Legatos Hungariae apud Siradiam agentes spes cwreta fuerat, excepturi, Barones&Proceres Regni Poloniae, pro die Pentecostes, qui in decimam Maii cadebat diem, ad nouam Sandecz conueniunt. Ad quos Sandiuogius de Subino Palatinus Calissiensis & Capitaneus Cracoviensis, mandata Elisabeth Reginae perferrens, aduenit. Qui (Sandovigius de Subino, palatinus Calissiensis et capitaneus Cracoviensis), Reginam Elisabeth cum filia Heduigi vsque Cassouiam descendisse & abinde propter inundationes aquarum in Poloniae Regnum procedere non potuisse, astruens rogabat, illi non succenserit, offerens eam, si id sibi non remittatur, etiam cum periculo venturam. ... Ubi post nonnullos tractatus, in derogationem conllusionis, quae apud Siradiam facta fuerat, pacta noua inita sunt, vt videlicet pro die Sancti Martini futuro, Heduigis filia Cracouiam adueniat, Regnum Poloniae, sponso, ex sententia Praelatorum & Baronum illi iungendo, possessura."

⁹⁹⁴ DF 237891 (27.11.1393). ZsO Vol. 1, ch. 3227.

determined by the course of the Danube, in which there were dozens of small islands at this area. No evidence is available concerning the dates of previous flood events: we only know that in late November the people from Oroszvár were cutting the trees in an area belonging to Püspöki. Usually, in such cases owners rarely wait years to complain and prohibit the illegal wood-cutters. Thus, we can presume that at least the last flood occurred in the same year.

Documented in an *urbarium* (Pozsony, 1574), in the late 16th-century there was a ford of the Danube at Püspöki where, due to frequent floods in 1573 much less income could be collected than in the previous years.⁹⁹⁵ According to the geographical description of Püspöki in the 1730s, the large village was located at the 'Tsaló-köz', and its boundaries were defended in this period by dams against the floods of the Danube. Oroszvár was one of its neighbours from the south. South of Püspöki a branch of the Danube was located where in the 1730s there was a stone-mill with 4 wheels.⁹⁹⁶

9.4.10.2 Late winter flood at the Upper-Danube in 1396

Postponed oath due to late winter flood or inundation of the Danube

Stephanus, son of *Homodei* (Amadé) *de varkon* (Várkony, Vrakúň-Sk) missed to go to *Jaurinum* (Győr) on 23 February ('*in octavis diey Cinerum nunc preteritis*') and take the oath in the lawsuit against *Johannes*, son of *Stephanus vrdug* of *Bews* (Bős; Gabčíkovo Sk). Since without this oath *Stephanus* would have clearly lost the case, he applied to the King to give one more possibility for taking the oath without giving any fine or penalty. With reference to his clear and acceptable reasons, namely the flood event ('*aque adeo fuere inundate*'), the King issued a charter on 16 May ('*feria tercia proxima ante festum Penthecostes*') postponing the deadline of the oath to 4 June ('*octauo die festi sancte Trinitatis nunc affuturo*').⁹⁹⁷ Based on this charter we can clearly state that on 23 February there was an ongoing flood event which was proved to be hard enough to István Ördög from Bős to travel and take the oath in Győr. We have, however, no information about the beginning and duration of this flood event.

Same great Danube flood obstructs to reach a land in Žitny ostrov

On 23 February ('*in octauo die cinerum*'), thus on the same day when *Stephanus* in the previous case should have taken the oath, the same chapter of Győr issued a charter concerning

⁹⁹⁵ Maksay et al. 1959. 86 p.

⁹⁹⁶ "Volt itt a Helség mellett Dél felül a Dunának egy ága, mellen a Méltóságos Uraság 4 kerekű Kő-Malma forgott, mell víznek menése mastanában megént ujjont helre hozattatik." In: Dávid-T. Polónyi 1980, p. 53.

⁹⁹⁷ Latin critical edition: Hazai Vol. 1, ch. 183, pp. 288-289: "..., quod quam Stephanus filius Homodei de varkon aduersus Johannem filium Stephani dictum vrdug de Bews in facto Juramenti conuictus eandem Juramentalem deposicionem iuxta adJudicacionem viri magnifici domini Leustachý de Ilswa regni nostri Palatini in octauis diey Cinerum nunc preteritis inpresencia Capituli ecclesie Jauriensis facere debuisse Ipseque Stephanus huiusmodi Juramentalem deposicionem obmittendo seu negligendo contra dictum Johannem infacto potencie obeandem obmissionem conuictus fore dinoscatur tamen quia ex plurimorum prelatorum et Baronum ac procerum regni informacione didicimus quod tempore dicte Juramentalis deposicionis aque adeo fuere inundate quod ipse Stephanus ad peragendum et consumandum dictum Juramentum verisimiliter nequiuuit proficisci nec indictam Jaurinum properare Ideoque nos pensata huiusmodi rationabili causa nolentes dictum Stephanum eatenus agrauari eidem in et superfacto dicte potencie in quo vt premittitur previa racione conuictus, fore censetur, capitique possessionibus et bonis eiusdem vniuersis graciam et misericordiam speciale duximus faciendam et fecimus perugorem decernentes vigore presencium et commitentes vt memoratus Stephanus filius Homodei annotatam Juramentalem deposicionem contra predictum Johannem dictum vrdug octauo die festi sancte Trinitatis nunc affuturo coram dicto Jaurensi Capitulo iuxta contenta litterarum palatinalium super ipsa Juramentali deposicione confectarum denuo et ex nouo facere valeat atque possit ..., datum Posony feria tercia proxima ante festum Penthecostes, Anno domini Millesimo CCCmo Nonagesimo Sexto." Hungarian regesta: ZsO Vol. 1, ch. 4389, p. 484.

another lawsuit. In this other legal debate between the chapter of Pozsony and *Temel de Sancto Georgio* (Sväty Jur-Sk), among other matters, *possessio Kyrth* in the Csallóköz district should have been visited, but because of the great flood of waters ('*propter nimiam aque inundantiam*') they could not go to the mentioned land.⁹⁹⁸

Since *Kyrth* (Kürt; Ohrady-Sk) was located in the Žitny ostrov island area, the flood of waters clearly means the Danube river, although it does not exclude the possibility of other rivers flooding as well in the same time. The text refers to the fact that the waters of a whole area were in flood ('*que in hiis partibus viget de presenti*'). Compared to the previous case which clearly described the same Danube flood event, it is an important addition that not only a flood but a great (*nimia*) flood of the Danube occurred in late February.

The same late winter Danube flood event or earlier flood waves?

In a charter issued on 7 March by the official judge of the archbishop of Esztergom on 1396, the debated land called *Kuzepteletek* (Középteletek) was annexed to the settlement and landed possession of Vagyakarsa (Kračany-Sk).⁹⁹⁹ This decision was a result of a multiannual debate over the ownership of Középteletek: whether it beloned to *Kuncelkarcha* (Göncölkarsa) or *Vagyakarcha*. The perambulation and other parts of the field survey went on without any problems. According to the order (*mandatum*), they should have reported the results back on 16 February ('*ad ... octavum diem diei dictarum octavarum festi Purificacionis beate virginis*'), but because of the floods of waters and dangers of roads ('*propter inundaciones aquarum et discrimina viarum*') they postponed the day of report.¹⁰⁰⁰

⁹⁹⁸ DF 228302 (23.02.1396): "Serenissimo principi domini eorum domino Sigismundo dei gracia Regi hungarie dalmacie Croacie etc, Marchionique Brand() etc, Capitulum ecclesie Jauriensis ..., cum perpetua fidelitate litteris, magnifici viri domini Comitum Johannis de pztoh, Judex Curie vestre excellencie ... in se experimentibus, pro (c)hanonici capitulo ecclesie posoniense contra Comitem Temel de Sto Georgio loquentibus, honorifice receptis, iuxta quarum continenciam, Emerico magno de vasvar, homine vestro, de curia vestra ad id dest destinato, nostrum hominem, honorum virum domini, prepositum ecclesie de papuch, socium et concanonicum nostrum, ad contenta dictarum litterarum, dicti Comitis Johannis, fideliter exequenda, per nostre testimonio fide dignum, duximus transmittendi Ipsum tandem, ad nos reuersi nobis contradic() retulerunt quod ipsum, die diei Cinerum, iuxta continenciam dicarum litterarum dici comitum Johannes, propter nimiam aque invndantiam que in hijs partius viget de presenti, nec ad faciem posessionis kyrth vocate, predicti capituli posoniensis, accedere neque contenta dictarum litterarum, eundem Comitem Johannis exequi valuissent ..., datum in predicto octavo die diei Cinerum, anno domini Millesimo cccmo nonagesimo sexto." Hungarian regesta: ZsO Vol. 1, ch. 4272, p. 468.

⁹⁹⁹ This charter also listed in the first volume of the regesta collection series ZsO; however, in the short regesta the flood itself is not mentioned. See: ZsO Vol. 1, ch. 4294, p. 469.

¹⁰⁰⁰ Zichy Vol. 5, ch. 11, pp. 10-17: "Nos magister Georgius filius Nicolai de Kwagowrs iudex et procurator curie reverendissimi in Christo patris domini Johannis de Kanisa archiepiscopi ecclesie Strigoniensis etc. memorie commendantes tenore presencium significamus quibus expedit universis, Quibus quidem literis exhibitis, partes predice eis per nos in premissis iuris medelam pecierant elargiri; verum licet prefati archiepiscopal et dicti capituli homines memoratam terram litigiosam Kuzepteletek nominatam tempore reambulacionis et metarum erectionis et ostensionis eiusdem intra, metas prefate possessionis Kuncelkarcha vocate ipsorum actorum existere conspexerunt, ipsa etiam terra litigiosa per eosdem archiepiscopalem et dicti capituli homines ad unum locum sessionalem ac viginti iugera terrarum arabilium et feneti decem falcastrorum estimata fuerit, tamen quia ipsa terra litigiosa Kuzepteletek nuncupata non intra metas prefate possessionis Kuncelkarcha ipsorum actorum, sed intra metas predice possessionis Vagyakarcha ipsorum in causam attractorum existere ex prescriptis duabus literis dicti capituli per prefatum procuratorem ipsorum actorum productis apparebat, ...; et post hec ... ad octavum diem dictarum octavarum festi Purificacionis beate virginis in literis dicti capituli per partes nobis commiseramus reportandam. ad prenotatam possessionem Vagyakarcha applicando et annexendo, in perpetuum statuissent et perennaliter commisissent possidendum; et quia prelibati in causam attracti iudicariam iuxta nostram commissionem ad dictum octavum diem diei dictarum octavarum festi Purificacionis beate virginis propter inundaciones aquarum et discrimina viarum seriem premissorum nobis bono modo reportare non valuissent, ideo ipsum capitulum eisdem in causam attractis coram nobis comparendi dictas octavas festi beati Mathie apostoli pro termino deputavisset Quibus quidem literis exhibitis, sibi et dictis aliis in causam attractis per nos in premissis iuris equitatem postulavit impertiri Mauricius prenotatus."

Since the perambulation took place in the Kračany (*Karcha*) area in Žitný ostrov, the mentioned floods of waters clearly referred to the Danube. Since dating also fits very well to the previous cases, we can conclude that this charter refers to the same flood event than the previous two cases.

Some additional information, however, have to be considered:

1. In the previous two cases simply flood of water(s) were mentioned, in our present case floods (in plural) were applied.
2. Since the dispute belonged to the authority of the archbishop of Esztergom, personal report most probably meant that responsible persons had to appear in Esztergom. And thus, travel from Žitný ostrov to the archbishop's court to Esztergom had to be launched.
3. Perambulators should have reported on the successful field survey on 16 February, but they failed to do so, because of the floods and uncertainties of roads/travel. This date is exactly one week earlier than the flood reports of the previous two cases.

In all the three cases the whole flood-problem was reported because people could not travel. This also means that the Danube flood did not occur on the very same day when the legal process or report had to take place and thus, in our present cases most probably we face with a prolonged flood event (possibly with flood waves), lasting for several days (or weeks).

Spring flood in Slavonia: 1396

Following the order of King Sigismund, issued on 2 September 1395, the chapter of *Chasma* (Časme-Hr) and the King's man (sent from the royal court) carried out the perambulation (and introduction) of the landed possession of *Thomasalch* (Tomašica-Hr) from the side of the *districtus civitas Rachya*, on 28 April 1396 (preserved in a charter issued on 3 May).¹⁰⁰¹ However, there was an inundation at the *fluvius Syuych* ('propter in aquaositatem et undationem(!) ipsius fluuy') and because of this inundation it was not possible to settle earth landmarks.¹⁰⁰² The mentioned *fluvius Syuych* might be the Trebež (Lonja-Trebež), since the *Chasma* (Časme) river is mentioned in the text as a tributary of the first one.

9.4.10.3 Floods in 1399

Roads and crossing place destroyed by winter floods: ferry of the Tisza river

According to a charter issued on 2 May, the harbour and crossing place (for ferry and ford) over the Tisza river (*in fluvio Thicie*) had to be moved from possessio *Roph* to *Swl* because floods destroyed the roads in winter. The owner, István of *Nana* (today Tiszánána) asked King Sigismund for permission for this significant change, requiring royal permission. Sigismund accepted his reasons and gave the permission for moving the ferry, toll, ships etc. from *Roph* to *Swl*.¹⁰⁰³ *Roph* (today Tiszaroff) and *Swl* (today Tiszasüly) were/are located in medieval Heves county, at the Tisza river.¹⁰⁰⁴

¹⁰⁰¹ Local geographic names: *Rachya civitas, Megurechye, possessio Palusnycha*. Waters: *fluvius Syuych, fluvius Racha, fluvius Waleňk, fluvius Grabouch, fluvius Kybnatech, fluvius Chernoch (Chornech), fluvius Chasme, flumina Zekernyes, fluvius Gradechka, fluvius Chermynylaka*.

¹⁰⁰² DL 87756 (remained in transcription, issued in 1406): ".... ut ipsi feria quinta proxima post festum beati Marci Evangeliste proxime preteritum, et alys diebus ad id aptis et sufficientibus ad faciem prelibate possessionis Tomasolch vocate, versus plagam meridionalem eundo directe caderet in fluum Chasme penes malendinum Mykla vayuode condam in Racha commorantis abhinc directe versus plagam meridionalem tendendo venissent in fluum Synych, vocatum vbi videlicet propter in aquaositatem et undationem(!) ipsius fluuy metam terream facere non ualuerint sed signo metalii vnam arborem Ilicis cruce signassent, in quod scilicet fluum Syuych fluum Chasme et alie aque equisimiles fluenter," Hungarian regesta: ZsO Vol. 1, ch. 4371, p. 483.

¹⁰⁰³ DL 24698 (02.05.1399): "Nos Sigismundus dei gracia Rex hungarie dalmacie Croacie etc marchioque Brandenburgensis etc Memorie significantes Tenore presencium quibus expedit universis quod fidelis noster

Great spring flood of the Danube in the South

In a charter dated 24 March the report about the planned perambulation of Bátmonostora and Szeremle (Bodrog county) was included. The planned date was 12 March ('octavo die diei medii Quadragesime proxime preterito..., et aliis diebus ad id aptis et sufficientibus'), but on that day and the following days, due to the great flood event ('quia propter nimiam excresciam et validam inundacionem aquarum'), the perambulation was postponed.¹⁰⁰⁵ Due to the fact that the settlement of Bátmonostora was located east of the Danube at the very edge of the low-lying floodplain of the Danube, and Szeremle was located directly at the Danube in the floodplain, where at its eastern side of the land one branch of the river called Vajas could be found, the mentioned flood event clearly means the flood of the Danube.

Spring flood in Szatmár county, in 1399

The judge of the royal court informed the convent of Lelesz that (among others) on 1 May 1399, the perambulation and land division of *Tykod* (*Tyukod*)¹⁰⁰⁶ took place. The forests, haylands and pastures, waters and fishponds could not be measured due to the flood of waters, so they were left in common use.¹⁰⁰⁷ *Tyukod* was located along the edge of the wetland area of

Stephanus filius Stephani de Nana nostram accedendo vie seu strate versus nauigium seu portum ac vadum suas in fluuio Thicie in possesione sua Rof vocata, penes Ipsum fluuium ad Jacente huius tendentes per Invndaciones aquarum taliter occupate destructe et anhilate hieme, ut per eas viatorum non valent, ...vt dictos portum nauigium seu vadum suas, ad alium locum aparte inferiori dicte sue possessionis videlicet in oppositum possessionis nobilium Swl vocate, penes eundem fluuium existentis, hominum transfere, et exacciones seu tributum Ipsiis suo portus nauigij seu vadi ab Ipsiis viatoribus Ibi Ipsum fluuium transfretantibus, In dicta possessione nobilium Swl vocata recipere et exigere valent, ..., vt dictum portum nauigium seu vadum suos in prefata sua possessione habitum, ad dictum alium locum videlicet in oppositum possesionis Swl appellate transfere ac de ipso loco sui portus nauigij seu vady, ad possessionem prefatam nobilium Swl nominatam prefatas viatorum transferandi, Ibique exacciones seu tributum eiusdem sui portus nauigij seu vadii hos quos in dicta sua possessione Rof appellata ab Ipsiis recipere et exigere consueuant(?), ..." Hungarian regesta: ZsO Vol. 1, ch. 5843, p. 646. See also: DL 8436.

¹⁰⁰⁴ Csánki 1890 Vol. 1, p. 69.

¹⁰⁰⁵ Zichy Vol. 5, ch. 94, pp. 103-104: "Nos capitulum ecclesie Quinqueecclesiensis damus pro memoria, quod cum nos receptis literis viri magnifici comitis Frank de Zechen iudicis curie regie adiudicatoriis, formam sue iudicarie deliberacionis in se exprimentibus, ei iuxta earumdem continentiam unacum magistro Ladislao de Thapaz notario eiusdem iudicis curie regie homine regio de curia ad id specialiter deputato, magistros Johannem de Rendeue pro parte religiosi viri domini fratris Johannis abbatis de Batha actoris, item Demetrius subcustodem pro parte magistri Ladislai filii Ladislai de Bathmonostora in causam attracti, socios et concanonicos nostros ad ea que in dictis literis adiudicatoriis annotati iudicis curie regie continentur peragenda nostris pro testimonii duxissemus destinandos, tandem iidem exinde ad nos reversi, nobis consona voce retulerunt, quod ipsi octavo die diei medii Quadragesime proxime preterito ad quem iudicaria commissio ipsius iuducus curie regie medianibus literis nostris prorogatoriis de regio literatorio mandato pro ipso magistro Ladislao nobis allato extiterat propogata, et aliis diebus ad id aptis et sufficientibus, ad facies possessionum Zeremlyem ipsius domini abbatis et Bathmonostora prefati magistri Ladislai, vicinis et commetaneis earumdem universis illuc legitime convocatis, predictisque partibus presentibus accessissent, et quia propter nimiam excresciam et validam inundacionem aquarum prescriptam iudicariam commissionem annotati iudicis curie regie in prescriptis literis suis adiudicatoriis explicatam effectui mancipare nequivissent," Hungarian regesta: ZsO Vol. 1, ch. 5775, p. 640.

¹⁰⁰⁶ Csánki Vol. 1, p. 488 in Szatmár county.

¹⁰⁰⁷ C. Tóth 2005, ch. 42, pp. 252-253 (12.05.1399): ".... ville Tykod a parte meridiei adiacenti in via fossato lutoso unam terream apparentem erexissent, que orientali eidem Johanni separaret, a parte vero occidental distingeret ... ad partem orientalem procedendo secus quandam arborem silicis in uno loco lutoso unam metu terream bene apparentem tumulassent, ... penes viam, qua iretur versus civitatem Zathmariensem ad terras arables eundo a parte septentrionis ...; dehinc versus plagam occidentalem ad lacum Tyztatow vocatum penes viam transeuntem a parte meridionali computando iamdictis in causam attractis cum signo metalii assignassent, ubi unam metu terream bene apparentem erexissent et sie mete ipsius quarte partis sepefate possessionarie portionis ...; silvas autem, prata et fenilia, aquas et lacus piscium, quas propter inundacionem aque mensurare non

the Ecsedi-láp. Thus, the mentioned flood probably went together with the increase of water level of the wetlands.

Late spring flood of the Sár river

According to the report of the Szekszárd chapter, in Tolna county at *Belch* and *Kuzepfalu* a perambulation took place on 1 May ('*octavo die festi beati Georgii martiris nunc preteriti*'), and a charter was issued on the third day after the perambulation (3 May). *Belch* (Belcs) and *Kuzepfalu* (Középfalu) were located in the area of *Kulesd* (Kölesd), *Kaydach* (Kajdacs), *Hence* (Pusztahencse), and *villa Barlyad* (Borjág). When the perambulation reached the swamp in which there was pasture and arable lands, the earth landmark did not appear (could not be seen) due to the inundation of water ('*propter inondanciam aque*').¹⁰⁰⁸ In this case the swamp had higher water level than usual. Since the place was located close to the Sár river, there is a possibility that it was the flood of the Sár river. Nevertheless, in other parts of the perambulation no problem appeared at the river itself. Thus, it is also possible that the high water level or innundation of the swamp is more connected to high groundwater level.

Flood of the Lonja river in Slavonia

Following the order of the King (Sigismund), the description of a perambulation was provided in a charter issued by the chapter of *Chasma* (Časme-Hr) on 11 December in 1399. The perambulation of the extensive *possessio Gresenche* (Garešnica-Hr)¹⁰⁰⁹ took place on 5 December and following days ('*feria sexta ... ante festum beati Nicolai confessoris ... et aliis diebus ad id aptis et sufficientibus*'). Perambulators walked along the boundaries without any problem until they arrived at the *Lonye/Lonya* (Lonja) river.¹⁰¹⁰ However, the Lonja was flooding in those days so heavily that they could not cross the river (mentioned as *aqua* or *fluvius*), and thus, they were not able to reach some other boundaries of *Gresenche* located beyond the Lonja, at the *Zawa* (Sava) river.¹⁰¹¹

potuissent, communi usui relinquendo; terras etiam, si que absque divisione relinquissent." (DF 220084) This entry is not listed in the regesta collection of ZsO Vol. 1.

¹⁰⁰⁸ Zichy Vol. 5, ch. 96, pp. 105-108: "..., qui tandem ad nos exinde reversi nobis concorditer retulerunt, quod ipsi octavo die festi beati Georgii martiris nunc preteriti, ad quem ipsa possessionaria reambulacio et cetera pro tunc inibi fieri debencia de parcium voluntate literis nostris mediantibus exinde confectis extiterant prorogata, ad facies possessionum Kuzepfalu predictam dictorum actorum et Belch in causam attracti, vicinis et commetaneis earumdem universis inibi legitime convocatis, et partibus presentibus accessissent, et primo prefatam possessionem Kuzepfalu ipsorum actorum a parte possessionis dicte Belch predicti magistri Ladislai per metas et cursus metales iuxta demonstracionem predicti Andree in sui personaliter dictorumque fratrum suorum cum literis procuratoris vestris personis, hoc modo reambulassent: quod primo incepissent a parte occidentis super rippam fluminis Saar in loco Toukaurtine vocato, abinde prata et paludes quasi inter meridionalem et orientalem plagas v....ad extremitatem eiusdem prati ad diverticulum terrarum arabilibus (sic!), ubi in palude quendam truncum piri silvestris ostendisset, ubi metu terream fore retulisset, que ipsis propter inondanciam aque non apparuisset; deinde reflexive inter easdem orientalem et meridionalem plagas venissent quasi ad latus cuiusdam montis quendam tumositatem terre pro meta ostendisset, quem ipsi utrum meta fuerit an non, cognoscere non valuissent, ubi signum metale fecissent; Datum tertio die termini prenotati, anno domini Mmo CCCmo nonagesimo nono." Although the charter is referred in the ZsO Vol. 1 (ch. 5846, p. 647), no information is provided there on the flood event itself.

¹⁰⁰⁹ For the landed possessions and domains of the area see, for example: Kiss 2002, pp. 127-141.

¹⁰¹⁰ Local geographic names: *possessio Gresenche*, *vallis Zapolscicha*, *Alsokozouch*, *possessio(?) Zythnik*, *possessio Zedininch*, *vinea Farkaseuina*, *mons Farkashege*, *Farkaswlege*, *vallis Zuhodal*, *puteum Glogouech*, *mons Dersanouch*, *vallis Dersanouchwlge*. Names of waters: *fluvius parvus Gresencha*, *fluvius Zapolscicha*, *fluvius Bramlath*, *fluvius Kozouch*, *fluvius Babyak*, *fluvius/aqua Lonye* (Lonja), *fluvius Peklench*, *fluvius Peznyakwlge*, *fluvius Dubocech*, *aqua Iezero*, *fluvius Naggresenche*, *Gresencheptaka*.

¹⁰¹¹ Full latin edition of the charter is published in: Smičiklas Vol. 18, ch. 355, pp. 510-513: "... Nos igitur mandatis vestre serenitatis semper obedire cupientes,, vt ipsi feria sexta proxima ante festum beati Nicolai confessoris nunc proxime preteritum et aliis diebus ad id aptis et sufficientibus ad facies predice possessionis Gresencha vocate et suarum pertinenciarum iuxta continencias ipsarum litterarum vestre maiestatis pariter

9.4.10.4 Flood in Transylvania prior to the end of 1400

In a charter issued on 6 December in 1400, the petition of *villa Bichal* (today part of Huedin-R), located in medieval Kolozs county was described: inhabitants applied for having their own parish church due to the ongoing difficulties such as the great distance, difficulties of roads and flood of waters (*propter nimiam distantiam et alias propter asperitatem et difficultatem viarum ac inundationem aquarum*). Permission did arrive from the apostolic seat.¹⁰¹² The village was located in the catchment area of the Sebes-Körös (Crișul Repede) river, north of Bánffihunyad (Huedin-Ro). Due to the importance of the problem, the flood of waters might mean a long-lasting (or frequently obstructing) disturbance for travellers between the parish church (Bánffihunyad) and Bikal.

accessissent,, inde flectitur ad meridiem per magnam viam in magno spacio eundo per metas terreas peruenit ad vnam metam terream, penes viam sitam iuxta possessionem Gresenche, et quia propter inundacionem aque Lonya nuncupate vltra ipsam aquam Lonya transire et metas eiusdem possessionis Gresenche vocate penes fluuium Zawa de nouo erigere et reambulare nequivissent." For Hungarian regesta (and transcription), see: Mályusz 1931, pp. 308-310. Although the charter is listed in the regesta collection ZsO Vol. 1 (ch. 6195, p. 689), the flood itself is not mentioned.

¹⁰¹² MVH Vol. 1/4/2, ch. 346, pp. 287-288: "Bonifacius etc. Venerabili fratri Episcopo Waradiensi salutem....Afluentis Apostolice Sedis benignitas supplicum vota, illa presertim, per que Christifidelium animarum saluti consulitur, et corporum periculis obviatur, ad exauditionis gratiam libenter admittere consuevit. Sane petitio pro parte dilecti filii nobilis viri Gregorii Helye de Thamasfalva, domicelli Transilvaniensis diocesis, nobis nuper exhibita continebat, quod cum dilectis filiis universitati et hominibus ville Bichal (Bikal in comitatu Kolos), tue diocesis, parochialis ecclesie sancte Elisabeth de Huniad (Bánffy-Hunyad), dicte tue diocesis, propter nimiam distantiam et alias propter asperitatem et difficultatem viarum ac inundationem aquarum ad eandem ecclesiam non sine laboribus magnis et plerumque discriminibus pro audiendis divinis officiis et percipiendis ecclesiasticis sacramentis et precipue baptimate parvolorum valde difficilis sit accessus, pro parte dicti Gregorii fuit nobis humiliter supplicatum, ut sibi in dicta villa de Bichal, in qua dicti parochiani habitant, et que est multum accommodus locus, aliam parochialem ecclesiam de novo fundandi et construendi ac sufficienter dotandi pro uno rectore, inibi perpetuo in divinis Domino servituro, licentiam concedere de benignitate apostolica dignaremur. Nos igitur de premissis certam notitiam non habentes et de tua circumspectione in hiis et aliis speciale in Domino fiduciam obtinentes, Fraternitati tue per apostolica scripta mandamus, quatenus, si est ita, super quo tuam conscientiam oneramus, prefato Gregorio huiusmodi aliam parochialem ecclesiam, ad honorem et sub vocabulo et cuiusvis sancti vel sancte maluerit, fundandi et construendi, prius tamen assignata per eum sufficienti dote pro uno rectore ipsius ecclesie, de qua rector ipse commode sustenari, episcopalia iura solvere et alia sibi incumbentia onera supportare valeat, auctoritate apostolica licentiam largiaris. Datum Rome apud Sanctum Petrum Octavo Idus Decembbris Anno Duodecimo." Although this charter is referred in the ZsO Vol. 2 (ch. 686, p. 80), no information is provided there on the flood event.

9.5 15th-century flood events

Similarly to the previous century, the 15th century is rich in flood related evidence. Whereas general temporal distribution, concerning the number of reference, shows a decline in the mid- and late-15th century, in spatial distribution (for locations, see: *App. 1c*) the importance of the western parts of the country is more pronounced than in the 14th century.

9.5.1 Floods of the period 1401-1410

9.5.1.1 Flood event(s) in 1402

Flood of waters and a Danube-flood event in June 1402

On the day of Peter and Paul apostles (29 June), flood of waters is mentioned in the *Continuatio Claustroneoburgensis* referring to Bavaria, Austria and Hungary. Flood water stayed for another 10 days and then decreased. Consequences of the destructive Danube flood event in Austria are as well listed: all agricultural products and villages were destroyed in the neighbourhood ('*destruxit omnia frumenta in vicinio, et gramina et villas et pomeria*').¹⁰¹³ The inundation extended to a mile along the banks of the Danube ('*in aliquibus locis dilatabat se aqua per unum miliare ad latus*').

Due to the fact that Klosterneuburg is located in the neighbourhood of Vienna, about 100 km upstream on the Danube from the Hungarian borderline, the information of this contemporary narrative is especially valuable. Nevertheless, it can as well be important that – according to the annalists of Klosterneuburg – there was a general flood of waters, which might suggest that, besides the Danube, other important rivers (probably in Hungary, too) were in flood. This can help us evaluating the next evidence, referring to other summer flood events of 1402.

Floods on the Danube and other rivers: summer 1402 in the South

On 27 June ('quarto die festo nativitatis beati Johannis Baptiste proxime preteriti') a perambulation took place in the area of Szeremle and Bátmonostora, at the Lower Danube. Taking the ongoing floods of the Danube and other rivers ('*considerantes inundaciones aquarum Danobii et aliorum fluviorum*') into consideration, perambulators commonly decided to postpone the fueld survey to the time when waters get frozen, to the period from 6 December to 13 January ('*a festo beati Nicolai confessoris proxime venturo incipiens usque octavum diem festi Epiphaniarum domini*').¹⁰¹⁴ Which suggests a 'massive' extension of water body, unlikely to decrease for a longer while.

¹⁰¹³ MGH SS Vol. 9, p. 736 (*Continuatio Claustroneoburgensis* V): "1402 fuerunt inundaciones aquarum per Bavariam et Austriam et Ungariam, ita quod Danubius exiebat ultra consuetum locum in Austria in utraque parte, et destruxit omnia frumenta in vicinio, et gramina et villas et pomeria; et in aliquibus locis dilatabat se aqua per unum miliare ad latus; et quidquid arripuit, hoc totum destruxit; et hoc factum est in die Petri et Pauli apostolorum (29. VI.), et aqua stetit fixe quasi ad decem dies, antequam minuebatur." See also Pautsch 1953, p. 85, and Rohr 2007, pp. 231-232.

¹⁰¹⁴ Latin edition published: Zichy Vol. 5, ch. 256, pp. 299-300: "....., quod ipsi quarto die festo nativitatis beati Johannis Baptiste proxime preteriti ad facies possessionum Zeremlyen et Bathmonostora predicata vocatarum, vicinis et commetaneis earumdem universis, et partibus videlicet religioso viro domino fratre Paulo abate de Batha actore ab una, et magistro Ladislao filio Ladislai de dicta Bathmonostor in causam attracto parte ab altera predictis presentibus accessissent, et dum contenta earumdem literarum dicti magnifici viri domini comitis Frank ad iudiciarium effectum deducere voluissent, tunc eodem partes concordili tractatu considerantes inundaciones aquarum Danobii et aliorum fluviorum, reambulacioni metarum possessionum predictarum impedimentum inferre, et eandem rembulacionem prohibere, unanimi earum voluntate et consensu, effectuacionem iudiciariam

In the light of the legal, charter evidence, the report of the *Continuatio Claustroneoburgensis* sounds quite interesting: first of all, this charter and the next one on the Rába flood support the description of the narrative concerning Hungary. Nevertheless, it is interesting that while the Austrian narrative dates the outbreak of the great flood event to 29 June, the charter evidence clearly suggests a somewhat earlier date, since the cancelled perambulation was dated 27 June in south-central Hungary, and even the charter itself was written within 5 days (1 July). Thus, either the outbreak of the great 1402 flood event occurred earlier than the Austrian narrative suggests (at least 1-2 weeks are needed for the flood wave to reach southern Hungary), or the flood started earlier in Hungary.

However, since the Danube has no significant inflow (which might cause higher waterlevel on the Danube) between the Hron and the Drava rivers, the 'Hungarian' Danube-flood had to receive the water surplus from the main rivers of the northern Carpathians (e.g. Vah, Hron) or even earlier from the Morava river, but the waterlevel of the river had to be high already in Austria. The charter evidence suggests that not only the Danube but also other rivers in the area were in flood in the same time. As such, the Danube possibly had high water level already well-before 29 June with probably several flood waves. With possible additional flooding of rivers (must have caused by rainfall) in the Carpathian Basin, the Danube flood caused a much earlier accumulation of waters in the south, than the date of the 'real', great outbreak in the West, reported by the *Continuatio Claustroneoburgensis*.

August flood or inundation evidence: the Rába river in 1402

Following the order on 1 August¹⁰¹⁵ and the description of the charter issued on 15 August ('quarto die octavarum diei festi dominici confessoris'), on 11 August 1402 ('in dictarum octavarum die festi beati dominici confessoris et dies sequentibus') a perambulation of boundaries between the possessions of *Kopach* (*Kopács*) or *Zeech* and *Balase*, in the neighbourhood of Rum took place where at that time the Rába river was in flood.¹⁰¹⁶ Thus, due to this flood event neither a 20 *iugerum* land, nor the '*nemus*' and the waters could be divided ('propter inundationem fluvij Rabe').¹⁰¹⁷ In the light of the information gained from Klosterneuburg, there is a possibility that this Rába flood is a flood event, still connected to the early summer (or already spring) precipitation surplus, which problems continued in July. In this sense, the early-August Rába flood could be either part of a long-lasting inundation, started already in late June or July (or earlier), or can as well be a result of a July rich in precipitation.

Among the most important geographic names, today the settlements of Rábakovácsi (*Kovach*), Balozsamegyes (*Balase* and *Megyes*) can be clearly located, all along the western shoreline of the Rába river where the main road led from the direction of Rum to the town of Kör mend (the medieval *via Kurmendwtha*). Although only the flood of the Rába river is mentioned, partly the present branch of the river, partly as a separate waterflow, the Herpenyó as a (fish)pond (!) also appeared ('piscinis Insulis et specialiter piscina wlgo herpenye dicta'). It

commissionis dicti iudicis curie vestre ad tempus ieuniale et congelacionem aquarum distulissent eo modo, ut a festo beati Nicolai confessoris proxime venturo incipiens usque octavum diem festi Epiphaniarum domini, quandocunque tempus congelacionis aquarum adeo eventum fuerit, ut demonstraciones utrarumque parcium iuxta premissamque iudicariam commissionem iudicis curie vestre reambulacionem exequi valuerint," For Hungarian regesta, see: ZsO Vol. 2/1, ch. 1759, p. 209. For some historical background with mentioning the fact of the flood event with reference, see: Fedele-K. Németh 2006, p. 423.

¹⁰¹⁵ ZsO Vol. 2/1, ch. 1815, pp. 214-215 (only transcription remained in DL 49584).

¹⁰¹⁶ Local geographic names and settlements mentioned in the charter: *Rum*, *Kouach*, *Megyes*, *via Kurmendwtha*, *Pechel*, *vie Pethendwtha*, *Pethend*, *Bodorfeld*, *Gothardfeld*, *Chakan*, *Tekenes*, *Sarmellek*, *Igrecij*, *Zeplak*, *Endred*, *Kewreshes*, etc.

¹⁰¹⁷ DL 49584 (ZsO Vol. 2/1, ch. 1831, p. 217): ".... Quoddam permissorium in viginti iugeribus terrarum vel citra adiacens ac quedam nemora propter inundationem fluvij Rabe in facie eiusdem decurrentis dividere non valentes simulcum quibusdam venis aquarum eisdem partibus communiter uti commisissent, eandem autem tertiam Balase"

is also interesting to note, that – similar to a later case of Lake Fertő – the count of river Rába is mentioned in the charter ('*a comite eiusdem fluuij Raba, vulgo varnagy dicto*').

9.5.1.2 Until March 1405: Continuous floods – human impact and/or natural phenomena?

After the preparation of a new mill-canal leading water away of the Sár river, due to continuous flood events, (fine) sediment started to fill up the original riverbed.¹⁰¹⁸ Beyond the legal and ownership problems, caused by the new mill canal, the main problem is artificial management. Still the period with flood events seemingly fastened up the sedimentation, and caused problem at the old riverbed of the Sár river. As such, natural processes were as well reported beyond problems caused by (mis)management (still, due to unertanties, it is not included in robust flood analyses). It is the present area of Telekes and Gersekárét and Sármellék (international airport) in Vas county.

This case, however, shows parallels to botzh Czech and Austrian flood conditions of the year: first melting of deep snow and than wet summer and autumn caused floods.¹⁰¹⁹

9.5.1.3 Summer flood in 1406 – on the Danube again

Connected to a long-lasting lawsuit concerning the division of some estates in the possessions of *Bodobar*, *Bodofalua*, *Obarfeulde* and *Fenyer* the occurrence of floods was mentioned. Because of floods, one of the parties could not appear at the chapter of Pozsony. Although it is not possible to provide exact information on the date of the event, it is clear that it happened some time between 1 July and 15 September 1406, but most probably more than at least a couple of days before the later date,¹⁰²⁰ and thus, most probably it was a summer flood. Since all the above-mentioned lands and other places mentioned in the charter are located on the island of the Danube (Žitný ostrov), this flood was clearly connected to the Danube. A great flood all over Austria is mentioned by the *Annales Mellicenses*, under the year of 23 June 1406 ('*In vigilia sancti Iohannis Baptiste*'),¹⁰²¹ which also supports the idea of a summer Danube flood on the Carpathian-Basin sections of the Danube.

9.5.1.4 Flood in early 1408 or before: the Transylvanian Sebeş river

Appearing in a charter issued on 22 March 1408 ('*viginti secundo die ferie quinte post cinerum*'), an earlier flood event is mentioned on the Sebeş river (close to the Mureş river). Partly ageing, and partly this flood event destroyed a mill in *villa* or possession Waradya (Alsó-Váradja, today part of Alba Iulia-Ro), in medieval Alsó-Fehér county in Transylvania ('*molendini ex nimia antiquitate et impetu inundationis aque corrupti*').¹⁰²² No information is

¹⁰¹⁸ DL 92239 (17.03.1405). Hungarian regesta: ZsO Vol. 2/1, ch. 3726, p. 446.

¹⁰¹⁹ Brázdi-Kotyza 1995, p. 120; Rohr 2007, p. 232.

¹⁰²⁰ DL 102961 (24.11.1406). For Hungarian regesta, see: ZsO Vol. 2/1, ch. 5133, pp. 649-650.

¹⁰²¹ MGH SS Vol. 9, p. 515 (*Annales Mellicenses*): "1406. ... In vigilia sancti Iohannis Baptiste magna inundacio aquarum facta est per totam Austriam."

¹⁰²² DL 9399 (22.03.1408): "... ut sponte voluerant, lapides molares predictos ad locum molendini pretaxati vectura in communi deferri facere ac pro reformatione corporalis hedificii domus ipsius molendini ex nimia antiquitate et impetu inundationis que corrupti pretaxatum capitulum carpentario dumtaxat solvere, ... Item particulam terre inter dictam villam Waradya et memoratos iobagiones Volachales adiacentem, ... item molendinum in fluvio Sebus existens nunc penitus desolatum et etiam alia loca molendini, que super fluminibus Morus et Sebus successu temporis intra metas dicta possessionis Waradya fieri possent, item silvas, nemora, terras

available concerning the date of this flood event. However, the winter of 1407/1408 was quite cold large parts of Central Europe since, according to the *Kalendarium Zwetlense*, the Danube froze over in Bavaria, Austria and Hungary.¹⁰²³ This fact usually highly increases the chance for a desctructive (ice) flood event while melting. Nevertheless, it has to be noted that since no more specification is available, this one certain destructive flood event, completely destroying the old mill, could as well occur earlier.

9.5.1.5 Flood in the South: summer 1409

In a prorogation charter issued on 8 August 1409, due to floods of waters, a lawsuit was postponed in Temes (Krassó) county. The official procedure of the legal debate (against *Demetrius de Dobuz* and sons of *Chep de Gyertyanos*) took place in the town (*civitas*) of *MezőSomlyo* (Mezősomlyó; Şemlacu Mare-Ro). The actual, designated place of debate in the area was affected by the flood of waters and thus these places were hardly reachable ('*propter inundationem aquarum ad locum designatum accedere minime valuissent*').¹⁰²⁴ The town (*civitas*) of Mezősomlyó located at the small Lunca river (which ended up in the swampy wetland of Alibunar), close to the eastern borders of Temes and Krassó counties: sometimes belonged to Krassó, sometimes to Temes – similar to *Dobuz* (Doboz-Ro)¹⁰²⁵ and *Gyertyámos* (Ghereniş-Ro).¹⁰²⁶ While Dobuz is located on the northern bank of the Pogonis river, Gertenyes at the south banks of the Berzava river (tributaries of the Temes river, flowing into the Lower Danube), both at that borderline of Temes and Krassó counties. Since the area in between is plain, but east of this plain waters come from the direction of the Pojana-Ruska mountains, this summer flood/inundation event on any of the rivers or on both rivers as well as on their tributaries might be the result of rainfall of larger quantity in the nearby mountains. The fact that in the charter '*inundatio aquarum*', thus plural case is applied might support the idea that all the waterflows in the area were in flood at that time.

arabiles cultas et incultas demptis terris nunc ad predicta duo loca allodiorum sufficientibus ipsis nobilibus dominabus et puelle deventis, feneta, flumina, excepta quadam piscinula in latere Marusi, que pisscinulla ipsis nobilibus dominabus et puelle cessisset ecclesiamque parrochiale supradictam simulcum curia sacerdotali prefati procuratores dictarum nobilium dominarum et puelle ac predicti capituli eisdem et iobagionibus earundem partium communi usui deputassent. ..." For Hungarian regesta and (partly) Latin transcription, see: ZsO Vol. 2/2, ch. 6022, pp. 122-124.

¹⁰²³ MGH SS Vol. 9, p. 697 (*Kalendarium Zwetlense*): "Anno 1408 yemps frigida fuit, quod nulla meminit etas; nam Danubius per totam Ungariam et Austriam et Bavariam gelidatus fuit, ita quod in Krempsa et in omnibus partibus Austrie perrexerunt per Danubium cum curribus vinum portantibus et alia necessaria; et homines putabant quod omnes fructus arborum et omnia sata essent destructa propter nimium frigus. Quod non fuit factum, quia Deus misericorditer suis previdebat. Nam eodem anno vinum ubique per Austriam vendebatur pro Item eodem anno metreta siliginis vendebatur in Zwetl pro 15 denariis, aliquando minus; triticum pro 25 vel minus. Item eodem anno facta fuit habundancia frugum." See also Pautsch 1953, p. 89.

¹⁰²⁴ TO Vol. 1, ch. 257, p. 420: "Prorogatoriae Valentini Panik Judicis nobilium et coeterorum Nobilium Comitatus Themesiensis, originales, universarum causarum inter Demetrium filium Dan de Dobuz ab una, necnon Jacobum Andream et Nicolaum filios Chep de Gyertyanos, partibus ab alia vertentium, quas causas iidem Judex nobilium et caeteri Nobiles praescripti Cottus Themesiensis virtute praesentum, secundum literatoriam commissionem Piponis Comitis Themesensis praetacti, ex unanimi consensu et voluntate dictarum partium, ex eo, quod nonnulli eorundem litigantium ad ordinationem et reformationem praetactarum causarum per eosdem Judices nobilium, et Nobiles fiendam propter inundationem aquarum ad locum designatum accedere minime valuissent, ad Civitatem MezőSomlyo prorogarunt. Scriptae in Vecgeh, feria quinta quindecimo die festi beati Jacobi apostoli, quo nempe die erant eaedem causae per suprascriptos ordinandae." For Hungarian regesta, see: ZsO Vol. 2/2, ch. 6966, p. 266 (08.08.1409).

¹⁰²⁵ Csánki 1894 Vol. 2, pp. 33-34 (in medieval Temes county).

¹⁰²⁶ Csánki 1894 Vol. 2, p. 102: located in medieval Krassó county.

9.5.1.6 Spring flood or inundation in Fejér county: 1410

On 6 April (*in quindenis festi pasce domini proxime preteriti*) in 1410, while perambulating the landed possession called *Thape* of the Fehérvár chapter at *Waytha*, due to the floods or inundations ('*inundaciones aque*'), it was not possible to reach an island (*insula Pronus*) belonging to the above-mentioned landed possession.¹⁰²⁷ The charter with the perambulation described, was issued five days later, on 11 April ('*sesto die dieij reambulacionis metarum*'). The villages of Tápé¹⁰²⁸ and Vajta¹⁰²⁹ in the late Middle Ages belonged to Fejér county, and later to Tolna county. The settlement of Kistápé and Vajta, the other settlement mentioned in the neighbourhood, today are located close to the Sió (Sár) river with lots of islands in between the branches. Due to its low-lying location and close vicinity, we have to account with the possible influence of (a high water level of) the Danube.

9.5.2 Floods of the period 1411-1420

9.5.2.1 Flood reported in 1411

Flood (some time) before 1409? A false (?) case of the old/new Rába riverbed

According the defendant of a lawsuit, some time before the legal process, documented by the chapter of Vasvár on 18 January in 1411, but most probably even earlier, before 1409, due to ice-jams the Rába river left its old riverbed and by 1411 (or 1409, or 1406 or even earlier) flowed in the bed of the *Stremen/Yztrermen* river.¹⁰³⁰ The debate was around an (former?) island, said to be given to a noble from Püspöki (Demeter Molnári) by King Stephan I. Finally, during the field survey it turned out that the island was not the land shown by *Demetrius*, but another one further from Püspöki (where according to the defendant actually the old riverbed ceased to exist). Moreover, the land had been located at the other side of the Raba river, closer to Vasvár town. And thus, nothing belonged to Püspöki from the side of the town, so *Demetrius* had to give back the land he previously had occupied to the town of Vasvár (*civitas Castriferrei*). An interesting additional information is that in 1409, the defendant described the situation (or at least his version) while standing with the other (official) participants on the Rába bridge (*supra pontem Molnary Hyd*) belonging to Rábamolnári. Not far from the bridge, according to the defendant, they saw the port or bank of the (former) riverbed, which was already at that time abandoned by the Rába flowing in the (former) riverbed of the *Stremen/Csemén* river (could be the Strém; nevertheless, that flows in at the other side of the Raba, further to the SW).

¹⁰²⁷ DL 9622 (11.04.1410): "..., in quindenis festi pasce domini proxime preteriti ad faciem predicte possessionis Thape, vocate vicinis et commetaneis suis vniuersis inibi legitime conuocatus.... taliter reambulassent Quod primo Incepissent aparte possessionis seu predy pertold per competens spacium permetas cursuales peruenissent, ad montem Monyorohegh, vbi Juxta quandam metam terream signum metales consignassent deinde per metas cursuales Iuxta quas signa metalia facienda venissent ad Insulam pronus vocatam, ad quam propter in vndaciones aque intrare nequiussent, Inde per medium villa waycha uocata Iuxta ecclesiam in eadem fundatam a parte meridiense transeundo et maiorem partem eiusdem possessionis waytha, incendendo peruenissent ad vineam Budy vbi sub quadam arbore piri, silvestris signum metale fecissent " For Hungarian regesta, see: ZsO Vol. 2/2, ch. 7485, p. 342.

¹⁰²⁸ Csánki 1899 Vol. 3, p. 352.

¹⁰²⁹ Csánki 1899 Vol. 3, pp. 355-356.

¹⁰³⁰ DL 92385 (18.01.1411): ", ultra fluvyum Rabe magne recentis civitas Castriferrei supra pontem Molnary Hyd vocatum non longe in ipsa terra litigiosa in portu seu rippa dicti fluvii Rabe magne recentis in loco pratoso, ubi concavitas parva appetat, ... " See also DF 279140 (Hungarian regesta partly with Latin transcription: ZsO Vol. 3, ch. 173, p. 107-108, ch. 251, p. 124):

In another charter, describing the legale case from its beginnings, namely from 1406 onwards, information is provided about the fact that during the last field survey perambulators proved that the defendant (*Demetrius*) was not right in several parts of his statements concerning the location of the island and in the fact to which direction the Rába river changed its course.¹⁰³¹ Unfortunately, it is not possible to declare without any doubt when the Rába river changed its bed or whether or not it changed riverbed at all. It seems likely that the Rába river in the past did change its riverbed, and probably ther wer also some ice (jamming) problems on the river some time, but not in the way how the defendant described it. The perambulators did not accept the statements of the defendant. Unfortunately, they did not provide the 'true' story instead. As such, although there is a possiblity that a preceding ice (jam) flood occurred on the Rába river in the area, no firm evidence provides any proof and thus, this case in not included in the later analyses.

Autumn flood of the Túr catchment, in 1411

In charter(s) issued on 17 October 1411 and 5 November ('*quinto die quindenis Michaelis; tricesimo octauo die octauarum festi beati Mychaelis Archangeli*'), a perambulation is described which took place on 13 October ('*quindenis festi beati Mychaelis archangeli*') by the convent of Lelesz. Concerning the perambulation, floods/inundations close to the Túr river are recorded in the area of *possessio Rauazd*, to which a landed possession or village called *Fyles* belonged. Here the boundaries, described in a 13th-century charter of King Béla IV, were ordered to be renewed. During the perambulation, while proceeding for a long distance through a forest, due to the floods/inundations of waters ('*propter inundationes aquarum*') they could not settle a landmark with a metal sign (there was also a dense, bushy/scrubby? area difficult to pass). Then the boundary in a greater distance 'touched' the bed of *Fylesdpathaka* (stream). In the neighbourhood (Szatmár county) one can meet up a village called *Kwlche* (Kölcse),¹⁰³² and a certain *Orozy* (Oroszi) possession.¹⁰³³ The entire perambulation of *Fyles* (Fülesd)¹⁰³⁴ started at the harbour of the Túr river ('*in portu fluvii Thwr*').¹⁰³⁵ Thus, due to the fact that presumably the closest waterflow could be the Túr river, these inundations of waters most probably occurred in its catchment area where several waterflows can be found.

Flood occured some time in the last 2 years: in Zagrab county, Slavonia

The memory of at least one flood event, some time in a two-year period before the early autumn of 1411 was preserved in a charter dated 14 September in 1411. According to the

¹⁰³¹ DF 279140 (21.02.1411). For Hungarian translation and partly Latin transcription, see: ZsO Vol. 3, ch. 173, pp. 106-108. In this charter, the name of the river also appeared as *Csemen*.

¹⁰³² Csánki 1890 Vol. 1, p. 479.

¹⁰³³ Csánki 1890 Vol. 1, p. 482.

¹⁰³⁴ Csánki 1890 Vol. 1, p. 475.

¹⁰³⁵ DL 69750 (17.10.1411): "... in portu fluvii Thwr vocati iuxta quandam meatum aque seu alveum tempore inundationis aquarum fluentem de ipso fluvio Thwr egredientem, quem ipsi nobiles de philpus stdm() ipsarum litterarum Capituli warad() Eredfew nominassent vbi sub arbore vulgo gerthyanfa vocata signum metale de terra fecisset, vnde ad partem meridionalem per rubeta et terras arabilis modicum eundo venisset ad quandam locum vbi actorem iuxta tenorem Ipsarum litterarum metalium monticulos fuisse duxissent qui non aparuisserunt vbi similiter signum terreum posuisset vnde secus ipsum meatum seu alveum Eredfew vbi ipse meatus transiendo fluit in fine quarundam terrarum arabilium invenisset ad quandam tumorem terre quem metam fuisse sed paratam et abolitasse dixisset ad magnum spacium eundo venisset ad locum viminosum wlgo Rakathyas dictum vbi signum deterra fecisset denique per ipsum locum Rakathyas propter densitatem et obscuritatem ipsius Silue signa metalia terrea propter inundaciones aquarum facere non vallens perd()msas arbores signis crucis consignatas per longum spaciun eundo attigisset alueum fylesdpathaka vocatum penes quam similiter signum deterra posuisset postremo transeundo ipsum alueum in eadem silua ad dictam parte occidentalem per longum spaciun girando venisset ad fluuium Thapolnok vocatum" Hungarian regesta and partly Latin transcription: ZsO Vol. 3, ch. 1079.

charter, two years before, some of the *nobiles iobagiones castri Capella* built a mill on the Bednye river. Since then, at the time of the flood of the river, great damages occurred on the meadows and lands of the chapter of *Chasma*.¹⁰³⁶ Although flood(s) of the Bednye river could happen any time during the previous two years, from the time of the application a flood, occurred in 1411 seems to be the most likely, and possible other flood(s) in the previous year. No indication is available on the magnitude of this flood event, but it is mentioned as a usual phenomenon, without further specification.

Flood of the Borsva river some time in 1411-1415?

The perambulation of *Beregh* landed possession, separating from *Fekethepatak* landed possession, took place some time in between 1411 and 1415. When perambulators reached the *Borswa* river, they found an earth landmark partly destroyed by the flood of the same river. Since only the draft and not the final official charter remained, no exact date is provided in the description. Mályusz dated this charter to 1411-1415 while in another available regesta, dating is 1404-1410.¹⁰³⁷ As such, the flood occurred at an unknown period of time before the charter was written – it is not possible to provide more precise dating based on the evidence available in the charter.¹⁰³⁸

9.5.2.2 Floods in 1412

Danube high water/flood in winter 1412

The perambulation charter of the Györ chapter, while settling the boundaries between the landed possessions of *Vasarwth* (Vásárút) or *Kyurth* (Kürt) from *Kyralkurth* (Királykürt) village, *Narasd* (Nyárasd) and *Istal* (Istál), saved the information of a Danube flood event, occurred some time between 21 January and 12 February, in 1412.¹⁰³⁹ When the perambulation arrived at *Locazigeth* in the Danube branch of *Jazewren*, because of the very great flood

¹⁰³⁶ DF 256683 (14.09.1411): "... in fluuio Bednye cum medietas ad possessiones ipsius Capituli de Thoplicha pertineret duo molendina cum edificijs acclausuris preparari et construi frciscent propter que Molendina et clausuras temporibus in vndacionis dicti fluuy Bednye in pratis et terris dicti Capituli plura dampna et nocumenta sepius euenissent et euenirent" For Hungarian regesta, see: ZsO Vol. 3, ch. 937, p. 258. For a conclusion of all previous steps and events of the legal debate, see: 1412: DF 256685; for Hungarian regesta: ZsO Vol. 4, ch. 2684, pp. 623-624.

¹⁰³⁷ DF 209489 (around 1411-1415?): "...ad illas plagas et loca, ad quas videlicet et que ipse littere metales procedere denotassent, primam metam incepissent prope fluvium Borsswa vocatum a parte septemtrionali, ubi idem procurator dicti domini ducis quandam tumositatem terre pro meta ostendisset, sed per ipsius aque inhundantiam in aliqua sui parte abolitam fore, prout et ipsi conspexissent, retulisset et ibi partes concordes extitissent; deinde prodictum fluvium Borwa vocatum transmeando et prefato procuratore dicti Georgii semper contradicte in bono spatio ad orientem tendendo penes eundem fluvium duas metas terreas bene apparentes reperissent, ubi signum metale terreum fecissent;" For Hungarian regesta, see: ZsO Vol. 3, pp. 374-375. While Mályusz provided his reasons why he dated the charter between 1411 and 1415, the regesta collection of the Hungarian National Archives provided no date but only a general dating for 1404-1410 – without providing any reasons.

¹⁰³⁸ Csánki 1890 Vol. 1, p. 434. Local geographic names mentioned: *Salank* (Salánk, historical Ugocsa county), *Berek/Beregh* (Bereg in historical Bereg county), *Fekethepatak/Ffekethepatak* (*Feketepatak*, historical Ugocsa county). Waters: *fluvius Borsswa/Borswa/Borwa*, *fluvius Athaagh*, *fluvius Rednek*, *fluvius Palothpataka*. The landed possession of Salánk was located north, while Feketepatak northwest to Nagyszöllös.

¹⁰³⁹ Placenames: *Megyesthelek*, *possessio Wasarwth/Kywrth*, *other Vasarwth*, *locus Belderthew*, *locus Bontoewren*, *possessio Kyralkwrth*, *possessio Zele*, *locus Zaruaewren*, *possessio Istal*, *possessio Kywrth*, *possessio Nyarasd*, *locus Synkethekutha alias Batyakwtha*, *possessio Zenthgywrgh*.

Names of waters: swamp of *Curtawéis*, *aqua/fluvius Hayoswth*, *flumen Kysduna*, *insula Kweszigeth/Kweszygeth* in *Kysduna*, other branch of the Danube called *Jazewren*, other branch of the Danube called *Hodere*, *insula Locazigeth*, *insula Kwithezigethe*, *fluvius Loca*, *Nagbelder/Kysbelder*(or *Hayoswth*) -two branches of the Danube at the island of *Kweszigeth*, *maius flumen Danubii*.

('propter maximam aque inundationem'), perambulators were not able to cross or settle any boundary. Here between the islands of *Locazigethe* and *Kwthezigethe* flowed the *Loca* river (a branch of the Danube). Later, at the end of the perambulation the water-problem again appeared: because of the magnitude of water in the riverbed of the Little Danube (Danube-branch) they could not follow properly the boundaries between possessions of *Istal* and *Vasarwuth* ('propter aque in ipso alveo existentis magnitudinem pro sequestratione metarum possessionis Istal dictorum nobilium et Vasarwuth ipsius capituli proficisci nequivissent').¹⁰⁴⁰

Vásárút (Trhová Hradská-Sk) (and still locates) at the Little Danube, between *Kyrt* (Ohrady-Sk) and Nyárasd (Topol'níky-Sk) and Istál (Dolný/Horný Štál-Sk) all located in the island area of the Žitný ostrov.¹⁰⁴¹ In the text the great flood is mentioned at the old branch of the Danube called *Jazewren*, at Vásárút, Istál possessions, also in the area of Nyárasd, Kürt and Királykürt.

Wet meadow at the Hosszú-ér in 1412

While renewing the boundaries between Tiszaszentimre and Tiszaszentgyörgy, Gyáma and Apaszentmiklós, along the bank of the waterflow called Hosszú-ér, a wet meadow was described.¹⁰⁴² The perambulation took place on 19 May, 1412. The Hosszú-ér waterflow does not exist today; however, there is a bulk called 'Hosszú-dűlő' and together with the help of other topographic names in the neighborhood, it was possible to identify its former bed south of today's Tiszaszentimre and Tiszaörsfürdő.¹⁰⁴³ Since we have only the evidence of a wet meadow located close to the Hosszú-ér, there is no direct evidence of a flood event. Nevertheless, the fact that there is a wet meadow close to a waterflow might suggest that either the groundwater level or the water level of the waterflow (or most probably both) were high, which might suggest the high(er) water level of the Tisza river as well. Since no flood or any clearly-related evidence is mentioned, this data is not part of robust analyses.

¹⁰⁴⁰ DF 227795 (12.02.1412): "... insulam Locazigeth, in cuius portu unam metam terream erexissent, quam scilicet insulam idem capitulum per priorem suam reambulationem, ut dicti procuratores ipsius capituli astruxissent, per ipsum capitulum alias factam propter maximam aque inundationem nec metaliter sequestrare et nec pertransire valuerint, ... a parte possessionis dictorum nobilium de Zenthgywrgh Kyralkwrth vocate terminari et ulterius ex opposito ipsius fluvii loca cum possessione Zele dominorum de Zechen commetaneitatem servare astruxissent; ... ad possessionem Kywrth prepositi et capituli,.. nobilium Istal et Nyarasd ...ad predictum meatum Danubii Kysduna vocatum ... ad transitum seu vadum cuiusdam alvei in loco communiter Synkethekutha alias Batyakwtha appellato, ubi penes viam per eundem alveum versus possessionem Istal dictorum nobilium, in rippa scilicet ipsius alvei a parte orientis metam terream comperissent, quam modo simili renovassent; a qua scilicet meta ulterius propter aque in ipso alveo existentis magnitudinem pro sequestratione metarum possessionis Istal dictorum nobilium et Vasarwuth ipsius capituli proficisci nequivissent." Hungarian regesta and partly Latin transcription: ZsO Vol. 3, ch. 1733, pp. 434-435.

¹⁰⁴¹ Házi 2000, pp. 113, 133, 330, 514.

¹⁰⁴² DL 43152 (03.06.1412), DF 266887 (also available in 1512 transcription): "...Et prima Meta Incipit, in quodam colle penes alueum quendam hozzijwr vocatum A parte orientali existent(), Inde per Rippam cuiusdam aluei, procedendo vltierius sunt due Mete terree, vbi pertransijt ipsum alueum, deinde inter Rippam aluei, et pratum lacum Eundo versus meridiem, est vna meta terrea, et ibi iterato pertransijt alueum, et ad eandem plagam proceden(tem) in Rippam eiusdem aluei, est similiter vna Meta terrea, Inde per directam lineam eundo peruenit(ur) ad duas Metas terreas prope sese Sequentes ab hinc vltierius per Rippam eiusdem aluei proceden(tem) peruenit(ur) ad publicam Stratam que dicit versus waradinum vni alueum ipsum sl()cum eadem Strata pertransit modicum declinando ad occidentem, vbi in Rippa eiusdem aluei, in vno Monticulo est vna Meta terrea, Inde vltierius transeundo versus collem Magnum peruenit(ur) ad duas Metas terreas et ibi terminarum, Mete duarum predictarum possessionum Mete autem possessionis Gijama." Hungarian regesta: Benedek 1997, ch. 6, pp. 284-287.

¹⁰⁴³ Benedek 1997, ch. 6, p. 286.

9.5.2.3 Floods of 1413

Mid-summer flood of waters in the (Mező)Zombor area in 1413

In a charter issued on 14 July ('decimo sexto die termini prenotati'), at the perambulation of Zombor, Adamtelke and Nymegh on 29 June ('octauo die festi sanctissimi Corporis Christi proxime preterito') and the next days, at Nymegrethe the meadows and reedy areas from the south, due to the inundation/flood of waters could not be divided ('*Prata vero et arundineta a parte meridionali propter inundationem aquarum dividere non potuissent*').¹⁰⁴⁴ Flood of waters means that not only one, but the waters around were in flood. In the close neighbourhood only the waterflow (*fluvius*) Nymeghpataka was mentioned. Nevertheless, since Szerencs is at the Szerencs stream and Mezőzombor is at the Takta river, but already located in the Tisza inundation area, there is a possibility that larger waters like the Takta or even the Tisza were in flood at that time (or inundation could as well mean inland excess waters). Zombor, according to Csánki and contemporary evidence, was located at the Tisza, while Ádámtelke at the Takta rivers.¹⁰⁴⁵

Flood of waters: the Danube at Jenő before 26 August, 1413

The convent of Pécsvárad issued the charter on 26 August: the possession of the Rabbit Island (*Insula Leporum*–Margitsziget) nuns, Jenew (Jenő), was perambulated on 24 August and other days. The first landmark was located from the east, over the banks (thus, in the direct neighbourhood) of the Danube in a ditch (*fossatum*). However, due to the floods of waters of the Danube this landmark was destroyed ('*sed per inundationes aquarum ipsius Danobii eandem abolitam fore astrinxisset*'); therefore, the landmark had to be renewed.¹⁰⁴⁶ Much later, at a public road, a former landmark is also mentioned which was destroyed long time ago. There is no evidence on the dates of these flood events: it is only known that they occurred before late August in 1413 – but this can as well mean years, too. Still, the location of the former landmark in the ditch could be followed. This fact makes it more likely that the flood events did not happen several years before: at least one might have happened not long before.

Jenő, the possession of the Rabbit island nuns, was located at the Danube in the eastern parts of Baranya county, north of the town of Mohács. Later deserted; today it is known as 'Jenye puszta'.¹⁰⁴⁷

¹⁰⁴⁴ DL 10086 (14.07.1413): ".... Prata vero a parte dicte possessionis Mad hoc modo sequestrassent, quod pratum dicti Farkasii in prato Bakarethe a parte possessionis Zombor seu vie Zeleswth vocate a duobus signis metalibus usque dictam utam in quatuor partes sequestrando unam eorum a parte terre arabilis et ab occidente domine Lucie antedice, cuius latitudo haberetur quinquaginta passus regalis mensure. Item aliud pratum Nymegrethe vocatum a fine inferiori et a parte vie, que vocatur Gyznokuth a duobus signis [metalibus] in medio dicti prati positis in quatuor partes dividendo, quarum quatuor partium una penes meatum fluvii Nymeghpataka a parte occidentali in latitudine decem et octo passus regalis mensure, in longitudine usque dictam utam eidem domine Lucie actrici devenissent, tres autem partes earundem terrarum et pratorum mensurate ubique domine Elene antedictae fuissent devente in portionem. Prata vero et arundineta a parte meridionali propter inundationem aquarum dividere non potuissent, sed vigesimam partem eorundem pratorum et arundinetorum eidem domine Lucie, proventus autem piscinarum in piscinis Nagythew, Syrch, Wyllas, Kengyel, Baluan, Bolchere et Tacta vocatis similiter vigesimam partem dicte domine Lucie," Hungarian regesta and partly Latin transcription: ZsO Vol. 4, ch. 853, pp. 208-209.

¹⁰⁴⁵ Csánki 1890 Vol. 1, p. 367 (medieval Zemplén county).

¹⁰⁴⁶ DL 10105 (26.08.1413): "Primo incepissent a parte orientis super rippam Danobii in quodam fossato, prope quod procurator earundem dominarum sanctimonialium de dicta Insula leporum unam metam dicte possessionis Jenew vocate fore alegasset, sed per inundationes aquarum ipsius Danobii eandem abolitam fore astrinxisset, ubi signum metale fecissent; dehinc versus partes meridionales transseundo pervenissent ad quandam viam, quam procurator dictarum dominarum sanctimonialium metam eiusdem possessionis Jenew fore dixisset;" Hungarian regesta and partly Latin transcription: ZsO Vol. 4, ch. 1013, pp. 236-237. See Also: Kőfalvi 2006, ch. 581, p. 294.

¹⁰⁴⁷ Csánki 1894 Vol. 2, p. 493.

9.5.2.4 Great flood of the Danube of 13 July and around: 1414

Perambulation carried out by the convent of the Szekszárd monastery between the possession *Zygethfew* (Szigetfő, Fejér c.), *Zyld* (Süld, Fejér c.; owner: Fehérvár chapter) of the Veszprémvölgy nunnery on the one hand, and *possessio Zalk* (Szalk) of Bátmonostori Töttös László (*Ladislaus Theutes*), *possessio Pentele* (Dunapentele; today Dunaújváros) of Almási Mihály (*Michaelis de Almas*) on the other. The perambulation took place on 13 July ('*vigesimo die festi nativitatis beati Johannis Baptiste*') and/or sufficient days around and after, in 1414. The charter was issued just a couple days later, on 16 July. Key part of the charter, namely the great Danube-flood ('*nimia inundancia aque*') is described as follows: "And so, after all these were completed, while wanted to measure the possession of the above-mentioned ladies, Master *Ladislaus* (Töttös of Bátmonostor) could not make reference in a right and legal way, since the river Danube, due to the great flood of its water, exceeded its bed and the harbour."¹⁰⁴⁸

9.5.2.5 Floods in 1416

Flood of waters – Kysdobron in early 1416

On 20 January ('*Quintadecima die festi ... dominum nunc proxime preteriti*') in 1416 a land division of *possessio Kysdobron* occurred at the same location. The results of this perambulation procedure were described in a charter written 5 days later, on 25 January. Nevertheless, due to the wish of both parties as well as to the flood of waters ('*propter inundacionem aquarum*') only land division, and no perambulation of the land took place. During the land division the land of Pokateleke (*Pokhateleke*) with a deserted *curia*, was also mentioned.¹⁰⁴⁹ Based on the description it seems likely that the flood quite strongly affected

¹⁰⁴⁸ Zichy Vol. 6, ch. 205, pp. 309-311: "..., in dicto fluvio Danubii distingendo et separando, reliquissent et commississent dicte ecclesie beate Marie virginis de valle Vesprimensi et per consequens annotatis religiosis dominabus in eadem deo famulantibus et famulandis. His itaque peractis, dum ipsum fluvium Danubii corporale extra metas dictarum possessionum prescriptarum dominarum adiacens mensurare voluissent, tunc ipse magister Ladislaus dictum fluvium Danubii propter nimiam inundanciam aque de suo vero cursu et portu exivisse et per hoc ipsam mensuracionem recto et iusto modo fieri non posse referens, ipsosque ab ipsa mensuracione inhibens, ipsum nostrum hominem pro sui parte datum secum deducendo abinde recessisset. Et licet ipsa inundacio aque pro tunc extiterit et predictus magister Ladislaus in ipsa mensuracione ipsis contradictor obvians ante perfectionem ipsius vestre judiciare commissionis recessit, ..., quod dictum flumen Danubii corporale extra metas prescriptarum possessionum dictarum religiosarum dominarum adiacens, solum inter duos portus antiquos eiusdem fluvii Danubii fluens et non aquam per ipsam inundanciam extra eosdem portus meantem, primo in loco ubi mete duplices in prescriptis literis ipsius Nicolai de Gaara palatini conscripte et in portu ipsius fluvii Danubii eructe ipsas possessiones Zygethfew et Penthele ab invicem separarent, ..." Hungarian regesta: ZsO Vol. 4, ch. 2260, p. 516. Connected charter, describing (among others) the same event: Zichy Vol. 6, ch. 226, pp. 337-346.

¹⁰⁴⁹ DL 10422 (25.01.1416): "... unum fundum sessionalem respectu curie ipsius Iohannis filii Nicolai cum corda mensurando in fine linee dicte possessionis Kysdobron versus occidentem a plaga meridionali adiacentem, quoad tertium partem unius quarte integre cum terris arabilibus, pratis et silva aliisque utilitatibus ad eundem fundum spectantibus dictum domine relicte filie prefati Georgij litterari, comisissent, contimacionem in duarum litteris vestre magistrando adindicatam expressatam, cum valentibus partibus tum propter inundacionem aquarum abmutentes, de inde ante residuum porcionis prefati Iohannis filii Nicolai, patris dictorum Georgij et Anthonij tercie scilicet partem dicte possessionis kysdobron in tres partes eequales, curia deserta Pokhateleke vocata, necnon in alia linea ipsius ville a parte orientali adiacenti fundi seu curie penes sese contigue adiacentes, quarum una a parte meridionali existens deserta, in alia vero puta a parte aquilonari Georgius filius Vallentini moraretur; item in eadem linea ad dictam plagam septemtrionalem locus sessionales desertus ex opposito curie Gregorii litterati eisdem Georgio et Anthonio, deinde vero curia seu fundus sessionalis in dicta linea ipsius ville a dicta parte occidentali adiacenti, fundus seu curia, in quo Anthonius filius Georgii resideret, penes dictam curiam desertam Pokathelke vocatam ..." Hungarian regesta and partly Latin transcription: ZsO Vol. 5, ch. 1463, pp. 402-403.

some of the landed portions ('*cum valentibus partibus tum propter inundacionem aquarum abmutentes*').

Although localisation is not easy based on the very few local names, Kisdobrony (Мала Добронь-Ua) belonged sometimes to Ung sometimes to Bereg county, acting as a crossing place of the Latorica river. The village was an important toll-place in the 14th century with a main road leading from Bereg to Ung county, crossing several rivers (with toll-places) in its way (not far from the Tisza), where such goods as salt and wine were transported in larger quantity.¹⁰⁵⁰

Previous flood of the Danube-branches reported in 1416

Replying for the order given on 7 June, the perambulation took place some time between 13 and 17 June.¹⁰⁵¹ Asked by the nobles of *Bodobar/Bodowbar*, in this case the boundaries of *possessio Bodobar* were described. Based on the plenty of placenames (e.g. Somorja, Szil, Nádasd),¹⁰⁵² official bodies (chapter of Pozsony), landowners (*Georgius et Nicolaus Groff de Bozyn*) and some of the characteristic names of water bodies (e.g. *fluvius Chelis*), it becomes clear that some main landmarks, destroyed by the flood of waters, were located in the Žitný ostrov area.

Although we do not exactly know when the flood took place, it is unlikely that they waited many years with fixing again the landmarks, and thus, it is possible to place in flood statistics as a decadal information. However, since the exact year of the flood is not known, it could also happen that the flood itself was part of any of the before-mentioned Danube flood events, thus at the moment it is not treated as a separate event.

Great flood of the Nagy-Küküllő river before early November 1416

The perambulation of *possessio Hwozywazo/Husywazo* (Hosszúaszó; Valea Lungă-Ro) from the side of *possessio Zanchal* took place on 4 November ('*quarta feria ... post festum omnium sanctorum*') and the days around and after. Hosszúaszó is located in the area of *Balasfalwa* (Balázsfalva; Blaj-Ro) and *Mykezaza* (Micăsasa-Ro) in Küküllő county, Transylvania. The above-mentioned boundaries had to be resettled because the great flood of the Nagy-Küküllő (Târnava Mare) river ('*per nimiam inundationem aque ipsius fluvii Kykullew*') previously destroyed them. The charter which provided the testimony of this great (*nimia*) flood was issued on 11 November.¹⁰⁵³

¹⁰⁵⁰ See DL 66855 (21.11.1389; 13.01.1390); for location, see Györffy 1987 Vol. 1, pp. 537-538. Today Малая Добронь in Ukraine.

¹⁰⁵¹ DF 273814 (13-17?06.1416): ".... in metali ipsorum reambulationem cum nobilibus de Nagbaar taliter processissent, quod incepissent a parte orientali iuxta quandam magnam viam, que dicit ad possessionem Nadasd et transit quendam lacum Folukezer vocatum, ubi predicta littera privilegialis dicti domini Bele septem capitales metas fore demonstrabat, ubi tamen solum unam magnam metam reperissent, penes quam a parte meridie unam novam metam erexissent, quas scilicet septem capitales metas predicti nobiles de Bodobar per transitum et per inundationem aquarum abolitas fore alegassent; abhinc tendit ad occidentalem plagam ad stagnum Hamwstow dictum, et in gutture eiusdem stagni duas metas terreas bene apparentes reperissent, ubi [unam] novam metam cumulassent; dehinc vadit ad stagnum Kengeleer ad duas metas terreas, p[en]es quas unam novam metam erexissent; abinde versus plagam occidentalem ad terram Kwrthwelte vocatam...." Hungarian regesta and partly Latin transcription: ZSO Vol. 5, ch. 2008, pp. 539-540. Following the order of king Sigismund on 7 June (remained in transcription in DF 273814: ZSO Vol. 5, ch. 1987, p. 533).

¹⁰⁵² Landed properties mentioned during the perambulation: Posfalua/Poczafalua (royal people), *possessio Swl* (Sül – Szil?), *oppidum Gelye*, *lacus P(..)gtow*, *lacus Ewremaga*, *lacus/paludes Kygostow*, *terra Zylzeg*, *lacus Gerbestow*, royal possessions of Gersoka and *Bodobar/Bodowar*, *possessio Nadasd*, *lacus Gylkostow*, *possessio Bar*, *villa Nagybaar*, *lacus Folukezer*, *stagnum Hamwstow*, *stagnum Kengeleer*, *terra Kwrthwelte*, *lacus Kendeerathow*, *villa Bodobar*, *oppidum Samaria*, *fluvius Chelis*, *possessio Zarwa*.

¹⁰⁵³ DL 30773 (09.11.1416): ".... Mete ante ipsius possessionis husywazo a parte predictarum possessionum Zanchal et Balassfalwa hoc ordine distinguerentur quod primo ixta viam magnam que a parte possessionis Balasfalwa penes kykullew maiorem vadit versus possessionem Mijkezaza in loco Lowdomb vocato vbi presens

9.5.2.6 Flood in 1417

A charter was issued on 24 February (*in festo beati Mathie Apostoli*) in 1417, giving clear testimony of repeated river-flood events, occurred due to abundant rainfalls. These circumstances continuously/frequently obstructed the (noble) inhabitants of Waya (Vaja) landed possession (located west to *Lorandhaza*/Lórándháza) to reach the official legal centre of Szatmár county. Thus, due to these unsolveable problems, the King (Sigismund) decided to give permission to change this difficult situation and in legal sense, move Vaja from Szatmár to Szabolcs county.¹⁰⁵⁴ Although the charter does not provide evidence concerning the start of this legal procedure and the date of flood events, again it seems to be logical to presume that people in trouble did not wait for years to submit a proposal and start to ask for such a change. Moreover, it seems to be a series of events repeatedly causing problems, so even if these problems might have started somewhat earlier, it caused troubles even in the near past, too. Other, very important statements are that in the charter more flood events (*fluviiis ... inundantibus*) are mentioned: thus, there are rivers which several times (or at least twice) flooded, causing troubles in traveling ('*ex superhabundati pluviarum multiplicatione*'). Here, therefore, we see one of the rare examples when the main reason of floods is directly provided in the text of the charter.

Although Vaja was located along the Apács stream (sandy Nyírség area, close to Baktalórándháza), it seems quite clear that this small waterflow could not be the main reason of the above-mentioned problems.¹⁰⁵⁵ Thus, finding principal reasons (and problematic larger waterflow), we need to look around the broader environment. The '*sedis judiciarum*', the legal (and administrative) centre of Szatmár county was the town of Szatmár (Szatmárnémeti; Satu Mare-Ro), located on the eastern side of the Kraszna river. In order to reach this town from Vaja, one had to cross the Kraszna, often surrounded by wetlands, and then the Szamos rivers. The main road led directly at the northern side of the extensive swamp and wetland area of the Ecsedi-láp, mainly supplied by the Kraszna river and also by surrounding other waters. Thus, while talking about the floods of waters, these waters most probably belonged to the (catchments of the) Kraszna and Szamos rivers (and the swamps and wetlands of the Ecsedi-láp), both forming major tributaries of the (Upper-)Tisza.

No direct information is available concerning the result of this petition; nevertheless, the Ibrányi noble family (concerning some landed possessions in Szabolcs county) in 1447 and

eciam tres mete antique quarum vna a parte occidentali existens pro possessione Balasfalwa, alia vero in qua lapis magnus extisset pro possessione hwzijwazo tercia autem a parte septemtrionali sita pro possessione Zanchal posite ipsis fuisse assertum et iam per nimiam invndacionem aque ipsius fluuij kukulle esse deletas modo consimili tres metas terreas duam videlicet pro dicta possessione Balasfalwa aliam pro possessione hwzywazo et terram pro possessione Zanchal preparantes de nouo erexissent et posuissent...." Hungarian regesta: ZsO Vol. 5, ch. 2423, p. 649.

¹⁰⁵⁴ DL 96927 (24.02.1417): ".... Quod fidelis noster Paulus filius dyonis nobilis de waija nostri talnunis accedens conspectum sua nomine Andree Aniani et Viti filiorum demetry Item Gregorij filij ladislai et plebarti filij Nicolai de eadem fratum suorum in personis maiestati nostre exposuit declarando Qualiter prescripta eorum possessione waija a plaga occidentali ex parte possessionis lorandhaza in metis et confinibus illarum parcium nostrarum habita Jurisdiccionis Comitatus Satmariensis ad Sedem Judiciarum ipsius Comitatus admodico loci spatio distante Interdum eciam fluiji ex superh(ab)undanti pluviarum multiplicacione inundantibus ex eoque ipsis ad Sedem Judiciarum dicti Comitatus Zathmariensis in quam sepe sepelius per nonnullos causantes signantur huiusmodi obstaculis eorum consideratis contra se ...entur et euocarentur accedere nequeuntibus ipsis et eorum quilibet in nonnullus birsagijs seu Judiciorum grauaminibus conuincentur exindeque eorum possessionibus alyisque rebus et bonis aggrauarentur dampnificantur et molestarentur" Hungarian regesta: ZsO Vol. 6, ch. 153, p. 97.

¹⁰⁵⁵ To the possible late medieval conditions of Vaja, see: Maksay 1971, p. 144.

1507 had to go to Szabolcs county to solve questionable (legal) matters.¹⁰⁵⁶ According to Csánki, in the (second half of) the 15th century sometimes it belonged to Szatmár, sometimes to Szabolcs county.

9.5.2.7 Flood in 1419

In the course of a private letter (sent on 4? April in 1419?) P. concivis in *Mediomonte* asked the parish priest of *Zewles* (Szólós) for an excuse since, due to his urgent tasks as well as the great flood, he together with his 'compater' (*Schicher dictus Nicolaus*) had to return home. Nevertheless, in the week of Pentecost he still planned to visit the parish priest for the necessary discussion.¹⁰⁵⁷

Since no year was provided in the letter itself, and the text remained only in transcription (where in another neighbouring document 1419 as the most probable date was mentioned), dating of the original letter, concerning the year, can differ from the one found in the copy. Nevertheless, the date itself (4 April) is fixed.¹⁰⁵⁸

The Latin name *Mediomonte* meant the town of Felsőbánya (Baia Sprie-Ro) in the eastern corner of medieval Szatmár county.¹⁰⁵⁹ For the location of *Zewles* (Szólós) the medieval town of Nagyszólós (Виноградів-Ua), in the neighbouring Ugocsa county over the Tisza river, seems to be the most possible option.¹⁰⁶⁰ For the location of the flood event it seems likely that the flood probably affected the Zazár river (Sásar-Ro), a northeastern tributary of the Szamos (Someş-Ro) river. Out of the two possible ways the two clergymen could take, one led towards the northeast and then along the Tisza, while the other road first led towards the northwest along the Szamos and then to the east along the Tisza river. Thus, if talking about such a great flood of probably not only the Zazár but the other rivers, e.g. Szamos or Tisza were as well in flood.

9.5.3 Floods in the period 1421-1430

9.5.3.1 Floods recorded in 1421

Mines flooded by water: the problem or the solution arose in 1421?

On 21 February in 1421 the royal mining inspector of Besztercebánya (Banská Bistrica-Sk) in Szomolnok (Smolník-Sk) regulated the reopening of mines (previously) flooded by water.¹⁰⁶¹ It is not mentioned when the water flooded the mines, but by 1421 it was clearly an

¹⁰⁵⁶ See 1447, 1507: DL 62428 (remained in transcription dated to 1519; see MOL regesta).

¹⁰⁵⁷ DF 290628 (ELTE Library Cod. Lat. 48), fol. 205a. (04.04.1419?): "Magistro distinccionis viris domino Petro plebano in Zewlos fautrum sibi quamplurimus diligenda obsequiosam in omnibus complacendi voluntatem honorabilis duc() fautor diligendi Sicuti vestre per inde industrie pro...seram et nunciaveram cum meo compatre Nicolas Slicher dicto vestram personaliter presenciam Visitandi Scire debetis quod et fecisset nisi arduis negotiorum meorum impedimentis prepeditus non fuisse Insuper me ad uos proficiscenti tanta aquarum in vndanciam circumdedeatur quod per eandem conpuslus sum viceuersa accipere iter admee habitacionis domicilium Sed dei suffragio mediante scientes fuerit quod meam personalem presenciam pascah in ebdomada per amicum habitis omnium debo proculmato. ... datum in Mediomonte proximo seconda feria p(ost) us(?) qua cantarur in ecclesia Iudica me / P Conciuis in Mediomonte semper utique vester in omnibus."

¹⁰⁵⁸ Although the regesta provided a date of 3 April, since Monday (*feria secunda*) after *Iudica* is always 4 April, since *Iudica* is a feast fixed to Sunday 3 April, regardless of the year.

¹⁰⁵⁹ Csánki 1890 Vol. 1, p. 468.

¹⁰⁶⁰ See Csánki 1890 Vol. 1, p. 430.

¹⁰⁶¹ Csáky Vol. 1/1, pp. 308-310: "Ich Niclas Karll von dem Newesoll oberster steiger unsers genedigen hern des kinugs von Ungern zhue zur wissen allen den, die diesen brieff lesen odir hören lesin, wie das für mich kommen

important problem; so as the question of reopening, which could not happen without significant investments.

In this case it is also possible that the water inbreak(s) in mine(s) occurred several years or even decades before. For example, in Zeiring (Tirol, Austria), after the major water inbreak in 1361, a mine was reopened only 30 years later.¹⁰⁶²

Nevertheless, since in the case occurred in Hungary the royal mining inspector found the problem important enough to make this (general) order, it is possible that not only one mine was affected by these questions (and problems), but it was a more general problem in the main mining areas (also affecting some other mines) at that time. This theory may be supported by the fact that the original order was found to be important enough to be preserved and transcribed at least twice, first in 1432 and then in 1524.¹⁰⁶³

Earlier flood event and the changing course of the Váh river: 1421

In a charter issued on 10 August 1421 by the provost of the Turóc convent, an earlier flood of the Váh river is mentioned when the river changed its course. Before the flood there was an island of the river which belonged to *possessio Zuchan* (Sučany-Sk). After the river-course changed, due to the fact that previously the riverbed formed the boundary between the two possessions, the area of the island was occupied by the people of the neighbouring *possessio Thuran* (Turany-Sk) (*per sui inundationem de suo vero antiquo cursu et eius alveo exilientem et sibi alium cursum et meatum facientem per populos seu hospites in Thuran vocata residentes occupatarum*).¹⁰⁶⁴ The decision was in accordance with Werbőczy's early 16th-century description: the old riverbed is the boundary and not the watercourse itself.¹⁰⁶⁵

sein die gewercken von der putten auff der Schmelnitz, die das ertrunken perckwerg entfangen haben zu der putten, das hab ich yn verliehen in solcher geschicht in allem rechten, als es die alten gewercken gehabt haben, als das sie haben sollen von kröts lehen anzuheben, darnach den hockerlein gancz pisa n die kerchen und den kerchenshacht pisa n die oberschar, und die oberschar pisa n den schacht, der do heist der Neid, mynner ein lochter, und wider an von dem hockerlein auff dem ligendde durch den myst und durch den pogend und durch die Gilniczer pis an lugestandth, und auff der hindern zechen haben sie entphangen ticzen und ticzenlehen, geyer und geyerslehen und örtelsgrub mit dem hangendez und liegendez mit allen den rechten als die laten gewercken gehabit habn, und also das khein mann tzwischen sie nicht khomen mag, es sey mit der oberschar oder mi durschlegen ode yndert ein hindernus, und also das yn khein ander gewercke von andern lehen schaden mag in delsing vorgenanten lhen und auch hein perckmaister denselben gewercken in den obgeschrieben lehet nicht hab zu verlichen, es sey it yrem willen und wiszen, auch mer wen sie das wasser gelassen, das sie fristage darzu haben sollen in solchermass, wen sie die konsth zur wegen prengen," For Hungarian regesta, see: ZsO Vol. 8, ch. 193, p. 80. See also DF 252482, 267885.

¹⁰⁶² Zöllner 1998, pp. 75, 79-80, 133-135. Especially because of such problems, both in Hungary and Austria, from the late 15th century, money of the Fugger family was used for pumping out the water from the flooded mines. For a detailed overview of the cases, caused damages and other consequences of inbreaking waters in Austrian mines in the late Middle Ages, see: Rohr 2007a, 345-349.

¹⁰⁶³ See also 1432: DF 252482, 1524: 267885.

¹⁰⁶⁴ DL 98381 (10.08.1421): "..., alys quam pluribus nobilibus conprovincialibus dicti Comitatus de Thuroch Item a discretis viris plebanis Anthonio de predicta Zuchan Iohanne de Moijs Nicolao de sancto Petro Iohanne de Nechpal et Andrea de sancto Martino Ecclesiarum parochialium rectoribus talem in facto prescriptarum terrarum per formam communis Inquisitionis plenam omnimodam atque verissima resciuissent veritatem, quod prescripte terre arabiles nunc in quadam Insula dicti fluuij Wagh exeuntes propter invndationem eiusdem fluvii de suo vero cursu et meatu ac alueo exiliente et sibi alium meatum faciente nunc per predictos populos de prescripta Thuran ut predictis occupate diu et ab antiquo inter metas et ambitum metarum predice possessionis Zuchan concluse fuissent et per consequens ad prescriptam aduocaciam de eadem Zuchan pertinuissent et de Jure pertinente pro presenti ac per ipsos populos de Thuran unus iuste et indebite fuissent occupate et quod incliti hospites de sepe dicta Thuran antequam meatum prescripti fluuij Wagh pro metis inter ipsas possessiones Zuchan et Thuran diuidentibus fuissent occupate ab antiquo fuisse et pro nunc consistere demonstrassent" Hungarian regesta: ZsO Vol. 8, 859 ch, pp. 251-252. Neighbours in Turóc county: *Schawnicha, Precopa, Kelechan, op(p)idum Senthmarton* (Turócszentmárton; Martin-Sk), *villa Podhrada, villa Konska, villa Nowchow, villa Kerpelan, villa Zuthrow*.

¹⁰⁶⁵ *Tripartitum* Pars 1, Titulus 87, § 2. pp. 168-171.

1421: 'propter maximas inundationes aquarum' Autumn floods in Heves county: 1st case

On 20 September ('*feria sexta ... ante festum beati Mathei apostoli et evangelistae*') in 1421 the boundaries of *possessio Kwrth* (Kürt) were renewed in Heves county.¹⁰⁶⁶ While perambulating the boundaries at *possessio Swlh*: '... after crossing wet lands (*per quasdam terras aquosas*)', after walking for a long distance they reached a watercourse (*alveum Swigerec*). Then the rest of the boundary and landmarks between *possessio Kwrth* and *possessio Swlh* (Süly) could not be renewed due to the very great floods of waters ('*alias vero metas versus possessionem Swlh vocatam propter maximas inundationes aquarum reambulare metasque erigere minime potuissent*').¹⁰⁶⁷ It is interesting to note that the charter, which presumably describes a Tisza flood of very great magnitude, was issued more than two weeks later, namely on 5 October ('*sedecimo die diei perambulationis et erectionis metarum*').

Swlh is the today's village of Tiszasüly, while the area of the later deserted *possessio Kwrth* today belongs to Jászkisér.¹⁰⁶⁸ Due to the fact that the area is clearly located in the Tisza floodplain, this extraordinary flood was most probably the flood of the Tisza river.

Same or another? Autumn floods of waters in Heves county: 2nd case

Due to the floods of waters ('*propter inundationes aquarum*'), the inspection of a mill between *Jacobus de Kuzepnouay* and the provost of *Jazow*, could not be carried out on 12 October in 1421 (*Zenthcosmadamian*), and was postponed to 20 November.¹⁰⁶⁹ In contrast to the previous case, here 'only' floods of waters without providing evidence on the magnitude were mentioned. Since there is hardly more than three weeks between the two information on flood or inundation events in the same county, there is a chance that the events are connected to each other and the great flood or inundation of waters can be still observed three weeks later, roughly in the same area.

Novaj is located about 10 km southeast of Eger (medieval Borsod county), while Jászó (Jasov-Sk) was located in medieval Zemplén county, there is also a possibility that the floods of waters in general meant that due to general flood events in the broader area (of several counties) obstructed them to come together.

¹⁰⁶⁶ The chapter of Eger was the official body which issued the new perambulation. Lands and waters mentioned in the perambulation: *possessio Zenthgwrgħ, alvei Ravascer, possessio Rasangħ, fossatum Arokħath, lacus Chetketava, alveum Swigerec*. Also mentioned by Maksay as an example for a landed possession with extensive arable lands, determined by swamps, lakes and waterflows (Maksay 1971, p. 152).

¹⁰⁶⁷ Gyárfás 1883 Vol. 3, ch. 393, pp. 570-571 (05.10.1421): "... Quod ipsi feria sexta proxima ante festum beati Mathei apostoli et evangelistae novissime elapsum ad facies praescriptae possessionis Kwrth in dicto Comitatu existente Tandem ab illa meta directe pergendo ad eandem partem per quasdam terras aquosas per magnum spatium procedendo pervenissent ad quandam alveum Swigerec appellatum quem commisissent pro signo metalii, alias vero metas versus possessionem Swlh vocatam propter maximas inundationes aquarum reambulare metasque erigere minime potuissent Datum sedecimo die diei reambulationis et erectionis metarum"

¹⁰⁶⁸ For more information, see flor example: Györffy 1987 Vol. 3, pp. 111, 132.

¹⁰⁶⁹ DF232868 (06.10.1421): "Nos Comes Petrus de peren Judex Curie domini Sigismumndi dei gracia Romanorum regis semper augustus ac hungarie Bohemie etc regis Memorie commendamus quod honorus vir dominus petrus prepositus ecclesie de Jazow personaliter ab vna, parte vero ex altera Jacobus filius Georgij filij Idran de kuzepnouay modosimili pro se personaliter ac pro Johanne filio Idran coram nobis constituti sunt concessi ... quod ipsi quandam molendinariam reuisionem que inter ipsas quindecimo die festi beate Michaeli archangeli nunc venturis Capituli ecclesie Agriensis homines Juxta continenciam literarum nostrarum ad Judiciam fieri debuisset, prescriptum terminum nequissent excipere, ymo eciam premissa propter inundaciones aquarum perfici non posse considerassent, obhoc ipsi eandem statu in eodem ad vigesimum die festi omnium sanctorum nunc venturis duxissent prorogand(o) ymo prorogauit datum NagIda octauo die prescripti festi beate Michaeli archangeli. Anno domini Mmo quad(ragesi)mo vigesimo primo." For Hungarian regesta, see ZsO Vol. 8, ch. 1038, p. 318.

9.5.3.2 Floods in 1422 and/or before

Complain over frequent floods obstructing in reaching parish church: 1422 and before?

In a charter issued on 27 February in 1422 it was reported that, rather similar to the case occurred in 1417, local nobles of Nempi complained. According to them their problem was well-known among the people in Ung county: the inhabitants of Nempi¹⁰⁷⁰ (Németi; Vyšné/Nižné Nemecké-Sk) lived and died at that time without confession or fulfilling their spiritual obligations/needs. In this case, (frequent) former flood events are especially blamed for obstructing travel between the two settlements. Additionally, when they crossed a large forest while going to Ungvár (Ужгород-Ua), they were robbed there several times.¹⁰⁷¹

Although no information is available on the dates, the charter clearly describes a current, existing problem which was though present already for a while, was still valid when the charter (complain) was issued on February 1422. Last autumn (1421) there was a great flood in the Heves county area, and probably even further, which could as well affect much larger areas to the southeast, causing further problems to people in reaching their parish church.

Flood caused by rainfall damaged the dam: flood of the Ronywa river in 1422

In a charter of the Lelesz convent, dated to 10 August, a description of a field survey, carried out on 1 August 1422, was included. In this description, the participants proved that not the inappropriate mill-slue (*clausura*) of the *Rakathyas*-brothers, but the flood of the *Ronywa/Ronwa* waterflow (a tributary of the Bodrog river), caused by rainy weather conditions, was primarily responsible for the inundation of a hayland and an oak forest on the neighbouring land of *Lazthoch* in Zemplén county (Lastovce-Sk).¹⁰⁷² Since it was difficult to decide in the legal debate, the proofs of the neighbours and (other) nobles of the area were asked. The majority of them made an oath on the side of a flood event of natural origin (even if few of them 'voted' for the other concept). Moreover, no flood damages were visible on the trees, and the river-diversion (for the mill) had been carried out in the area of the *Rakathyas*-brothers and not in *Lazthoch* as *Nicolaus* suggested. All these circumstances proved the truth of the 'flood-caused-by-rainfall' concept, declared by the *Rakathyas*-brothers.¹⁰⁷³

Even if the date of the flood event is unknown (before 1 August 1422), since the king's man and the delegated member of the Lelesz convent were searching for obvious (fresh) signs of flood damages on trees, we can presume that the flood event did not occur long time (e.g. years or even several months) before.

Mill damaged due to vehement flux of the Nitra river: in or (short) before 1422

In a charter dated to 25 November in 1424, an earlier charter of a legal debate in 1422, taking place between a local noble called *Sandorff de Viczap* (Kis-Vicsáp; part of Hrubaňovo-

¹⁰⁷⁰ Csánki 1890 Vol. 1, p. 395.

¹⁰⁷¹ DF 221404 (27.02.1422): "Sigismundus dei gracia Romanorumque Rex semper augustus ac hungarie Bolgarie dalmacie Croacie etc Rex fidelibus suis Conuentui ecclesie de lelez Salutem et graciam. dicitur nobis in personis Nicolai filij Nicolai de felnempi ac Martini et Stephani, quod licet pro genitores ipsorum et ipsum per consequentes de libero coram ben et placito pro audiendum missis et susciperendum alijs ecclesiasticum Sacramentum ad ecclesiam beate marie Virginis in possessione hunghwar fundatam recessum et refugium hactenus habuissent Tamen ipsum et Jobagiones eorum plerumque et sepe sepius propter invndaciones aquarum ad ipsam ecclesiam proaudiendum diuinis accedere non valuissent nec valerent neque plebanus dicte ecclesie ad dictum hunghwar propter premissas invndaciones aquarum administranda Sacraenta infirmis et Baptisma perueniorum facienda proficisci non posset neque valeret Inuico quod notabilis est cum ipsam ecclesiam de hunghwar predictam in confinis Regni nostri foret constituta et adeandum per silvas grandes cum homines vtrisque sexis ipsius possessibus Nempi confluere h(..)uisserunt tunc continue multi e..isdem in eiusdem Siluis spoliati fuissent vel spoliarent incessantur," For Hungarian regesta, see: ZsO Vol. 9, ch. 210, p. 85.

¹⁰⁷² Csánki 1890 Vol. 1, p. 355: it is located north to Sátoraljaújhely, close to the present Hungarian borderline.

¹⁰⁷³ DF 221420. For Hungarian regesta, see: ZsO Vol. 9, ch. 876, p. 284.

Sk) and the prior of the St. John monastery in *Elefant* (Lefantovce-Sk), was included in a short form. Reason for controversy was in 1422 that the monks blamed *Sandorff* for diverting the Nitra river. Caused by this which diversion (the water) damaged the mill of the monastery.

The careful survey, however, revealed that *Sandorff* was not responsible for the damage, but directly the vehement flux of the Nitra river ('*per vehementem et impetum cursum dicti fluvii Nitrie*') ruined the mill.¹⁰⁷⁴ Thus, although the final decision in this debate was made in 1424, the problems clearly were described in 1422, so the damage of the mill by the vehement flux of the Nitra river occurred in 1422 or (not long time) before. Even if this is not a direct reference on a flood event, increased flux (with increased damaging, transporting capacity) of the river usually means increased water discharge (or major human intervention).

9.5.3.3 Spring flood in 1423

The next report is about the misuse of meadows which were wet due to the inundation of the Korpona river (Krupinica-Sk). In *Saagh* landed possession (Ipolyság; Šahi-Sk) a field survey took place on 6 April, when it was observed and stated in the charter that meadows of the Ság convent were all affected by the actual multiple (?) flood of the Korpona river and thus, they were muddy ('*per presentem inundationem eiusdem fluvii Korpona plurimam(?) fuissent lutosa effecta*'). According to the charter, on 2 April the serfs of the provost of Esztergom from *Gerek* (neighbouring village) let their pigs to the meadow of the provost of Ság. This meadow along the bank of the (the other side of the river) Korpona river was too wet at that time, so it was not allowed for the animals (or anyone) to step on it, and basically the pigs of the provost caused damages in the meadows by using them.¹⁰⁷⁵

9.5.3.4 Reports from 1424 on frequent flood events

Chapel ruined due to constant floods and wet walls

A very important petition arrived to the pope in late winter time (12 February, 1424) from the duke of Transylvania, Miklós Csáki. The duke applied to the pope to allow the demolition of the Saint Otilia chapel in the castle of Körösszeg (Cheresig-Ro), which was in very bad condition (ruined) due to continuous floods/inundations and the leaking of the castle ('*propter aquarum inundationes continuas et stillicidia dicti castri*').¹⁰⁷⁷ However, the duke also asked for preserving the patrocinium, even after demolishing the chapel itself.

¹⁰⁷⁴ DL 11591 (included in a charter dated to 1438). For Hungarian regesta and partly Latin transcription, see: ZsO Vol. 10, ch. 1388, pp. 555-556: ".... eundem fluvium Nitria supra prope ipsum molendinum prescriptorum heremitarum in eodem fluvio Nitrie decurrens de suo vero et antiquo meatu excipere et per quasdam duas venas Korothva et Hayoser appellatas ad molendinum eorum, quod in fine dicte ville Apathi de novo edificassent, fluere divertissent, propter quod memoratum molendinum prescriptorum heremitarum destructum haberetur. predice vero due vene non per alias fossuras per predictos Sandorff et dominam fieri procurate, sed per vehementem et impetum cursum dicti fluvii Nitrie facte haberentur."

¹⁰⁷⁵ Unfortunately, the paper is damaged at one part of the word (with a hole), so content can be only estimated.

¹⁰⁷⁶ DL 11334 (14.04.1423): "...universa prata tam sua, quam iobagionum suorum ultra fluvium Korpona intra veras metas eiusdem possessionis Saagh existentia, que per presentem inundationem eiusdem fluvii Korpona plurimam (or: plurimum?) fuissent lutosa effecta, tam dictos suos, quam etiam universos iobagiones dicti Francisci prepositi ecclesie Strigoniensis in possessione Gerek vocata residentes, ne ipsi grees porcorum seu pecorum ipsorum ad ipsa prata pellere et eadem conculcari facere deberent, prohiberi fecissent et publicari manifeste,....". Hungarian regesta and partly Latin transcription: ZsO Vol. 10, ch. 392, pp. 184-185.

¹⁰⁷⁷ Lukcsics 1931 Vol. 1, ch. 723, p. 156 (12.02.1424): "Suppl. Nicolai de Chaak, waivode Transilv., de lic. destruendi capellam a se ipso in castro Kereszeg, Varad. d., sub vocabulo B. Otilie V. fundatam, que propter aquarum inundationes continuas et stillicidia dicti castri admodum ruinosa est. Suppl. Item de reserv. Sibi et

The castle was located along the Sebes-Körös river in historical Bihar county. The medieval Körösszeg with its castle was a market town. The castle was built in the mid-13th century (after the great Mongol invasion), its donjon is still visible (also on GoogleEarth) today.¹⁰⁷⁸

It is, of course, an interesting question, whether the chapel was simply of a bad building construction (possibly it was made of brick, as the donjon?) or the environmental conditions changed in the meantime (or both). Nevertheless, the duke's petition clearly states that they had problems with the constant inundations and wetness and thus, with the environment. Continuous floods around and wetness of the castle suggest an intensive, high flood-frequency period of the Sebes-Körös (more intensive and higher frequency than before), in which case in this low-lying area water remained for longer while, perhaps inundation remained even until the next flood event, and this caused continuous wet conditions around and in the castle.¹⁰⁷⁹

The still existing red-brick donjon is located on a mound, surrounded by a moat, right at the bank of a former branch of the Sebes-Körös river, right at the borderline between Hungary and Romania. According to a description related to an early 16th-century land division, a chapel building existed among the buildings of the castle,¹⁰⁸⁰ so it is likely that a new chapel was built up afterwards.

Late autumn flood of the Nitra river

The Nitra river caused problems not only with its vehement flux in 1422, but also in 1424 late November, again in the area of *Wichap* (and *Apáthi*; Výčapy-Opatovce-Sk). In the charter dated to 25 November, participants of the legal debate could not visit the area of the mill (of the monastery) and the river due to the actual, ongoing flood event of the Nitra river.¹⁰⁸¹

Frequent floods at the Upper-Dunajec: charter evidence from 1424

On 27 October ('*feria sexta in vigilia Simeonis et Judae Apostolorum*') 1424 Carthusians in Lehnic (Lehnica-Sk), from the monastery of *valle S. Antonii* in the Szepesség (Spiš) area received a land, subject to frequent flood events, at the upper course of the Dunajec river (over Lehnic) from Wladislaus, the Polish king. The charter thus refers to problems caused by flood (in general) without dating any event.¹⁰⁸²

The monastery was located at the Dunajec river, very close at the Polish borderline. At the time when the charter was issued, the above-mentioned area was under the legal authority

successoribus suis ius patronatus et presentandi personam idoneam in capellatum capelle huiusmodi de novo fundate et de indulg. dictam cap. deputare." For Hungarian regesta, see: ZsO Vol. 11, ch. 122, pp. 59-60.

¹⁰⁷⁸ Györffy 1987 Vol. 1, pp. 637-638.

¹⁰⁷⁹ Concerning the location of the castle, it is clear that the castle mound was surrounded by a moat, which received its water supply from the nearby river (Sebes-Körös). Naturally, this means on the one hand human impact on the water regime. Nevertheless, even artificially, waters could be kept around the castle only in case of a relatively constant (natural) water supply. While it was possible to keep water in the moat for a while even in drier periods, a moat could not really defend the castle mound from constant high waterlevels of the nearby river.

¹⁰⁸⁰ Rusu n.d.: <http://www.castrumbene.hu/erdelyivarak/var/korosszeg.html>.

¹⁰⁸¹ DL 11591 (25.11.1424). ZsO Vol. 11, ch. 1388, p. 555.

¹⁰⁸² Fejér Vol. 10/6, ch 273, pp. 620-621: ".... Proinde Nos Wladislaus, Dei gratia Rex Poloniae, Quomodo considerato sincerae devotionis zelo, quo fratres Carthusienses Monasterii in Lechnitz de valle S. Antonii in terra Scepusiensi, virtutum dono in spiritu humilitatis sedulum impendunt famulatum, orationumque ipsorum cupientes esse particeps, per quod praesidia et in praesentis vitae decursu, votivae felicitatis incrementa authore Domino amplecti et in futuro aeterna gaudia consequi speramus. Horum intuitu quamdam superficiem terrae, a Monasterio usque litus fluvii Dunayecz progredientem et plerumque ex inundatione fluvii eiusdem impeditam, cum omnibus et singulis eius fructibus ac vtilitatibus ex ipsa arte et ingenio, aut quoconque labore aquirendis, Monasterio et Fratribus Carthusiensibus pro tempore constitutis, iure perpetuo et irrevocabiliter et de promptuario liberalitatis nostrae, ex certa nostra scientia dedimus et donavimus per ipsos libere et pacifice tenendam, possidendum et habendum," See also: AS Vol. 3, pp. 185-186. Hungarian regesta: ZsO Vol. 10, ch. 1209, p. 492.

of the Polish king and authorities. Based on this information it is difficult to draw any conclusions concerning flood frequency or dates of flood events of the land desired by the Carthausians.

9.5.3.5 Two references of former floods, mentioned in 1426

Perambulation at the Rába river in 1426: former floods

On 1 September and the following days ('*in festo beati Egidii abbatis ... et aliis diebus sequentibus*') in 1426 a perambulation took place in Sopron county, between the landed possessions of Mihályi and Kisfalud, located at the Rába river. This new perambulation took place because the charter describing the boundaries were written in the 13th century. Thus, on the one hand the boundaries were old (*propter nimiam temporis vetustatem*), on the other hand due to constant/continuous flood of waters (*propter... assiduam aquarum inundacionem*) majority of landmarks were not visible any more. In this case only flood of waters, occurred before, is mentioned without any specific date.¹⁰⁸³

Preceding great floods and early flood protection in Žitný ostrov in 1426?

A very important charter, dated to 12 March in 1426, was described and published at the end of the 19th century by Gyula Földes, giving information of basic importance both concerning the 15th-century history of Danube flood events and late medieval flood protection issues. Although the original is not yet found, a complete transcription of th charter is provided by Földes.¹⁰⁸⁴ In early March, King Sigismund in his order briefly described the situation:

¹⁰⁸³ SvO Vol. 2, ch. 63, pp. 105-106 (16.09.1426): "..., quod ipsi in festo beati Egedii abbatis proxime preterito et aliis diebus sequentibus presentibus magnificis dominis Stephano de Kanisa ac Ladislao filio eiusdem domini Stephani pro se et pro magistro Johanne filio Nicolai de eadem, item Vgrino filio Dominici, petro filio Pauli de Mychaly, Anthonio filii Laurencii, Nicolao filio Stephani de Kysfalud aliis eciam nonnullis vicinis et commetaneis earumdem possessionum ad facies ipsarum possessionum Mychaly et Kysfalud accessissent et easdem per cursus metales iuxta tenorem literarum privilegialium condam domini Andree regis Hungarie felicis recordacionis ibidem er dictos nobiles de Mychaly in specie productarum, quarum seriebus utraque parcium predictarum se benivole submisissent, quamvis propter nimiam temporis vetustatem et assiduam aquarum inundacionem mete antique in ipso privilegio conscripte in paucis locis infractactis apparerent inveniri potuissent, plagas autem et loca in eodem denotare semper tenendo concordantibus et in nullo contradicentibus ambabus artibus predictis, hoc ordine reambulassent:..."

¹⁰⁸⁴ Due to its significance, hereby I add the full text of the charter (published by Földes 1999, pp. 221-222): "Nos Sigismundus Dei gratia Romanorum Rex semper Augustus, ac Hungariae, Bohemiae, Croatiae Rex, Fidelibus nostris Universis et singulis, Nobilibus et Incolis Comitatus Posoniensis possessionariisque hominibus, in Districtu Csallóköz Possessiones habentibus Salutem et gratiam. Tamquam ex recommendatoriis insinuationibus Fidelium nostrorum Stefani et Georgii de Rozgon Comitum nostrorum Posoniensium, nominibus et personis Civium Civitatis nostre Samariae Majestatis nostre factis, percepimus: Quomodo aqua Danubialis a pluribus jam retroactis Annorum curriculis, a suo cursu solet excurrere, Littora ipsius Danubii per alluvium rumpere, et ad tantum accrescere, per campos etiam hinec Cursus et vicos suos dilatare, quo in petu magnae Partes terrarum arabilium atque usualium, illius proluvie et signanter praescriptae Civitatis nostre Samaria, ex talismodi alluvionibus vehementibus, et repentinis in undationibus plurimae terraes arables essent quasi in nihilum redactae, imo usui eorundem Colonorum nullius forent valoris atque utilitatis. Et nisi ipsae aquae debito tempore ad alium Cursum deriventur, aut vertantur aut obstacula seu clausurae necessariae perinde disponantur, utique ipsae aquae in Insula Csallóköz et in dicta Samaria maiora facient detrimenta. Unde eidem Civitati nostrae, et multorum ex vobis tam in vestris propriis Iobbagonum vestrorum Sessionibus, Pratis et Terris usualibus damnum irreparabile posset evenire. Idcirco Fidelitatibus Vestris universis et singulis per praesentes mandamus, quatenus dum et quando ac quotiescumque per praefatos Stefanum et Georgium Comites dicti Comitatus Posoniensis vel ipsorum Vice Comites serie praesentium requisiti fueritis toties universos et singulos populos et iobbagones vestros pro disponendis et ordinandis Clausuris et obstaculis, per praemissae aquae, ad alium Cursum, et alveum iuxta informationem praefatorum Stefani et Georgii fiendam, cum ligonibus fossoriis et aliis instrumentis ad id necessariis dirigere, et destinare debeatis nullam negligentiam eatenus commissuri. Alioquin commisimus et serie

"... already for years, the water of the Danube often leaves its regular course, destroys its banks by flood (sediment?), and increases so high that inundates roads and villages, and with its great flux it demolishes large parts of the arable lands and (other) cultivated lands. Namely, a great amount of arable lands of our town, Somorja, were demolished by vehement floods and repeated inundations in such extent that the inhabitants do not earn anything out of them and can use them for nothing valuable or profitable any more."

For ordering acts and practical works for further protection of the area under great flood risk of the Danube, more information is available in the same charter. The King found the problem so great that he in fact ordered some kind of regulation of the Danube (e.g. damming, sluices etc) for the adequate flood protection of the Žitný ostrov area and Somorja (Šamorín-Sk) town with its arable lands. Thus, he delegated the two counts (*comites* of the county) responsible for regulation and protection works ('*Cursum deriventur, aut vertantur aut obstacula seu clausurae necessariae perinde disponantur*'), and gave them full power as well as authority to order any of the people in the county to come with tools suitable for the work to the endangered area, whenever they see it necessary.

Nevertheless, since the original charter (remained in its 18th-century transcription)¹⁰⁸⁵ I have not found up to now, at present we can use this precious document only tentatively. Thus, in the further, mass analysis I included this data and the flood evidence with question mark.¹⁰⁸⁶

9.5.4 Floods of the period 1431-1440

9.5.4.1 Flood reports of 1432

Great flood of the Nitra river at Elephant in 1432

In connection with a controversy over a mill and the altered watercourse of the Nitra river, a great flood is recorded. The exact date of the field survey is not recorded, however, it occurred within four days (from Monday to Thursday), immediately after the King sent his order to the chapter of Nitra for further inspection. The great flood ('*nimia ipsius fluvij Nitre inundacio*') was witnessed when the officers, responsible for the legal procedure, wanted to cross the river from *possessio Elephant* (Dolné/Horné Lefantovce-Sk) at a ford to the village of *Wychap* (Vyčapy-Opatovce-Sk).¹⁰⁸⁷ Nevertheless, due to this great flood of the Nitra river they could not cross, and the procedure was postponed to 1 August.¹⁰⁸⁸

praesentium committimus eidem Stefano et Georgio ut ipsi vos ad id faciendum cum vestris damnis compellant et adstringant. Authoritate nostra Regia praesentibus ipsis ex praeecepto attributu, Secus igitur facere non auditis et praesummatis. Praesentes enim post earum lecturam reddi iubemus praesentati. Datum in Tata Feria tertia proxima post Dominicam Letare Anno Domini Milesimo quadragesimo Vigesimo Sexta. Regnorum nostrorum Hungariae Trigesimo octavo et Bohemiae quinto. Sigismundus." To some extent, maybe another charter, issued in 1425 show some connections to this problem, where the problems (on arable land and fruit gardens) caused by rain and other waters in winter time are described and some solution was as well mentioned (ditches leading away surplus waters). For an interesting, possibly parallel case, see: DL 11726 and Maksay 1971, p. 161.

¹⁰⁸⁵ Földesi 1999, p. 63.

¹⁰⁸⁶ In this case it has to be mentioned that in their significant study, Pišut and Tímár (2009) without source/literature reference, referred to a document dated to 1422 for the village of Megyercs in which "repeated flood events were blamed for making works on the fields impossible for years" (p. 61). Checking through the known charters of Megyercs (e.g. ZsO Vol. Vol. 9, ch. 608-609, 754, 860; also Csánki Vol. 3, p. 507; and the DL-DF collection of the Hungarian National Archives), remained for the year of 1422 (or the years before and after), I found three originals (DL 11231, 38470, 87960), but none of these charters contained the mentioned information. Thus, finding the mentioned charter needs (and subject of) a further, more elaborated survey.

¹⁰⁸⁷ For more information, see: Györffy 1998 Vol. 4, p. 487.

¹⁰⁸⁸ DL 12454 (02.05.1432): ".... secunda, tercia, quarta et quinta ferijs nunc proxime consequentur... vnacum vicinis et commetaneis Ad vadum dicti fluvij Nitre ex Wychap a parte scilicet possessionis Elephant ... accedentes ac possessionum wijchap predicte et Apathij vocatarum partis aduerse eundem fluvium Nitre

Since the date of the charter issue was 2 May ('*feria sexta ... ante festum Inuencionis sancte cruce*'), the attempt for a perambulation and the field survey most probably took place between 28 April and 1 May (on 28, 29, 30 April and 1 May). The medieval conditions of Elefánt landed possession are described and studied in detail by Fügedi.¹⁰⁸⁹ This is the third case when floods at the Nitra river in the area of Vicsap, Elefánt and Apáti were mentioned.¹⁰⁹⁰

Great flood in July 1432: Czech Lands, Austria and Hungary

On 21 July in 1432 a very great flood was reported, occurred in Bohemia, Moravia, Austria and Hungary, which destroyed villages and towns, and in Prague it destroyed the bridge and the mill.¹⁰⁹¹ This could cause further problems also in Hungary, especially if it caused destruction, since Hungary had to enter the year of 1432 with a monetary reform, as the monetary chaos already caused several (but maybe not merely moncausal?) problems such as high prices and need (*caristia, penuria*) in the country.¹⁰⁹² There is no information about the actual rivers flooded in Hungary; nevertheless, in this case the Danube catchment was clearly affected. This flood event in mid-July suggests some great/intensive rainfall event(s) in the previous period.

Great flood of the Danube at Belgrade: April 1433

The travel(s) of Bertrandon de la Broquière took place in Hungary in 1433, when the legate travelled back from the Holy Land through Constantinople and the Balkan peninsula. He left Constantinople in January. Arriving to Belgrade on 12 April, he witnessed the extraordinary great flood of the Danube what he reported in the following way:

"Au partir de Belgrado je passay la Dunoe qui a celle heure avoit bien dix mille de large, et me fu dit, quil nestroit point de memoire d'homme que onques leust veue si large, ne si parfonde a une toyse de hault, comme elle estoit a la donc, et ne povoit on aler a Boude par le droit chemin. Et puis arrivay a vne ville champestre que lon nomme Penseg, et de la chevauchay par le plus plain pays, que je veisse onques, sans trouver montee ne vallee et passay une riviere en vng bac a vng village."¹⁰⁹³

Thus, he crossed the Danube at Belgrade, which was in especially great flood and its width was around 12 miles. According to the source, the Danube had not been so extensive since time immemorial. Therefore, he could not continue the travel directly towards Buda, but turned his way towards the town of Pancsova (PančevoSrb) and then to the direction of Szeged. No travel problems, caused by floods or other circumstances, were mentioned in his notes at this time.¹⁰⁹⁴

Nevertheless, it is interesting to mention that, as the ethnographer Miklós Szilágyi also warns attention to the fact, Broquière noticed and documented the extraordinary (at least for him it was extraordinary) great abundance of fish in the Tisza at Szeged in late spring 1433.¹⁰⁹⁵

pertranseundo accedere voluerent Tamen quia videntes et conspicientes inibi nimiam ipsius fluvij Nitre inundacionem propter quam premissarum executionum debito modo sic faciem non posse agnouissent ..." ¹⁰⁸⁹ Fügedi 1998, pp. 110-115.

¹⁰⁹⁰ For the 1422 case see section 5.5.3.2, and for the 1424 case see 5.5.3.4.

¹⁰⁹¹ FRA SS Vol. 6, p. 77 (*Rosenberger Chronik*): "Fuit diluvium maximum in Boemia, Moravia, Austria, Hungaria feria secunda (21 July) ante Mariae Magdaleneae (22 July) et destruxit villas (et) civitates et in Praga destruxit pontem et molendinum. Et statim sequenti anno fuit caristia annonae sic quod siligo et triticum vendebatur pro 30 grossis albis." See also Weikinn 1958 Vol. 1/1, p. 345.

¹⁰⁹² King Sigismund's charter about the monetary reform and the actual situation was issued on 20 January, 1432: Fejér Vol. 10/7, ch. 174, pp. 428-432.

¹⁰⁹³ MHHD Vol. 4, pp. 309-310.

¹⁰⁹⁴ See also: Szamota 1891, p. 90; Nagy 2009, p. 86.

¹⁰⁹⁵ Szilágyi 1977, pp. 166-167. For source text, see: MHHD Vol. 4, p. 310.

This might indirectly refer to (previous) prolonged late spring-summer flood(s) of the Tisza river.

9.5.4.2 High water level of Lake Fertő in 1434?

Two charters, dated to 1434 and 1435 provide likely evidence on contemporary (either periodic or continuous) high water level (or flooding state) of Lake Fertő. In the 15th century on the eastern, northeastern shores of the Lake several smaller, temporary lakes could be found. Being a 'proper' lake and having freshwater in its basin during the high water level of the big Lake, one of these temporary lakes, at that time belonging to the land of (Felső)Csitvánd, clearly had freshwater and fish in its basin some time before or during January-May 1434.¹⁰⁹⁶ Since according to the charter evidence, dated to 1435,¹⁰⁹⁷ the fishpond received water only in the case of high water level or flood of Lake Fertő, in 1434 or 1433 the water level of the Fertő had to be high.¹⁰⁹⁸

The date of the high water conditions is, however, not exactly provided: fishing over the fishpond occurred some time before or during the period of January-May 1434. Thus, although the event could not really happen many years before and it seems likely that it was a rather urgent case. Information on high water-level conditions of Lake Fertő can most probably be largely thanked to the (otherwise very practical) legal tradition that temporary fishpond was worth for much less, half the price of a fishpond with continuous water coverage in its lake basin.¹⁰⁹⁹

¹⁰⁹⁶ For Latin edition, see: SvO, Vol. 2, pp. 197-198: "... Denotamus nostris in literis eidem vestre magnificencie, quod nos ex veredica relacione percepimus, quomodo officiales vestri vicecomites Ferthw, familiarem nostrum videlicet Egidium de Chythwand strenuumque militem in eorum iuribus pro quadam piscina sine scitu vestre fraternitatis magnificencie nimium impedirent et turbarent, imo eciam proventus presenis anni idem vestri officiales per vestram magnificenciam inibi constituti exiguerunt, quoniam si talia facta super nos et ad (pertinentes) alias evenerint vestre fraternitati magnificencie non cessaremus renunciare et superinde remedium fieri speraremus, que facta idem familiaris noster nex vestra magnificencia domino imperatori minime retulimus sed vindictam et remedium a vestra magnificencia fieri speramus. Qua propter presentibus intime vestram rogamus magnificenciam, ut eundem familiarem nostrum per amplius molestari non permittendo, sed in eorum iuribus defensare dignemini, sciendo hic coram domino imperatore pro vestro honore toto cordis desiderio laborare. Scriptis (sic!) Basilie, anno domini Mo CCCCX XXXo quarto. Georgius de Hedrehwar, agazonus regalium magister."

The area of the deserted medieval settlement is today located in Burgenland, Austria – close to shoreline, between Gois and Podersdorf. Concerning medieval (and early modern) topography and environmental circumstances, see: Kiss-Piti 2005, pp. 164-184. Imre Nagy dates this letter between January and mid-May (SvO Vol. 2, p. 197), due to the fact that king Sigismund (with his court) stayed in Basel between 1 November 1433 and 13 May 1434.

¹⁰⁹⁷ DF 278003. (full) Latin edition: Kiss-Piti 2005, pp. 182-183: "...., quomodo ipsi intra metas possessionis eorum Felsewchytwand vocate in comitatu Mosoniensi habite haberent et possiderent quandam piscinam que tempore inundacionis laci Fertew vocati per quandam meatum seu effluxum aque ex ipso laco decurrentem wlgariter fok appellatum aqua bene et abundanter repleri, tempore autem decresscencie seu ariditatis perditi laci sic in aqua deficere consuevisset, quod ipsa piscina propter huiusmodi defectum aque et eius ariditatem valde modici vel quasi nullius esset eis comodi utilitatis, verum si ipsi huiusmodi meatum seu exitum aque de ipso laco decurrentem quanke profundius effodi quandoque verum secundum accresscenciam et decresscenciam aque laci Fertew prenotati iuxta temporis congruiciam obstaculis seu aggeribus claudi et demum dum opus esset aperiri facere liberam haberent facultatem," In this paper, after the date of the charter we have dated the high water-level year to 1434. It is, however, clear that the event may also have happened earlier. However, most probable time of the event is in the Lent-period of 1434 – this can be supported by the idea that there could be an important, urgent need for this official letter if this had been sent from Basel. Thus, due to the constantly good, close connections between count Héderváry and the Csitvándi family, it is rather unlikely that the event happened years before.

¹⁰⁹⁸ For more details, see Kiss-Piti 2005, pp. 164-184.

¹⁰⁹⁹ *Tripartitum* Pars 1, Titulus 133, § 40, pp. 218-219.

9.5.4.3 Flood of 1435?

In a charter (*litterae divisionis*) issued on 26 June 1435 by the convent of Lelesz, it is described that during the division of *Lewk* (Tiszalök), *Ozlar* (Tiszaeszlár), *Goman* and *Bagos* landed possessions on 19 June (and the days after), due to the flood of the Tisza river, it was not possible to go to some parts of *Ozlar* landed possession.¹¹⁰⁰ The flood clearly occurred in the Tisza river ('*propter circumiacentiam aquae fluuy Ticie tempore inundationis ipsius facte*').

This case is also interesting, because in case of *Ozlar* not simply lands, but the inner area (*sessiones Jobagionales*) itself was as well affected: eight serf-lands were deserted due fact that the flood of the Tisza surrounded the land. It is an interesting example of a partial desertion of a village, mentioned to be caused by flood(s). It is, however, not clearly stated when the flood(s) took place, causing the desertion of one part of the village (thus, it could happen in 1435, or before).

9.5.4.4 Prolonged floo(s) of the Danube in 1436?

Unsuccessful attempt for a perambulation in May

On 13 May in 1436 the chapter of Kalocsa gave a testimony on the unsuccessful perambulation of Felszekcső, Lak and Paliport landed possessions, along the middle section of the Danube. In this case, neither the (re)settling of boundaries and landmarks nor the perambulation could take place due to the ongoing flood event.¹¹⁰¹

Danube (still?) in flood: unsuccesful (repeated) attempt for field survey in August 1436

Although the next field survey of Felszekcső, Lak and Paliport landed possessions should have taken place on 8 August. However, on 7 August canon *Lazarus* and *Thomas de*

¹¹⁰⁰ DL 54943 (26.06.1435): "..., qvod Ipsi quinto decimo die festi Pentecostes proxime preteriti, ac aliis diebus ad id aptis et sufficientibus, ad facies Possessionum Lewk, Ozlar, Goman et Bagos vocatrum, ob hoc ipsi praedictas octo sessiones in dicta Possessione Ozlar, licet Joanni de Kallo, loco autem earundem tottidem octo sessiones in dicta Possessione Bagos praenominatis in causam attractis pro eo dedissent in divisone, qvia tantam Terram vacuam et corumperem in facie praescriptae Possessionis Ozlar, propter circumiacentiam aquae fluuy Ticie tempore inundationis ipsius facte, in qua scilicet Terra ydem in causam attracti sessiones Jobagionales locare possent minime comperire et eisdem dare valuerint."

¹¹⁰¹ Zichy Vol. 8, ch. 397, pp. 570-571: "Magnifico viro domino Mathius de Paloch regni Hungarie palatino et iudici Comanorum amico eorum honorando capitulum ecclesie Colocensis amittitiam paratam cum honore. Noveritis, quod cum nos receptis litteris vestre magnificentie adiudicatoriis, modum et formam possessionarie reambulationis, metarum demonstrationis, consignationis, revisionis, estimationis et statutionis in se denotantibus, pro partibus honorabilis capituli ecclesie Albensis agentis, ac Ladislai filii Ladislai Thetheus de Bathmonostra in causam attracti loquentibus, nobisque amicabiliter directis, iuxta quarum continentiam unacum magistro Ladislao de Alba notario et homine vestro in eisdem litteris vestris inter alios homines vestros nominatim conscriptos nostros homines, videlicet honorabiles viros dominos Georgium archidiaconum Bodrogensem pro parte ipsius capituli Albensis, necnon Jacobum pro parte ipsius Ladislai Thetheus, socios et concanonicos nostros, nostris pro testimentiis ad contenta litterarum vestrarum peragenda duximus destinandos, demum iidem exinde ad nos reversi, nobis uniformiter retulerunt, quod ipsi quinto decimo die festi benti Georgii martiris proxime preterito ad facies possessionum Felzekchew ipsius capituli Albensis, necnon Lak et Palyport vocatarum ipsius Ladislai, vicinis et commetaneis earundem universis inibi legitime convocatis, et eisdem ac bonorabilibus viris dominis Gregorio et Lazaro canonicis dicte ecclesie Albensis legitimis procuratoribus ipsius capituli, necnon prefato Ladislao Thetheus presentibus accessissent, easdemque possessiones parcium, iuxta seriem et continentiam litterarum vestrarum adiudicatoriarum propter inundationes aquarum reambulare et signis metalibus consignare nequivissent. Datum sexto die executionis prenotate, anno domini millesimo quadringentesimo tricesimo sexto."

Bessenyew (in the name of László Töttös) appeared at the chapter of Kalocsa (*locus credibilis*), and reported that it was impossible to carry out the field survey due to the still ongoing inundations ('*propter invndationes aquarum*').¹¹⁰²

9.5.4.5 Great flood in 1437: a winter flood case?

Documented in a charter dated to 21 April in 1437, on 27 March (in Prague) King Sigismund ordered to cancel a previous decision concerning some lands in Rezege and Mezőrezege landed possessions. Main reasons were that one of the affected parties (*Georgius filius Blasy de Rezege*) had not been present at the legal trial because of a funeral and the great flood ('*propter nimiam aque inundacionem*'). Thus, a new date for another legal trial was decided.¹¹⁰³

Georgius should have been present on the legal trial, taken place on 13 January ('ad...octavas festi Epiphaniarum domini'). Instead of participating the legal trial, *Georgius* went for the funeral of the (former) palatine in Pálóc (*oppidum Paloucz; Pavlovce nad Uhom-Sk*), which was on the very same day as the trial (13 January).¹¹⁰⁴ The negative decision, due to the absence of one of the parties, was made by the royal judge (*iudex curie*), István Bátori (*Stephanus de Bathor*). Even if no location for the great flood event is mentioned, it could have affected the lowland areas of the northern Great Plain, since *Georgius* should have travelled to Buda because of the legal trial. Since King Sigismund wrote his *mandatum* on 27 March in Prague, and *Georgius* should have been at the trial on 13 January, it seems likely that the great flood of waters took place in winter or latest in the first days of March.

¹¹⁰² DL 80573 (07.08.1436). The successful perambulation, carried out by the chapter of Kalocsa, finally took place in the area of Felszekcső, Lak and Paliport on 19 May in 1438. See: Zichy Vol. 8, ch. 428, pp. 617-619. It is interesting to note that a short part of the perambulation took place in between swamps and reedy area (*inter paludem et arundineta*).

¹¹⁰³ Károlyi Vol. 2, ch. 111, pp. 189-192: ".... Noveritis nos literas serenissimi principis dicti domini Sigismundi regis evocatorias nobis preceptorie directas omni cum reverencia recepisse in hec verba: Nos Sigismundus memorie commendamus per presentes, quod fidelis noster Georgius filius Blasy de Rezege nostrum veniendo in conspectum, sua ac Gregory et Blasy filiorum suorum in personis nostre exposuit maiestati, quod licet nos temporibus retroactis nobili domine Elena alio nomine Myklosazon vocate relicte condam Stephani de Zarwad in eo ut ipsa contra prefatos Georgium ac Gregorium et Blasium filios eiusdem Georgy in facto quarundam medietatum possessionum Rezege predice et Mezewrezege nunc deserte vocatarum in comitatu Zathmariensi existencium, quas alias ydem exponentes a prelibata domina Myklosazon per legitimorum terminorum comolecionem obtinuerint literas et literalia sua instrumenta si quas super facto earumdem medietatum dictarum possessionum pro se haberet confectas, in octavis festi Epiphaniarum domini proxime preteriti in presenciam nostram denuo et ex novo producere et exhibere valeret, id faceremus in premissis quod iuri et regni nostri consuetudini videretur expediri, tarnen ipsi exponentes tum propter nimiam aque inundacionem tum eciā quia eo tempore dictus Georgius unacum fideli nostro dilecto reverendissimo in Christo patre domino Georgio archiepiscopo ecclesie Strigoniensis in oppido Paloucz in celebracione exequiarum condam magnifici Mathius de eadem Paloucz palatini fuerit constitutes, ad dictasque octavas festi Epiphaniarum domini non prius pervenisset nisi cum iam pro parte dicte domine contra sepefatos exponentes litere iudiciales et sentenciales fidelis nostri magnifici comitis Stephani de Bathor iudicis curie nostre maiestatis in premissis emanate extitissent et extradate, cum quibus tarnen literis eodem die quo eadem fuissent emanate et restitute, procuratorem dicte domine ibidem in ipsis octavis Bude repedendo petivisset per dictum iudicem curie nostre pro habendo in premissis iudicio facere arrestan, quod idem iudex curie nostre facere noluisset, communem iusticiam sibi in hac parte abnegando;"

¹¹⁰⁴ See Engel 1996, p. 5.

9.5.4.6 Perambulation obstructed by uninhabitable wetlands: 1438

This is not a clear, 'direct' flood case (thus it is not included in later, main analyses), but the environmental circumstances, the area and the description of one particular section of the perambulation, where perambulators could not settle boundaries, can remind us to the conditions and problems mentioned in the great flood year of 1342 at the Upper-Tisza and at the Lower Danube. In our present case, the perambulation took place in a rather interesting wetland area close to the Fehér-Körös river.

On 4 November (*feria tercia proxima post festum Omnium Sanctorum*) in 1438 a perambulation took place in medieval Zaránd county,¹¹⁰⁵ in the areas of Gywla (Gyula) town and some neighbouring landed possessions such as Vary (Gyulavári),¹¹⁰⁶ Ewzy (Özi), Gylwath (Gelvács?) and the *predium* called Varahth (Várajt).¹¹⁰⁷ During the course of perambulation a wetland landscape with 'swampy' waterflows and/or river branches (*stagnum Olthuanneer, Meleer* etc) and 'swamps'/wet meadows around (*stagnum Lapisreth*), sometimes with a forest (*silva Olthuanzeke*), is described.

What makes this description interesting is that during the perambulation process, although (stagnant) water bodies are mentioned in several cases, they are never 'in the (wrong) way': they form part of the identification 'objects' in the landscape, but do not disturb the progress of the perambulation. With the clear exception of one area, namely at the boundaries of the landed possessions of Ewzy and Gylwath. The boundary line should have been identified and several landmarks settled (probably there were/should have been landmarks and boundary line in this area in the past?), but it was impossible to do so (*plures vero metas propter lacum et stagnum inhabitabile ulterius erigere non potuissent Terminatis*).¹¹⁰⁸

Moreover, in the text (apart from a lake!) the rather interesting phrase of '*stagnum inhabitabile*' appears in an area where landmarks and boundary line should have been settled. The application of the word '*stagnum*' is also worth for a special consideration: in the earlier part of the charter the '*stagnum*' stayed together with the name of a 'brook' (ér) and another one with 'meadow' (rét). In these cases the wet character of the brook's surrounding and that of the meadow was perhaps emphasised. In this sense, however, '*stagnum inhabitabile*' only can be interpreted as a wet area, and not necessarily as a 'real' swamp or stagnant body of water. It is also interesting because the word '*inhabitabile*' occurs rather rarely, and the last context (in 1342) was quite clearly connected to (prolonged) flood(s). The application of this word,

¹¹⁰⁵ Today the above-mentioned area is located in Békés county, around the town of Gyula.

¹¹⁰⁶ Vári was a medieval toll-place near to Gyula, in Zaránd county. Csánki 1890 Vol. 1, p. 748.

¹¹⁰⁷ Csánki 1890 Vol. 1, p. 741. According to Csánki the deserted medieval land of Ösi was (most probably) located in an area close to the Fekete-Körös river (in the area of present-day Batár and Suplacu de Tinca in Romania), in medieval Zaránd county. Várajt and Vári are not listed by Csánki. Nevertheless, it is possible to trace back in the local history literature. The medieval Várajt (*predium*) was located northeast to Vári, in a wet meadow area, located approximately half way between the Fehér- and Fekete-Körös rivers. See: Scherer 1938, pp. 44-45.

¹¹⁰⁸ Haan-Zsilinszky 1877, pp. 43-45: "Quod ipsi feria tercia proxima post festum Omnium Sanctorum abhinc ad dictam plagam eundo et dicto prato seu stagno Lapisreth pretermisso venissent usque silvam Olthuanzeke vocatam, ubi in margine ipsius silve metam terream, posthec autem plagam ad eandem ttranseundo et ipsa silva pertranssita attigissent quoddam stagnum Olthuanneer vocatum, ac inter ipsum stagnum et silvam eundo ipsa silva prescripta oppido Gywla et possessioni Vary, eodem autem stagno Olthuanneer predicto predio Varahth remanentibus venissent usque quandam magnam arborem Tilie ubi sub ipsa arbore metam terream elevassent, que quidem mete a parte sinistra predicto oppido Gywla et possessioni Vary, a parte autem dextra predictis possessionibus Ewzy et Gylwath ac predio Varahth distingueret et separarent, plures vero metas propter lacum et stagnum inhabitabile ulterius erigere non potuissent Terminatis autem ipsis erectionibus et reambulationibus metarum oppidi et possessionum prescriptarum, idem oppidem Gywla et dictam possessionem Vary prefato egregio Ladislao de Maroth, antefatas quoque possessiones Ewzy et Gylwath cum predio Varahth pretactis nobilibusdeisdem (sic!) sub inclusionibus prescriptarum metarum distinctas et separatas reliquissent et comisissent, Jure ipsis incumbente perpetuo possidendas, nullo penitus contradictore apparente, tam in faciebus earundem, quam nostra in presencia legitimis diebus et horis sufficientibus exspectando."

together with the fact that perambulators clearly should have continued in that wet area along the (former?) borderline and should have settled landmarks, but they could not, suggests generally wetter conditions.

9.5.4.7 Floods destroyed bridge before 1439

In 1439 during the reign of King Albert, crossing the Danube at Pozsony (Bratislava-Sk) was still problematic due to the accumulation of sand and trees. The reason of these problems are also provided in the charter issued on 11 July ('*Sabbatho ... ante festum beate Margarethe Virginis et Martiris*') : floods and fluctuations of the Danube ('*per aquarum inundationes et fluctuationes*'). Due to these events the bridge had been damaged and had to be repaired. Nevertheless, not only the use of the bridge was impossible, but there were also difficulties in using the ford and the 'waterway'.¹¹⁰⁹

As an important parallel, it has to be mentioned that, referring to early 1439 (on 17 February: *in nocte carnisbrevi*), in the *Continuatio Claustroneoburgensis* a destructive Danube flood is mentioned.¹¹¹⁰ Thus, maybe the same flood event/wave as well caused problems in this area, close to the medieval Austrian borderline. Moreover, due to the short distance, it is quite probable that the mentioned woods were coming mainly from Austria, together with the larger amount of (soft) sediments, brought by more floods.

This charter, can as well refer back to not only one year, but also might provide a picture referring to preceding years: 1432 and 1433 were surely great flood years also on the Danube, and there might be a chance of another Danube flood or high water-level conditions in the years afterwards. Especially, because in the charter itself 'floods of waters' (thus, clearly not one but more) are mentioned.

9.5.4.8 Floods in the year 1440

Damages caused by ice on the Danube, recorded in the town accounts: 1440

On 12 March, there was substantial ice (*mit eys gieng*) on the Danube, documented in the accounts of Bratislava, and therefore, ships/ferries were taking travelers from one side of the Danube to the other.¹¹¹¹ The icy water took or destroyed some wooden parts of the bridge which had to be taken back or replaced by workers, paid on 12 March (Saturday) and other days.¹¹¹² After the 'event' workers, paid at the end of April, drove piles of the bridge into the

¹¹⁰⁹ Fejér Vol. 11, ch. 98, pp. 224-225: ".... per aquarum inundationes et fluctuationes et inceptam Conservationem hinc inde distractus, ruptusque, et annihilatus in eius structuris et necessitatibus defectum non modicum patiebatur, nosque, ne temporum in Processu aliqua impedimenta his penes praelibatam Civitatem nostram Posoniensem Danubium transfretantibus praebantur"

¹¹¹⁰ MGH SS Vol. 9, p. 740 (*Continuatio Claustroneoburgensis* V): "1439 Danubius fecit magnum dampnum in Austria, in nocte carnisbrevia, quando homines dormierunt, ita quod ascendit ultra muros civitatum, sicut in Stayn, in Kremps, et multos submersit cum pueris et rebus, et hoc glacies fecit."

¹¹¹¹ (DF 277059): "Item am Sambstag Gregorij pape hab wir geben den fischer gesellen das sy ein Stat poten über dy Tvana gefuert haben, als dy ains tails mit eys gieng, der ken koczsee gelauffen ist noch den Soldnern, dem Nidendranvd sein gesellen 1 pint wein XII en. Wien." See Ortvay 1900, Vol. 2/3, p. 188.

¹¹¹² (DF 277059): "Item auch am Sambstag Gregorij pape hab wir geben besunderlichen iiij gesellen, dy mit andern Schifleuten gefaren synd vnd haben Ennspawm vnd Strew gesucht vnd Schif, das der Stos fuder gefuert hat, ydem XI den. Wien. Facit xlii den. Wien. / Item am Freitag nach letare VI aribatern dy nach dem prukholcz gefaren sein, das der stos hingefuert hat, ydem XI den. wien, lxiii den. wien. / Item am Mantag noch Domine ne longe xi schifleuten, dy noch den Schiffen vnd noch den Ennspawm gefaren sind, dy der Stos fuder gefuert hat vnd haben geben i lb xviii den. wien." See Ortvay 1900, Vol. 2/3, p. 187.

riverbed of the Danube.¹¹¹³ Ships of the pontoon, taken by the water, were also pulled back by paid workers.¹¹¹⁴

Same or another? Late spring- summer flood/high water report of the Danube: 1440

According to the same town accounts, some reparation works were done, and were paid on 20 May.¹¹¹⁵ At the end of June flooded cellar is mentioned in the account book of 1440.¹¹¹⁶ In late July a payment was made to the fishers for their work, "when the water level of the Danube was high, and one yoke was taken from the bridge".¹¹¹⁷ Moreover, as we can see other dates for payments which might be connected to the same, or other flood events in the same year, there is a possibility that the water level was high for a while after these dates and/or in other periods of the year, too.

These late spring and summer flood mentionings might refer to the earlier mentioned late winter or early spring flood event. However, the reference on the flooded celar might suggest that possibly there was a separate late spring or early summer high water or flood event, too. The next case(s?) may also support the idea of a wet late spring, early summer, resulting high water level conditions of rivers in the Danube (upper, middle) catchment.

'Not a single person in the area ever having seen' – Great (flash)flood in the Sopron area

Latest on 12 June (but most probably a couple of days before) there was a great shower (torrential rain?) in the Sopron area, followed by a (flash) flood of waters. In her memoirs, Helena Kottannerin (together with the baby king, Ladislaus V), coming from Gois to Eisenstadt (both settlements are located today in Austria) and then arriving to Ödenburg (Sopron), described the event in the following way:

"But ehen we were almost across from Eisenstadt, we became very concerned because we were told that a great train of travelers had come into Eisenstadt and that they were enemies. It was raining hard, and we kept silent and were full of fear. But when we approached Ödenburg, many people, men and women, came out of the city with the reliquary to come and meet the noble King (the baby) and to welcome him as their natural lord. And when we had arrived in Ödenburg, we decided to stop there and rest. And you should know that on the night of our arrival, there was such a flood that not a single person in the entire area could remember ever having seen such a great rush of water before."¹¹¹⁸

¹¹¹³ (DF 277059): "Item am pfincztag nach sannd Jorigen tag XX aribatern, dy an dem hoier geczogen haben ginhalben der Tyna zu den Stekchen per XVIII den. facit XII sch. d. wien. / Item am Freitag vor philippi et Jacobi hab wir gehat XXI aribater dy an dem hoier gezogen haben, zu den Jochern ydem XVIII den. wien. facit XII sch. XVIII d." See Ortvay 1900, Vol. 2/3, p. 188.

¹¹¹⁴ (DF 277059): "Item auch an dem tag hab wir geben dem Mert kreüs noch des pergermaister gescheft, das er ein prukschif aufgefangen hat zu kergelpurk, 1 prukschiff 1c new d. facit V. s. d. wien." See Ortvay 1900, Vol. 2/3, p. 188.

¹¹¹⁵ (DF 277059): "Am Freytag nach pfingsten ein Bruckschiff aus der aw gen das wasser gefuert." See: Ortvay 1900, Vol. 2/2, p. 400.

¹¹¹⁶ (DF 277059): "(1440) Item am Sambstag nach Johannis baptiste hab ich geben iiiii gesellen, dy dy vas aus dem keller zu dem hanreich stengel gezogen haben von dem wasser, vnd dy gewaschen haben vnd dy laden auch aus dem keller getragen haben, dar aus man gerust hat von wasserwegen, ydem VI d. w. facit XXIII d. w." See Ortvay 1900, Vol. 2/3, p. 165.

¹¹¹⁷ (DF 277059): "Item am Erichtag noch sannd Jacob tag hab wir geben den Schifleuten dy Ennspawm vnd Reichladen aufgefangan haben noch des purgermaister gescheft, als dy Tyna als gros war, das ain Joch von der pruk hinreis xlii d. w.". "..... als das Wasser III Jocher fuder gefuert hat." See Ortvay 1900, Vol. 2/2, p. 400, and Vol. 2/3, p. 165.

¹¹¹⁸ English translation: Williamson 1998, p. 52. Critical edition of the German original: Mollay 1971, pp. 34-35: "Vnd do wir nu(e) schi(e)r kommen gegen der Eysnein stat v(e)ber, Da waren wi(e)r aber in sorgen, Wann (35) man het vns gesagt, es wér ain michlér zeug von geraisigen in die Eysnein Stat kommen vnd es wéren auch veint. Vnd es regnat gar vast vnd wir warn gar still vnd farchten vns hart. Vnd da wir nu(e) schier zu Odenburgk kommen, do gieng man mit dem heiltumb aus der Stat vnd ain Michel volkch mit von fraun vnd von manen, dem edelen kung

Similar to this medieval description of a flood occurred by rainfall, we can find same, early modern descriptions for the same area.¹¹¹⁹ An interesting parallel can be the one included in the 1715 conscription of Sopron town, when major problems occurred in the agricultural activities of the area (especially mentioned for meadows/haylands) due to the flash floods caused by showers.¹¹²⁰

Flood and plague obstruct salt transport in Transylvania: problems in 1440

Only a few days after the flood-description of Helena Kottannerin, on 19 June 1440, a letter was written in Retteg (Belsőszolnok county, Transylvania) and sent by *Desiderius Losonci*, duke (*voivoda*) of Transylvania to Matkó Tallóci, duke (*banus*) of Slavonia and Croatia describing the services and great difficulties of the lieutenant, Papi of Florence. According to this letter, problematic situation developed in salt transport, since due to disease (*pestilencia*) a shortage of labour-power developed ('*vix tercia pars hominum remansit*'). Moreover, due to torrential water (rain and/or flood?) ('*signanter vero per aqua intorrens extitit*') salt transport declined.¹¹²¹

Since *Desiderius Losonci* wrote his letter from Retteg (Reteag-Ro), located about 15 km northeast of one of the Salt Chambers, Dés (Dej-Ro), it seems likely that his description of difficulties is based on (his own) experience. However, since he writes in rather general terms about the difficulties of salt transport, these problems might affect other salt-mining and transporting centres in Transylvania. Nevertheless, even if taking 'only' the narrower case, in and from Belsőszolnok county, as a major salt producer, the main route of salt transport was organised on the Szamos (Someş-Ro) river. Thus, at least the Someş was most probably in flood at that time.

Based on all these information it seems that, after a hard winter and an early spring flood, May and probably also June could be predominantly wet in 1440 in large parts of the country, and probably also in the areas west to the Carpathian Basin.

9.5.5 Floods in the 1440s

9.5.5.1 Torrential rain and flash flood event prior to 14 April, 1443

In a private letter written on 14 April to János Hunyadi, duke (*vojvoda*) of Transylvania, János Kórogyi asked the duke to send workers to help/participate in building his new castle. Kórogyi had to build a new castle since his previous one in *Chery* was destroyed by the torrent and abundant waters ('*Thorrens et abundancia aquarum castellum nostrum in Chery habitum, omnio destruxit*').¹¹²²

entgegen vnd enphiengen in (40) als i(e)ren naturlichen herren, vnd da wir nu gen O(e)denburgk kommen, da nu wolten wir da rasten. Nu solt ir merkchen, daz desselbigen nachts, als wir kommen waren, da kam ain solcher grasz wasser flus, daz kain mensch in der ganczen gegent was, daz ains also aines grossenn wasser flus mocht gedenkchen."

¹¹¹⁹ Boronkai 1965, pp. 339-346.

¹¹²⁰ "Prata habet falcatorum ducentorum quinquaginta unius et dimidii, majori in parte foenum bonum producentia, inundationibus ob incidentes imbræ valde obnoxia, ita ut parum aut nihil pro usu tali tempore ex ipsis colligi possit." In: Dóka et al. 1988, p. 32.

¹¹²¹ DL 55213 (19.06.1440): " Ex eadem accedet ad v.f. Nobil() Papi de florencia, qui in singulum factum vestris vna cum suis fratribus fidelem familauit, et ex permissione dimitatum plaga pestilencia hominum in tantum Regnauit quod vix tercia pars hominum remansit propter quam Incisio Saluum solicitari non potuit, signanter vero per aqua intorrens extitit, In qua sales in manibus nostre descendere potuerunt. "

¹¹²² DL 55253 (14.04.1443): "Magnifice vir fratrū nostrū carissime, vestram requirimus firmitatem, quod Thorrens et abundancia aquarum castellum nostrum in Chery habitum, omnio destruxit et unum alium castellum Edificare intendimus, ad que rogamus ... homines qui nostras cum hominis vestris"

János Kórogyi was a castellan (and owner) of *Chery* (Cseri) castle. To this castle an estate, including the market town of Cseri and the afore-mentioned Gyertyános (and many other settlements), belonged. The settlements and the castle, all located in medieval Temes county, were deserted in the early modern-modern period.¹¹²³ The castle of Cseri was located in a lowland area (east to Temesvár; Timișoara-Ro) and thus, it had to be a rather major flood (and rainfall) which could cause such a damage: the entire castle/fortress was destroyed and had to be rebuilt.

Another important point is timing. Located at the south, Temes county in the 1440s was situated in the direct neighbourhood of the hostile Turkish empire. 1443 was in a period when Turkish showed higher 'activities' at this border region: Moreover, we are only some months before the great winter campaign of the Hungarian army, led by the King and the above-mentioned count János Hunyadi to the Balkan peninsula, which ended up with the Varna battle (today in Bulgaria).

Due to this fact and also because it was the (administrative, military) centre of an extensive estate (in strategic position), it was clearly of vital importance for not only János Kórogyi, but also for the inhabitants of the estate, the county as well as to count János Hunyadi (leader of borderline defence against the Turkish) to rebuild Cseri castle as soon as possible. Therefore, the destructive event could not happen long time before: most possible dating could be early-mid spring, or maybe late winter.

9.5.5.2 Flood at the end of December 1446

Since one party could not come on 29 December ('*feria quinta ... post festum Nativitatis Domini*'),¹¹²⁴ due to the dangers on roads ('*propter discrimina viarum*') and flood of waters ('*propter inundacionem aquarum*'), a lawsuit was postponed to 2 January. The case happened in the are of *possessio Vasarhel* (Trhovište-Sk), Pazdics (Pozdišovce-Sk), Nagymihály (Mihalovce-Sk) – all located today in the district of Mihalovce near Košice, in southeastern Slovakia along the Laborec and Ondava rivers. Since the charter mentioned '*inundacio aquarum*', it seems rather likely that both rivers were in flood.

9.5.6 Floods in the period 1451-1460

9.5.6.1 Flood and accumulation of waters in 1454

Flood of the Danube at the turn of 1453-1454: Pozsony

On 1 January in 1454, by the charter issued by the chapter of *Poson*, the town citizens declared that, being invited for the Parliament to Buda, they definitely intended to participate, but due to the flood and inundation of the Danube on both sides (banks), they were unable to

¹¹²³ Csánki 1894 Vol. 2, pp. 11-12.

¹¹²⁴ Sztáray Vol. 2, pp. 398-399: "... feria quinta proxima post festum Nativitatis Domini novissime preteritum, omnes simul ad possessionem Vasarhel, dum requisiti fuimus, personaliter accessimus; ibique iuxta tenorem literarum vestrarum prescritas partes, tam ipsos Jacobum Gyapl de Morwa et dominam consortem Wenczeslai de Pelechte, legitime citationis modum servando, nostri in presentiam auctoritate vestra vocare fecimus; quibus coram nobis personaliter constitutis, prefata domina relicta dicti Venceslai absente, et hic propter discrimina viarum et inundacionem aquarum venire non valente, protunc in medio partium nullum examen nec aliquam revisionem ratione ipsius dotis et rerum parafernalia facere potuimus, nihilominus predictis partibus alium terminum, feriam videlicet secundam post festum Circumcisionis Domini nuper elapsam, sub gravamine trium marcarum computi Budensis, coram nobis constituendi prefigimus."

proceed. Nevertheless, as soon as the road would become suitable, they would definitely appear at the Parliament meeting.¹¹²⁵

There are two further data which provide us with help concerning the type of magnitude of this flood event. On the one hand, the flood affected both sides, banks of the river: this means that not only its low-lying right banks, but also the higher left banks were inundated: this provides clear evidence on a flood of great magnitude.¹¹²⁶ This made travel impossible either on water or on roads. Moreover, this flood was caused by prolonged frosts and ice – this quite sounds like a description of a flood caused by the accumulation of ice.

Fishpond ruined by the accumulation of water in Transylvania; natural or artificial?

In the protocols of the Kolozsmonostor convent, in a (prohibition) charter issued on 4 April in 1454 an ongoing flood event is mentioned, namely the great accumulation of water which destroyed ('*propter nimiam tumositatem aque esset in ruina*') one of the fishponds around the boundary of Zek (Szék: medieval salt mining centre; Sic-Ro) town in medieval Alsó-Fehér (later Doboka) county, in Transylvania.¹¹²⁷ In the late medieval economy of Szék, apart from salt mining, fishponds had special importance: at least nine fishponds were described – most of them in some form (lake, reedy area, wet meadow) still existed in the 18th century and some of them preserved for today.¹¹²⁸

Even if, merely based on the names of the owners, one cannot clearly identify the location of this particular fishpond, there was another fishpond connected to this ruined one ('*in uno alveo existeret*') which is possible to locate. Due to an ongoing debate over the joint water-supply (stream) of the two fishponds, and some other, ownership problems of the second pond, the two fishponds are relatively well-documented from the mid-15th century to the 1520s.¹¹²⁹ According to these charters, the second fishpond can be identified as the Kodori or Kondor lake,¹¹³⁰ which, although does not exist today, was still mentioned as an existing one in the 17-18th centuries.

The medieval town of Szék, today as a village is located in a hilly area where streams directly come from the hills nearby the settlement. This industrial activity (together with farming and animal husbandry) usually was accompanied by forest clearance and thus, an increased probability of flash-flood events.¹¹³¹ Based on the other charter evidence we can say that, due to the fact that the two fishponds received their water from the same watercourse, the accumulation of water which destroyed one of the two fishponds might be the result of an one-sided water-management, neglecting the interests of the other owner(s), which in a possibly wet period could cause problems. In this area, similar problems were discussed in the course of

¹¹²⁵ DL 44718 (01.01.1454): ".....in personis adpermissa peragenda penitus et omnia parati presenti atque invndatorum aquarum danubialium propter glacies se in eodem disrumpen(te) adeo dilatasset, quod fere totam prouinciam ex vtroque parte eiusdem danubij repleuisse, que scilicet aque invalescentes tandem propter iterata frigora in glacies durantes et alibi ... conuerse fuissent atque essent propter quod nulla via in aquis uel in terris exquisita ad dictam congregacinem Budensem licet toto cordis desiderio affectauissent, transire scilicet neque transmittere valuerint nec valerent subito depreseste nisi deus qui est via et veritas talismodi apparui Inter per reflexionis diripere et reformare dignarent tales super huius(mo)dj autem protestacione prenominati MagistriCiuium ac Jurati Ciues nominibus quibus supra presentes nostras sibi ipsi dari perierunt litteras protestacionales, quas eidem iuste potentibus ac premisso suomodo declaracionibus duximus concedendas datum in festo Circumcisionis domini Anno eiusdem Mille-mo cccc-o quinquagesimo quarto."

¹¹²⁶ For (medieval) morphological conditions of the medieval Pozsony area, see: Ortvay Vol. 2/1, pp. 1-20 (chapter 1).

¹¹²⁷ DL 36407 (1454-04-04). For Hungariain regesta, see: Jakó 1990. Vol. 1, ch. 1151, p. 487.

¹¹²⁸ For more information, see: Farkas-Kiss 2008, p. 66.

¹¹²⁹ 1454: DL 36407, 1465: DL 36393; 1479: DL 36395; 1489: DL 27733, 1495: DL 36398, 1498: DL 36403, 1504: DL 36399, 1525: DL 36402.

¹¹³⁰ 1525: DL 36402: *Kodorytho* – named after the Kodory family who owned the fishpond.

¹¹³¹ For more details concerning historical landscape evidence, see Farkas-Kiss 2008, pp. 62-67.

an ongoing legal debate later in the same century.¹¹³² This particular flood event might have had a connection to previous wet late-winter conditions.¹¹³³ Thus, final conclusion is that a natural flood/high-water event of unknown magnitude was in this case most probably strengthened by human management coniditons (due to uncertainties, it is not included in main analyses).

Torrential rain (with flash flood?) destroyed pastures in Kisvárda: before August 1454

According to Miklós Várdai, not only harvested goods, but also pastures were (at least partly) destroyed by a long-lasting great rainfall event int he family estate. Accordig to his description, written to his brother, the long-lasting, intensive rainfall event continued day and night and did not want to pass by. The result was torrential water (*aqua torrens*) greatest-ever-seen ('*nunquam nullus homo et anima aquam tallem habuisse dixisset*'), which caused some damage in 'fruits' (harvested goods) and destroyed pastures in the area of Kisvárda.¹¹³⁴

The letter was written on 9 August ('*feria sexta, in vigilia beatissimi Laurencii martiris*'). Although the date of the rainfall and flash flood event is unknown, since it was a private letter between brothers seemingly in regular correspondence, probably occurred not long time (e.g. several months) before the letter was written and sent. Thus, the great rainfall might have taken place in the same summer, not long before early August. Nevertheless, since he also mentioned harvested goods (i.e. crops), this suggest a somewhat earlier summer event.

9.5.6.2 Danube flood in 1458

The perambulation of *possessio Parthmadocha* was carried out on 23 July 1458 ('*die Dominico ... ante festum B. Jacobi Apostoli*') by the chapter of (Székes)Fehérvár. Main reason for a perambulation was that in the debate between the abbot of Madocsa and the nuns of Veszprémvölgye over the property rights of *Parthmadocha* the latter party won, and thus, they needed exact information about their properties.¹¹³⁵

According to the description, the landed property contained a fishing place (*tanya*), an island and arable lands; all located in the Danube or its close vicinity. While settling the boundaries between lands of *Parthmadocha* and *possessio Bewlcheke* (today Bölcske, north of Madocsa) together with an island and a fishing place, it was not possible to settle landmarks

¹¹³² See e.g. DL 74256, 74315 (14.02.1496)

¹¹³³ DL 30037 (03.03.1454): the occurrence of a destructive spring flood event has a somewhat better chance in 1454: described in another charter, issued on 3 March, it was not possible to reambulate and evaluate some lands in *possessio Egek* on 25 February in Szabolcs county (today Northeast-Hungary) due to the great coldness and snow.

¹¹³⁴ Zichy Vol. 9, ch. 337, pp. 461-462: "...de frugibus modicum haberemus tunc per fauces perite sunt et per pluviam magnam; quia nocte dieque nichil cessasse vellet et prata nichil habebimus de aqua torrente, quia nunquam nullus homo et anima aquam tallem habuisse dixisset."

¹¹³⁵ DL 15273 (29.07.1458): "Quod ipsi die Dominico proximo ante festum B. Jacobi apostoli nunc preteritum, die scilicet in dictis litteris ipsius Domini Regis deinde ipsa via pertransita ad eandem plagam meridionalem, dum per quasdam valles Ire voluissent ad quandam planitiem, vbi et in qua metu erectam esse dixissent, propter inundationem aque ad easdem valles et planitiem Ire non potuissent, et apparentiam metu alicuius reperi nequivissent. deinde circumundo invndationem ipsius aque per bonum spaciū versus partem orientalem ad troncum piri siluestris, qui fuisset combustus, et apparuisset circumquaque signo metali signatus. ubi fecissent cumulum terre pro signatura. Et abhinc versus eandem plagam procedendo, peruenissent ad portum danubij. vbi ostendabant cursus metarum que per danubium quo ad medietatem esset anihilatus, vbi similiter fecissent quendam cumulum terre. Et hijs peractis, prefatam possessionem parth madocha, simulcum piscatura vsonum wlgo Tonija ac Insula necnon terras sub inclusionibus prefatarum metarum, vnius scilicet prope danubium, ac alterius inter spinas, et tercie penes viam, que de ipsa parthmadocha vadit ad Madocha cumulatarum habitas et existentes, demptis terris, quarum metas ut prefertur propter invndacionem aque reperi nequivissent, et particula terre sub inclusione metu errecte, prope troncum Arboris piri, statuissent et relinquissent,"

(and/or boundary) at one part, because of this certain area was inundated ('*propter invndacionem aque*').

The Hungarian meaning of the possession (*part*=bank) suggests that, compared to the settlement of Madocsa, this other, Partmadocsa located right on the banks of the Danube. Even today, Madocsa is located 2 km west of the main branch of the Danube. Thus, it is rather likely that in this flat area the inundated area was covered by water coming from the Danube, and the present description is connected to higher (flooding) water-level conditions of the river, even if there is no any indication concerning the magnitude of this event.

9.5.7 Floods of the period 1461-1470

9.5.7.1 '*Maxima inundatio aquarum*' great flood in 1466: east central Great Plain

The perambulation of *possessio* Ecseg (Heves county) could not be completely fulfilled due to great inundation of waters. The perambulation process, in the full text Latin edition, was dated by Haan to 28 August 1476,¹¹³⁶ by Benedek 22 August 1466.¹¹³⁷ Based on the clear (though a bit unusual) dating of the charter, the perambulation had taken place on 21 August in 1466, since for the date of the perambulation event the charter mentioned 'the twenty eighth day closest (after) the feast of the blessed Jacob apostle' ('*vigesimo octavo die festi beati Jacobi apostoli proxime praeteriti*'). This means 28 days after 25 July; calculating with day no. 1 for 25 July, date of the perambulation comes out for 21 August. The charter was issued by the chapter of Buda 20 days after the perambulation, and thus, Benedek properly dated it to 10 September.

On the day of the perambulation process, thus on 21 August, all invited people went to the above-mentioned landed possession of Ecseg. The area is rich in waters, especially in lakes, often used as fisheries or fishponds.¹¹³⁸ While walking along the boundaries and settling landmarks, there were clearly no problems up to the boundaries of Bala (the latter Csudabala) located southwest of Ecseg. Perambulators did not enter this boundary due to the great flood or inundation of waters ('*ad quam propter maximam inundationem aquarum venire non valuissent*'). Still, they officially agreed on the boundaries of this area (in theory): at the boundary there was a fishpond ('*piscina Ecsegho*'), meadows, reedy areas and lands.

Similar to the 15th-century situation, the (former location of) the settlements Ecsegfalva, Bucsa, Dévaványa and Kertészsziget are in the eastern-southeastern, low-lying part

¹¹³⁶ Latin edition in: Hahn 1870 Vol. 1, pp. 92-94. ".... Qui tandem exinde ad nos reversi nobis conformiter retulerunt: Quod ipsi vigesimo octavo die festi beati Jacobi apostoli proxime praeteriti diebusque aliis ad id aptis et sufficientibus ad facies possessionum Ecsegh in cottu Hevesiensi adiacente Keerszigeth vocatam praeferat Nicolai Compolt et dictam possessionem Ecsegh dictorum fratrum eremitarum et praenominatorum nobilium ab invicem separassent et distinguissent, dehinc eadem plaga servata directe versus metam possessionis Bala, quae quorundam nobilium filiorum Chuda prafuisset, venire debuissent, ad quam propter maximam inundationem aquarum venire non valuissent, sed tamen eandem metam dictae possessionis Bala pro communi meta reliquissent, ipsam piscinam scilicet Ecsegho simul cum pratis, arundinetis, terris a plaga septemtrionali ipsius possessionis Bala adiacentibus possessioni Keerszigethe dictae Nicolai Compolt includendo et relinquendo et ibidem hujusmodi metas terminassent." See also: 1477: DL 17993.

¹¹³⁷ Hungarian translation and background information is available in: Benedek 1990, pp. 269-271. According to this study, original of the charter has not remained to us, but an authorised transcription, issued in 3 May 1649 is available in its copy dated to 1 September 1733, in the lawsuit collection book series of the monastery in Budaszentlőrinc.

¹¹³⁸ Some local geographic names, important in localisation, are mentioned in the reambulation, e.g. *possessio Ecsegh*, *possessio Vanya*, *possessio Vanya* (today Dévaványa), *possessio Kertiszsiget*, *aqua seu locus Kovácsfoka*, *piscina Ecsegho*, *piscina Bessenyweto/Bessenyeito*, *piscina Kerekto*, *Myregto*, *insula Ritkaboz*, *fluvius Thurzive* *alio nomine Berettyo*, *piscina Fizesto*, *possessio Bucsa*.

of the Great Hungarian Plain, in Békés county (roughly 40 km north of Békéscsaba), close to the Berettyó river. In the 15th century, this small area exceptionally, in legal-administrative sense, belonged to the county of Heves which county otherwise located further to the north.¹¹³⁹ Before the water regulation works of the 19th century (and also in the 15th century), the broader area, was criss-crossed by several watercourses, being in connection, apart from lakes, fishponds (for example *Ecsegho*, *Fisesto*, *Kerekto*, *Myreghto*) and stagnant body of waters, with the Berettyó and Körös rivers.¹¹⁴⁰

Thus, when the charter mentions '*maxima inundationes aquarum*', this should have a further meaning: all the waters in the area, directly or indirectly connected to rivers Berettyó and Körös were flooding. As such, Berettyó and the Körös (as well as at least the lower section of the Sebes-Körös) were presumably in flood, while there is a quite good chance that the Tisza had high water level or similar to the others, flooding. Since the upper catchment area of the Berettyó, Sebes-Körös and Körös rivers (and partly that of the Tisza rivers) is located in Transylvania, a late June great flood/inundation of waters might be connected to a major or prolonged rainfall event. Since there is no information concerning the beginning of the flood event, there is also a chance that snowmelting already caused inundation which was prolonged by late spring-early summer rainfalls. The word '*maxima*' provides very precious further information concerning the magnitude of this particular event: according to local (and non-local) eye-witnesses, it was extraordinary greater than the 'normal,' usual magnitude of flood.¹¹⁴¹

9.5.7.2 Flood in autumn 1468

In one of his poems (*elegia*), presumably written in late 1468, *Janus Pannonius* described a major flood event, occurred in autumn, due to prolonged rainfall.¹¹⁴² In his poem, he even dated the flood-wave: although usually such a great flood should take place in spring time, either due to snowfall or rainfall, in this case it happened in autumn, after vintage and the autumn equinox, turned into the sign of the Scorpion.¹¹⁴³ This means most probably a late October flood event, which he mentioned referring to the Sava, Maros, Drava, Tisza and (Lower) Danube rivers ('*Iam Savus et Marisus, iam Dravus et ipse Tibiscus, / Inter et Arcoas, maximus Hister, aquas*').

Janus mentioned that the great flood was caused by prolonged rainfall taken by the southern wind.¹¹⁴⁴ The poet did not provide the exact year of the event in his poem. Still, it is

¹¹³⁹ See Csánki 1890 Vol. 1, p. 61.

¹¹⁴⁰ See, for example: Jankovich 1996, p. 315.

¹¹⁴¹ In addition, it is interesting to note that the *Annales Mellicenses* mentioned a Danube flood event referring to 1465. MGH SS Vol. 9, p. 521 (*Annales Mellicenses*): "1465. ... Danubius tam magnus erat, ut operaret cunctam insulam octo fere diebus; ut arbores sublimiores per medium vix cernerentur."

¹¹⁴² The full text of this long poem of basic importance is included in the Appendix, as App. 2.

¹¹⁴³ Vine harvest time: from late September-till mid- or late October; autumn equinox: 22 September, sign of Scorpion: 24 October-22 November.

¹¹⁴⁴ V. Kovács 1972, pp. 371-381. De inundacione: "Tantus ab assiduis, quid vult sibi, nubibus imber? / Quid tempestatum copia tanta parat? / Unde tot humores nebulis? tot nubila coelo? / Quando potens madidi, tam fuit aura Noti? / Quisve unquam tantum variae bibit Iridis arcus? / Pontus an arcana scandit in astra via? / Saepe exhalatos, ima de parte, vapores, / Smintheos igniferi sustulit acre iubar. / Nec potuit tantum radii consumere, quantum / Traxerat, in tenues, sed solvit pluvias. / / Inflexit deflet non unum rusticus annum; / Nam tritura simul cum satione perit. / Squalentes nuda, marcent in vite, racemi, / Putris et effuso, diffluit uva, mero. / Deficiunt pecudes, et clausi millia vulgi, / Urbibus in plenis, obsidet atra fames. / / Pagus erat, subito palus est, et mersa profundo, / Quaerunt montivagi culmina ruricolae. / / Iam Savus et Marisus, iam Dravus et ipse Tibiscus, / Inter et Arcoas, maximus Hister, aquas; / Terrarum quamvis longo discrimine distent, / Confusis, inter se coiere, vadis. / Noscere nec possis, ubi rus, ubi collis, ubi arbor, / Omnia sic facies aequoris una tegit. / /

possible to date the year of the flood event (1468) based on the arrival of famous comet, also mentioned in the poem. About the arrival of the comet several contemporary reports are available, both from Hungary and other parts of the Europe (visible from 18 September until the end of the month in 1468). Moreover, beyond his flood-poem, Janus also wrote another poem for this event (*'De stella aestico meridie visa'*).¹¹⁴⁵

Rivers, mainly located on the southwestern parts of the Carpathian Basin, such as Sava and Drava have the most important flood maximum in spring-early summer, but also a clear secondary maximum can be observed in autumn, as a Mediterranean effect. In a less striking way, it is generally also true for the other large rivers of the Carpathian Basin. These conditions also clearly appear in the description of Janus, who even provided the reason of these floods, namely prolonged rainfalls. Another important point in Janus' work is referring to flood as a sign; this question is discussed in chapter 5 in more detail.

9.5.7.3 'Usual' flood event(s) of preceding two years: 1469 and before on the Tisza

A more 'regular', usual flood event or flood events are mentioned in a charter dated 10 April, 1469. In the course of a legal case it is described that the fishponds of *Georgius de NyarasApath* could not be filled up with water of the Tisza (more punctually: the fishes were not allowed to go to the fishponds from the Tisza) in the previous two years ('tempore inundacionis aquarum pisces exire consueuissent'). As the text of charters suggests, this activity would have been otherwise the usual way, essential for the water-supply of the above-mentioned fishponds.

This happened due to the fact that the serfs from Cegléd town, (among others) people of the Virgin Mary monastery of Óbuda closed down the waterflows/streams, ditches/canals (did not let the fish to swim into the fishponds) while the river was in flood. With this act, they caused great damage to the real owner.¹¹⁴⁶ Here we see the description about temporary waterflows, what we could as well call 'fok'-s, part of the floodplain management system at that time. As a conclusion, at least one of the usual, 'regual', flood events clearly occurred on the Tisza river at Nyársapát.

9.5.8 Floods reported in the period of 1471-1480

9.5.8.1 Flood, snows damaged road before August 1473: Verestorony (Turnu Roșu) pass

In a charter issued by King Matthias on 31 August in 1473, it is mentioned that the trade route of *civitas Cibiniensis* leading along *Castrum Weresthoron* (Turnu Roșu-Ro) in the valley of the Olt river, were destroyed by the frequent floods of waters and snows.¹¹⁴⁷ The road was

Nimirum natura suas praepostera leges / Vertit, et autumnus veris ademit opus. / / At modo successit flavae vindemia messi, / Coepit et aequatum, nox superare diem. / / Pannoniae in fluvios pluvialia toxica misit / Iam refugis Phoebi Scorpius ustus equis."

¹¹⁴⁵ Bartha 1978, pp. 340-345.

¹¹⁴⁶ DL 16834 (10.04.1469): "... Ceterum his proxime preteritus duobus annis ladislau filius ladislai de Wesen predicta quosdam meatus et riuos aquarum per quos Ticia ad piscinos eiusdem exponentis inter metas eiusdem possessionis Nijarsapath In Comitatu Zolnok exteriorij tempore inundacionis aquarum pisces exire consueuissent per Johannem dombij Jobagiones in possessione Thoheg vocata commorans recludi fecissent ipsosque pisces ad dictas piscinos eiusdem exponentis venire non permittent. Potens modicum In preiudicium et dampnum eiusdem exponentis valde magnum ..."

¹¹⁴⁷ US Vol. 6, ch. 3966, pp. 554-555: ".... Accidentes itaque nostrae maiestatis in conspectum fideles nostri circumspecti magister Thomas Althemberger, magister civium, et Nicolaus Aurifaber, iuratus civis civitatis

so narrow that it was problematic even going with one horse at once. These circumstances greatly disturbed the trade of the town, primarily living on the incomes of (international) continental trade, along the Olt river.¹¹⁴⁸

The trade route passing through the Verestorony area was predominantly used by the merchants of Nagyszében (Hermannstadt; Sibiu-Ro) town. The road and the pass itself, according to the testimony of local contemporary economic evidence (border tax accounts), were normally used (if passable) throughout the whole year, including winter days.¹¹⁴⁹ The importance of the problem can as well be highlighted by the fact that '*magister Thomas Althemberger, magister civium*' and '*Nicolaus Aurifaber, iuratus civis civitatis nostrae Cibiniensis*' went to Buda in August to solve this problem with the King. There is no evidence available concerning the date of a great snow and flood event in the area. However, as the problem itself was raised in the year of 1473, due to the importance of the pass in the international trade, some of these problems (probably added to previous ones) might have occurred in the earlier part of this particular year.

9.5.8.2 Inundation of the Sava river at Szabács in winter 1476

Whereas two years before, in 1474 the extraordinary low water level, in early February 1476 the inundation of the Sava river caused problems in the siege of fortress of *Sabbatz/Sabacz* (Шабац-Srb). In his letter written on 3 February in 1476 to Florio Roverella (the Napolitan King's delegate), King Matthias provided a vivid picture about the circumstances of the siege: at that time his army was waiting for the decrease of the Sava river which was a significant obstacle, greatly inundating the moats and the islands of the fortress: "We are only waiting for the decrease of the Sava river; with its frequent inundations, the river fills up moats and islands belonging to the fortress. We have produced huge vessels (ships) which cannot be harmed by canons, catapults or weapons, we all settle them to the moats, ..." ¹¹⁵⁰

nostrae Cibiniensis nobisque in sus ac universorum civium et inhabitatorum eiusdem civitatis nostrae Cibiniensis necnon Saxonum septem sedium Saxonicalium personis exponere curarunt in hunc modum. Quomodo quadam via prope eandem civitatem nostram Cibiniensem penes quoddam castrum Weresthoron existens ad partes Transalpinas tendens, per quam res mercimoniales ad ipsam civitatem et de ipsa civitate nostra ad alia loca asportari deberent, adeo stricta esset, ut vix unus equus dumtaxat sequi alium posset, saepiusque per inundationes aquarum et nivium in tantum obstrueretur, ut nemo per eandem viam ire neque redire posset, ex cuius viae strictitate incolae eiusdem civitatis nostrae et ipsi Saxones non parvum dampnum sumpmerent. Supplicatum itaque extitit nostrae maiestati per prefatos magistrum civium et Nicolaum iuratum civem ut praemittitur in suis et aliorum universorum et singulorum civium de eadem civitate nostra et ipsorum Saxonum personis, ut ipsis circa praemissa provisionem talem, ut per ipsam viam amplior transitus omnibus per eandem transire vel redire volentibus redderetur, facere dignaremur. ... Datum Budae feria tertia proxima post festum decollationis beati Johannis baptistae, anno domini millesimo quadragesimo septuagesimo tertio, ..." See also: Teleki 1855, ch. 555, pp. 502-503.

¹¹⁴⁸ For an overview of this medieval-early modern trade route (and its secondary literature), see: Pakucs-Willcocks 2007, pp. 6-10. Specifically for this period, see: Simon 2009, pp. 243-261.

¹¹⁴⁹ See: Pakucs-Willcocks 2007, CD-ROM-appendix 4.

¹¹⁵⁰ Fraknói 1893. Vol. 1, l. 231, p. 334: "Missi sunt interea lapides in exercitum de tormentis nostris maioribus, que plures ex ipsis occiderunt; Alibeg autem et Sachibeg ac alii vajvode quoque non ausi amplius fortunam tentare cum nostris, una cum omnibus copiis quas secum adduxerant, subito diffugerunt, ceterique passu tota die hesterna et hac nocte in Turciam reversi sunt, pluribus hominibus et equis in medio itinere, propter asperitatem viarum, relictis. Jamque spes optima est Deo propitio, quod castellum hoc Sabacz brevi expugnabimus, expectamus solum ut Savus decrescat, quod iterato inundatione nimia et fossas castelli et insularum replet. Paravimus etiam naves maximas, quibus neque bombarde nec alie machine vel etiam aliqua jacula nocere possunt, quas deinceps ad fossatum collocabimus, et de illis fortalitium expugnabimus; speramusque auxiliante Deo ex hac munitione

Some two weeks before, on 16 January, King Matthias still wrote to the pope from Sabac in snow and frost ('*inter nives et frigora*').¹¹⁵¹

In the same time (letter written on 3 February), the bishop of Eger, papal legate informed the pope on the circumstance of the siege. His description is very important because (being an Italian from Verona) he complained quite much about the unfavourable weather: including the unusually cold and freezing conditions at the Sava river, which was followed by the Sava flood(s) and the travel problems of the Turkish army, which might be also connected to thawing.¹¹⁵² Thuróczy, writing about the same event, mentions that the siege of Szabács occurred in severely hard winter time.¹¹⁵³

As a conclusion, the Sava flood(s) most probably occurred some time in the second half of January, but definitely after 16 January when there was still 'snow and frost'. And there was an ongoing flood event at the beginning of February. Since by that time the King managed to take there vessels and used them in the siege, the flood started not only a few, but probably several days before Matthias wrote his letter to Roverella.

9.5.8.3 Damages caused by Danube ice in 1477: flood or not?

Although it was only reported in the summer (5 July; '*Am Sambstag nach Udalrici*'), the ice of the Danube damaged part of the bridge at Bratislava ('*das eyss hat hin gestossen*').¹¹⁵⁴ Antonio Bonfini's detailed descriptions suggest that the winter of 1476-1477 was extraordinary cold and snowy, with special emphasis on December 1476 when, for example, the Lower-Danube deeply froze over.¹¹⁵⁵

9.5.8.4 High water caused damages on the Danube: summer 1478?

On 2 September ten workers were paid for their labour around the bridge at Bratislava, because the great water took part of the pile ('*wan das wasser war gross*').¹¹⁵⁶ Since the payment took place in the first days of September, the flood most probably occurred some time in summer. Nevertheless, we cannot completely exclude the possibility of a spring flood event.

hostem nostrum in proximo obtinere. Ex obsidione castelli Sabacz, tertio die Februarii, 1476." See also: Nagy-B. Nyáry 1877, I. 236, pp. 342-343.

¹¹⁵¹ Fraknói 1893. Vol. I, I. 229, p. 330.

¹¹⁵² Thallóczy-Áldásy 1907, I. 119, pp. 388-390: ".... Regia maiestas post ubi parvitate aque Danubii penetrare ad regnum Transalpinum nequivit, glacie quoque in eodem flumine cogente in Savum classem trahere coacta est, qui fluvius raro vei nunquam congelatur quod certe divino nutu factum puto. Nam exinde regia maiestas novo concepto animo ad obsidendum hunc locum properavit, et quamvis munitissinius esset, tamen gratia dei brevi tempore et civitatem exteriorem et interiorem, que fossatis navigabilibus et fortibus sepibus cingebantur obtinuit, moxque ad obsidendam arcem accessit, que cum latissimo et profundo fossato aquis pleno, (nam Savus ipsam circumfluit), circumdata fuit et arte ac opere lignorum inter se compactorum in medioque terra et aggere repletorum admodum firmata, et quod precipuum est, fortissimis viris, idest sexcentis electis bellatoribus, quorum trecenti pixidibus manualibus utuntur. Supervenit tanta fluminis inundatio, ut sicut in prima civitatis obsidione, ita et nunc exercitus in campo natet. Vocavit regia maiestas partem exercitus tam equitum quam peditum quos ad Transilvaniam premiserat, ita ut speremus in divina bonitate, quod si etiam Turcus ipse venerit, quem aiunt exploratores ad Andrinopolim exivisse nihil lucri deportabit. Ex castris regiis in obsidione opidi Sabacz IIIa Februarii MCCCLXXVI. Eiusdem vestre sanctitatis devota creatura G(abriel) episcopus Agriensis."

¹¹⁵³ Thuróczy p. 305.

¹¹⁵⁴ (1477: DF 277059): "Am Sambstag nach Udalrici von den Urfar diselb wochen vor Ee di Pruck das eyss hat hin gestossen genacht ist worden VII Pf. XII den." See Ortvay 1898, Vol. 2/2, p. 405.

¹¹⁵⁵ Bonfini Vol. 4/4, pp. 63, 66, 68-70.

¹¹⁵⁶ (1478: DF 277059): "Am Erichtag Egidii hab ich X Tagwercher die auch die Stokch aus der prugken gewinten habn wan das wasser war gross und di Stokch sind dreien Jochen angeronnen." See Ortvay 1898, Vol. 2/2, p. 405.

9.5.8.5 Drava-Sava flood obstructs the army in autumn 1480

On 14 December King Matthias wrote to the pope about his actual (successful) autumn military campaign against the Turkish in Bosnia. To get there, the king and his army had to cross the Drava and Sava rivers. Reaching the rivers, the royal army could not cross because the rivers were in flood at that time ('nam inundata [flumina] meo infortunio transvadari non poterant'), so they had to make bridges, and therefore had to wait many days ('multi dies elapsi sunt') for crossing the rivers, which greatly decreased the chance for a sudden and unexpected attack on Turkish.¹¹⁵⁷

9.5.9 Floods of the period 1481-1490

9.5.9.1 High waters and/or strong flux of the Danube in 1481: a spring case

Late March and early April references suggest that some parts of the bridge and a ship were taken by flood some time before late March. A late June payment can be still connected to this spring flood event.¹¹⁵⁸ The high water ('wan das Wasser gross war') of the Danube destroyed some parts of the bridge. For this reason workers had to be employed and paid on 23 June ('Am Sambstag nach Corporis Xti').¹¹⁵⁹

9.5.9.2 Ice of the Danube destroyed some piles of the bridge at Bratislava: 1482

Reported in the town accounts under 23 February, in (late) winter 1482 the ice again damaged part of the Danube bridge.¹¹⁶⁰ Based on the short description it is not sure that flood as well occurred, or only the broken ice pieces (thick enough to cause damage) were responsible for the mentioned problems. This case reflects on preceding hard winter conditions.

¹¹⁵⁷ MVH Vol. 6, l. 118, p. 154: "Verum ubi ad flumina perveni Drawm et Zawm, antequam ponte facti traicerem, nam inundata meo infortunio transvadari non poterant, multi dies elapsi sunt, sicque Turci meo adventu cognito, priusquam flumina prefata transiram, cum omni preda celeriter reversi sunt. Postea vero collectis omnibus copiis meis, quas ad me undique convocari feceram, cum diversa meditarer, requisitione et mandatis vestre sanctitatis, que me paterna clementia ad prosequendum fidei negotium hortabatur, obedire cupiens, rursum instaurato ponte Zawm traecto, et ne iniuria Christianis nuper illata impune pertransiret, cogitavi de Turcis sumere vindictam."

¹¹⁵⁸ (1481: DF 277059): "Pfinstag nach Oculi eine newe traunzulln aufgefangen darauf man die prugk geslahen hat, das hab ich abkawft. Mein herrn habn von den Pauln Spiess ein regenspurgerin Scheff, derauv man die Tonawprugken geschlahen hat um 9 guldn kauft./.... Meister Wolfgang Zimmermann selbst sexten das sie das werch auf die Tonaw und die Scheff dabei zugericht und gesetzt haben als man die Tonawprugk hat angehebt zu machen." See Ortvay 1898, Vol. 2/2, p. 404.

¹¹⁵⁹ (1481: DF 277059): "Am Sambstag nach Corporis Xti hab ich gehabt V Tagwercher Tagleich die in der aw zwischen den peeden Tonawprugken die peisch gehakt habn und den weg zu der pruken gemacht mit peisch wan das Wasser gross war." See Ortvay 1898, Vol. 2/2, p. 403.

¹¹⁶⁰ (1482: DF 277059): "Meister Wolfgang Zimmermann selbander da sie Endspawm und stekhen zu der Tonawprugh gespitzt habn als das Eyss hätt ettlich joch hingestossen. als das eyss die prugken hat hingestossen." See Ortvay 1898, Vol. 2/2, p. 405.

9.5.9.3 Ice (jam) flood on the Danube in 1485, 1486 or 1487?

In 1485, most probably an ice (jam) flood of the Danube (*eysguss*) was documented in the Bratislava town protocols.¹¹⁶¹ This flood cleared away (damaged) both the outer and the inner bridges. According to Ortvay, the whole bridge of the Danube was destroyed by ice only in the winter of 1486. To support this statement, Ortvay referred the letter of King Matthias, written in 1487, in which document the King refers to the fact that the bridge was damaged by the ice fo the Danube in the previous winter.¹¹⁶² Based on this document, the destructive event could happen in both 1487 and 1486, or even in 1485. Still, the dating of '*praeterita hyeme*' most probably suggests the very last winter, namely that of 1487.

9.5.9.4 Flood event in summer 1490?

According to Bonfini, after the death of King Mathias, occurred on 6 April in 1490, the Danube very much increased, and flooded many villages and towns along its banks. This was evaluated by Bonfini as a sign: after the death of the great defender of Hungary (Mathias), the Danube protected the country against Turks by making the river impassable by flooding.¹¹⁶³ Bonfini's last note suggests that the Lower-Danube was, according to his opinion, surely in flood in the mentioned time. Without providing an exact date, the *Annales Mellicenses* dated a great flood event of the Danube, which had not happened for 56 years, for the year 1490 (maybe remembering the great 1432 flood event in 58 years time?).¹¹⁶⁴ Reported in early May of the same year, there was great hunger in Austria,¹¹⁶⁵ and in the previous year (1489) a great flood of the Danube was recorded in the diary of Johannes Tichtel, occurred in Vienna, on 28 November ('*danubij inundacio maxima*').¹¹⁶⁶

On 13 April the King's body started its journey to Buda on the royal ship together with several other ships where the queen and the royal court travelled downstream the Danube: on 14 April they were in Pozsony where they spent two days, on 16 arrived to Komárom and on 20 April ships finally arrived to Buda. At this time, the Danube was clearly not in such a great flood, which would have meant any danger for the King's body or the whole royal court.

Living in (and moving with) the royal court, Bonfini was clearly an eye-witness of what happened during the whole journey and thus, he had to have rather punctual information. In the *Annales Mellicenses*, the King's death appeared after mentioning the great flood event which, however, does not necessarily mean a temporal order. Concerning the great flood

¹¹⁶¹ (1485: DF 277059): "Die ausser und inner prugk abzutragen in der eyssguss." See Ortvay 1898, Vol. 2/2, p. 405.

¹¹⁶² Ortvay (1900 Vol. 2/2, p. 405) refers to a letter of King Matthias, written to count Bánffy in 1487, quoting the following text: "pons ille Posoniensis super Danubio per Impetum glaciei praeterita hyeme penitus destructus est." The old catalogue number, provided by Ortvay, ("ered. okl. a pozsonyi városi Itárban Lad. 12. Nr. 6.") is not included in any published (or unpublished, but referred) collections and thus, more investigations are needed for the further utilisation of the full document.

¹¹⁶³ Bonfini Vol. 4/8, p. 162 (6 April): "Mathias igitur princeps invictissimus anno salutis (203) nonagesimo supra millesimum et quadringentesimum Nonis Aprilis et die Martis, etatis autem anno quadragesimo septimo cum perpetuo sui desiderio diem obiit., item Danubius insolenter post obitum eius excrevit, multos pagis et accolae urbes inundavit, ut extincto regni propognature Pannonia a Turcorum incursu tueretur."

¹¹⁶⁴ MGH SS Vol. 9, p. 525 (*Annales Mellicenses*): "1490. Hoc anno Danubius evagans alveos suos, et narracio antiquorum hoc protulit, quod in 56 annis preteritis talis inundacio Danubii non extiterat. Eodem anno rex Mathias Hungarie miserabiliter Wienne extinctus est;"

¹¹⁶⁵ Hunger in Austria: SVT Vol. 1/6 (Sopron account books): 1490: 64; see also DL 2315: letter issued in Vienna, on 4 May, 1490.

¹¹⁶⁶ FRA S Vol. 1/1, p. 50.

occurred in Austria, Rohr dated this major flood event on the Danube and its tributaries to July.¹¹⁶⁷

Since Bonfini was a member of the court (he was practically writing his work in parallel with the events) it is unlikely that he would have made a great mistake at least at an annual and seasonal level, even if the day or the week of the flood event later might become one part of the events that happened around the death of the great king. Nevertheless, defence against a probable Turkish attack was also of crucial importance. The news of the King's death might have arrived to Constantinople still in April, but the main parts of the Turkish army clearly needed at least 2-3 months for reaching Hungary.¹¹⁶⁸ Thus, they could not have arrived much earlier than (late-)July, by which time (latest) the flood had to arrive to the Lower Danube in order to act as an effective defence line against major Turkish troops.

Thus, most probably the river was in flood also at the lower sections in mid- or late summer. Additionally, it is also possible (also partly based on Austrian parallels) that there were smaller flood waves already earlier, as it probably happened in 1402,¹¹⁶⁹ and these waves accumulated and caused prolonged inundation at the Lower Danube earlier, and lasted for weeks (or months). In this case it indeed could have acted as an effective defence line for long while at the southern borderlines.

9.5.10 Floods of the period 1491-1500

9.5.10.1 Peace treaty and flood in April (or May?) 1494

Presumably in April (or May) in 1494 the Polish king, Jan Olbracht I, was invited and met his brother, the Hungarian King Uladislaus II in Lőcse (Levoča-Sk). After the meeting the Polish delegation had to wait until the high waters of rivers, caused by prolonged rainfall, passed away.¹¹⁷⁰ They most likely used the travel route through the valley of the Poprad river towards Poland. Thus, the Poprad most probably was also affected by this flood/high-water event, and so as the other waterflows of the area might have been as well in flood.

¹¹⁶⁷ Rohr 2007b, pp. 81-82.

¹¹⁶⁸ For more details on the length of Turkish military campaigns and other calculations see, for example: Perjés 1979, pp. 80-85. Perjés calculated 66 days for which time the (main) Turkish army approximately needed (on average) to reach Belgrade. For a comparison, in 1526 the Suleiman the Great arrived on 9 July to Belgrade and the siege of Petrovaradin at the Drava started on 14 July (Perjés 1979, pp. 342-344). Nevertheless, a smaller, local Turkish army (i.e. from Serbia) could any time cross the Danube and devastate along the southern borderline (even if it was risky to do so).

¹¹⁶⁹ See Section 5.5.1.1.

¹¹⁷⁰ Bonfini Vol. 5/4, pp. 248-249: "Inde audito fratres iam Ungarie appropinquare Leuchoviam per Eperyes, Cibinum et Scepusium iter ingressus apud Saros castellum, quod inter Cibinum et Eperyes in edito monte situm interiacet, magnifico imprimis apparatu cum toto pontificum ac procerum comitatu palatino suscipitur parique ab eodem liberalitae in Scepsiensi arce quinque milibus passuum a Luchovia distante tractatur. Ubi vero Leuchoviam venit, omni in eam curam animo incumbere cepit, ut fratres et sororis virum ducem Brandenburgensem, quos multos ante annos non viderat, quam honorificantissime posset, acciperet; Palatinus, cum Albertum propediem accessurum sentiret, acerbum eius odium superiore Polonico bello in se conceptum animum extimescens impetrato a rege commeatu e conventu recessit. / Polonis longa propter intumescentes ex assiduis imbris amnes in itinere tracta mora, desidentibus tandem fluiis tridui abesse itinere nunciatis rex ad patres de illorum adventu excipiendo retulit."

9.5.10.2 Floods in 1495

Flood in the South: early 1495

On 11 April in 1495 Prince János Korvin protested against the fact that János and Ferenc Csibak of Gyeres in *Warsan* (Gyulavarsánd, medieval Zaránd county), had built an unusually large mill over the *Feyerkeres* (Fehér-Körös) river with a high dam. This dam was so high that during the time of flood haylands of *Pyl* and the toll-place in *Wary* (Gyulavári, medieval Zaránd county) were destroyed causing more than 1000 (golden)Ft damage. The king's man and one of the canons of the Arad chapter went out for observation, and on 17 April they came back with the information that the complain was reasonable.¹¹⁷¹

This case is clearly related to artifical management, but the damage occurred during a flood event, which flood event in itself is a natural phenomenon. Since it seems that the legal process was carried out rather fastly (for a very powerful person), the flood event might have occurred not long time before, most probably still in spring time.

Spring flood around 1495: a Transylvanian case

According to a charter issued on 25 December 1505, sent by the duke of Transylvania to the convent of Kolozsmonostor, some 10 years before around Pentecost the fishpond of Miklós of Bethlen at *Bwd* (Bőd; Beudiu-Ro) in the medieval county *Zolnok Interior* (Belső-Szolnok) was corrupted/destroyed by flood. Seeing that most of the water disappeared from the pond, the neighbouring family came and collected all the great abundance of fish from the pond and sold them to strangers.¹¹⁷² As it is clearly stated in the charter, the damage of the fishpond was caused by a ('natural') spring flood phenomenon.

9.5.10.3 Great flood and ice damaged bridge, stopped salt transport – Transylvania 1496

Difficulties, in some extent rather similar to the ones occurred in 1440, are described in a charter issued on 4 July in 1496. Previous flood events due to accumulation of ice destroyed the bridge at *Ewrmezew* (Órmező; Jibou-Ro) near to *Dees* (Dés; Dej-Ro) over the Szamos river (Someş-Ro).¹¹⁷³ This bridge was of utmost importance due to the fact that majority of the

¹¹⁷¹ DL 37693 (17.04.1495). "..., quoddam molendinum super fluuiio feyerkeres In facie possessionis Warsan In Comitatu de Zarand ... amnam vltra solitam mensuram parari, et aggeres eiusdem fecissent Quod tempore Indacionem aquarum vniuersa fenilia possessionis prefati exponentis pyl vocate In eodem comitatu de Zarand"

¹¹⁷² DL 28005: "...In anno cuius jam decima vel circa instant Tunc piscina ipsius exponentis intra metas possessionis Bwd vocate in Comitatu Zolnokiense ... per eundem exponentem proprys suis exponentis preparata in cuiusque scilicet ...domino idem exponent protunc extitisset... per inonationem siue impetu aquarum disrupta per qua aqua ipsius piscine parte in maiorj isina de eadem efluiisset... domina Juthka vocata relicta ac Gregorij Blasius Alexius et Johannes filij condam Gregorij de prefata Bethlen ignoratem quibus ... per pluribus Jobagionibus et familiaris ipsorum piscinam ad eandem ruptam pro eorum libitu de pyten() piscesque prensos in magna abundacia et copiositate partio vendj fecissent ... in quibus eodem exponentem plusque quadringntorum flor() dampna intulisset ..."

¹¹⁷³ DL 65441 (04.07.1496): "... Exposit maiestati nostre fidelis noster Egregius Petrus de Sombor cum querela Qualiter ipse haberet quandam pontem in possessione sua (Ewr)mezew vocata iuxta fluum (Sa)mos vocatum prope est oppidum nostrum dees habitum er quem vniuersi emptores et ductores Salium nostrorum in curribus incederent et hincinde proficiserentur pro cuius restauracione licet nos superioribus temporibus iuxta institutionem et prouisionem predecessorum nostrorum Regum felicis memorie Sales in valore centum et quinquaginta flor. per vos prefato exponente singulis annis dari deputauerimus vos tamen mandata nostra obaudientes Sales huiusmodi nostram ad rationem dicto exponente dari facere non curassetis propter quod iam pons ipse per nimiam aquarum tumefaccionem et inundacionem glacierumque vehementem dissolucionem totaliter dir.us et dissolutus esset et vectores Salium nostrorum hoc impedimento obstan(te) a vectura Salium nostrorum cessasset exindeque non solum Maiestati nostre sed vniuersoque Regno nostro non paruum damnum secutum fuisset. Cum autem reformacio pontis pretacti propter causas promissas sit admodum necessaria nec

domestic salt transport was carried out here: all the coaches with salt had to cross this bridge, transporters and customers of the royal salt had to pass this bridge. Since the bridge was destroyed, the royal salt transport completely stopped towards the inner parts of Hungary, which caused problems not only for the King, but also for the whole country. Usually, the counts (*comites*) of the Transylvanian salt chambers (in Déz) had to give salt of 150 Ft value (Hungarian golden Forint) annually, from which money the regular reparations of the bridge were paid. Nevertheless, the two chamberlains (János Tharczay, Miklós Prol) did not give this salt to the relevant person (Péter Sombory), so he could not repair the bridge in the last period (year?).

Although the text divides the vehement ice-melting from the great accumulation of water and flood, these two parts together present the typical characteristics of an ice (jam) flood event. The most possible situation is that the larger (Someş) river was firmly covered by ice when (after prolonged frosty period when the firm ice cover developed) due to sudden change in temperature (caused by mild, possibly wet air masses) snow (rapidly) melted in the catchment. This was followed by a flood event: (with or without rain) larger amount of water came down suddenly from the catchment area to the lower-lying terrains where the water of the two small rivers (whose probably melted earlier than that of the Szamos) flow over the still-existing ice cover of the Szamos where ice pieces possibly already greatly accumulated. In this way, rather common in hard winters, we have all events together, described in the charter. An interesting parallel can be, for example, the ice flood of the Maros river in late December of 1783.¹¹⁷⁴ In a milder winter (only with short cold periods) such floods are also possible, but in this case the great accumulation of ice would not be mentioned (e.g. recently happened in January 2010 on the Körös rivers, similarly coming from Transylvania towards the west).

Since proper salt transport, due to the basic importance of salt in medieval economy and household, was very important in Hungary, it is less likely that they were waiting years without salt to raise this problem to the King. Thus, at least the last event – which finally so much destroyed the bridge that salt transport completely stopped – could not occur years before issuing the charter of official complain. It is also important that, besides the flood events, ice-drifting were as well blamed for damages in the bridge, which indirectly refers to such events in the recent past. Between 1490 and 1494, due to the civil war and money consuming campaigns for the throne and the crown, all sorts of taxes were collected and money was kept back everywhere possible. Moreover, due to the anarchy, the usual way of salt transport also suffered, and such problems occurred as the missing annual fee of road- and bridge-preparation.

Concerning the date, István Draskóczy in his study suggested spring of 1496. According to his opinion based on a charter-data from 1510, not only a bridge but also important dams existed over the low-lying floodplain area (which could have existed, to some extent, already 15 years before). Nevertheless, he suggested that the above-mentioned bridge was located over the two smaller rivers and not the Szamos river itself. Still, he also claimed that the damage caused by ice and flood could be caused by not only the small rivers (Almás and Egregy), flowing into the Szamos river, but also the Szamos river might be responsible as well.¹¹⁷⁵

Due to the fact that this was the most important route of salt transport from Transylvania towards the inlands of the country at that time,¹¹⁷⁶ it is quite likely that officers

huiusmodi reformacio commode fieri sine speciali nostra promisione singulis annis possit Volumus et mandamus fidelitatibus vestris presencium serie strictissime. vt a modo prescriptos Sales in valore Centum et quinquaginta flor. ..., datum Bude feria secunda proxima post festum Visitacionis beatissime Marie virginis. Anno domini Millesimo Quadragesimo Nonagesimo Sexto. ..." For location, see: Györffy 1987 Vol. 2, p. 83.

¹¹⁷⁴ For more details, see: Kiss et al. 2006, pp. 353-362.

¹¹⁷⁵ Draskóczy 2005, pp. 96-97.

¹¹⁷⁶ Draskóczy 2005, p. 96.

quite soon reported the problem (of salt transport obstructed). Especially, because they had also other problems, such as lack of money, and the most important problem: lack of workers due to the ongoing plague disease. Moreover, according to another charter, some time between 24 January and 21 March in the area of Ungtelek (*Wngthelek*) and Kanyar landed possessions in Szabolcs county (Northeast-Great Plain), while checking the background of a legal debate, people crossed water on ice, which means that a firm ice cover developed in the northeastern, lowland parts of Hungary in early 1496, suggesting hard winter conditions.¹¹⁷⁷

Great (torrential rain) caused damages in the town wall in 1496

According to the report of the notar of Lőcse (Levoča-Sk), described in a letter sent to the town council of Bártfa (Bardejov-Sk) written on 28 October in 1496, great rain and shower (torrential rain?) damaged at four places the town wall(s) of Buda ('*Grosse gws und regen sind Ofen gewesen die habe die stat Mawer an vier enden wiedergeworfen*').¹¹⁷⁸ The report most probably described a torrential rain, occurred some time before (exact timing is not known). Nevertheless, since the medieval town walls, similar to the present-day situation, were located on and around the castle hill, there is a possibility that not only directly the rain, but also the weight of the wet soil (which is much heavier than the dry one) might cause these problems.

Due to the extraordinary rainy conditions of the year 2010, already in early June some smaller parts of the walls around the castle district fell down, another small part on 25 December (ca. 4 m²), but rifts appeared in more places (five seemed to be the most dangerous). Moreover, similarly in early June the town wall slipped some cm in an area of 1000 m² (Karmelita Udvar, Ellyps sétány).¹¹⁷⁹ All these occurred after an extraordinary wet period, although shortly before these events (last days) greater amount of rain fell in the first case, and snow in the other case.

Even if we also have to consider the actual (physical) conditions of the walls, in this particular 1496-case, taking into account the special location and situation of the walls it seems rather likely that not only one great torrential rain event, but rather a preceding (prolonged) wet period, and then 'as a final push' (or catalyst), a torrential rain might have caused the damage of the wall on some sections. As a consequence, this case is likely to be connected to a special group which also belongs the category of inland excess waters (in this case, the great abundance of ground water).

9.5.10.4 Floods in 1499

Fishpond destroyed by late winter (flash)flood: case study from the North

A charter dated to 6 May in 1499, remaining in its 1502 transcription, contained information about a flood event caused by heavy rainfall, in *possessio Fakowezeken* (Fakóvezekény; Fakó Vozokany-Sk) in medieval Bars county.¹¹⁸⁰ The flood occurred on a fishpond: the dam of the pond had been repaired on 24 February but the flood, caused by rainfall, broke the dam on the next day ('*ex impetu pluuiarum Inundacioneque Aquarum*'), and fish swam away, causing a 1000 Ft loss to the owner (who then protested).¹¹⁸¹ Here at least two

¹¹⁷⁷ 1496: DF 234560, 278601. For regesta, see: C. Tóth 2003, ch. 712, p. 121.

¹¹⁷⁸ DF 216076. For published regesta, see: Iványi 1910, p. 485.

¹¹⁷⁹ See, for example: http://index.hu/belfold/budapest/2010/06/03/tobb_helyen_is_leszakadhat_a_budai_varfal/; http://ingatlanmagazin.com/ingatlanpiac/cikk_12980/; http://hvg.hu/itthon/20101225_negy_negyzetmeternyi_fal_dolt_budai_var.

¹¹⁸⁰ See Györffy 1987 Vol. 1, p. 487.

¹¹⁸¹ DL 63494 (06.05.1502): "... Quod cum Circa dominicam Reminiscere quius nam tercia predijsset reuolutam annualem ... ad quasdam piscinam suam Impignoranciam in possessione fakowezeken vocata in Comitatu Barsiense ... Et licet tandem ijdem homines ipsius exponenti ipsum Aggerem distractum, rursus recluserint,

important points concerning the reason and the probable type of the flood event has to be considered:

1. the flood was caused by (much or prolonged) rainfall,
2. the flood event occurred rather quickly, so it was rather probably a flash flood event.

Based on this information, both the preparation of a dam, rainfall and then flash flood might suggest that there were already warmer times (mild spell) several days before the event.

Spring floods in 1499 obstruct travel in the North

Emericus de wyfalu confessed in a charter dated 19 September in 1499 that he did not appear on 21 March ('*feria quinta ante festum annunciationis domini marie*') in the market town (*oppidum*) of *Zambokreth*. The main reason for not coming to the chapter of Nyitra was that the very great floods ('*propter maximas Inundaciones aquarum*') and illness obstructed him, but he kept the agreement made 2 years before with *Bernad de Rwdna*.¹¹⁸² Thus, since on the day when the charter was issued, he could already appear at the chapter of Nyitra, so floods and illness did not obstruct him any more in traveling.

Due to the fact that three placenames as well as the responsible chapter were provided in the charter, it is possible to localise the event. The chapter of *Nitra* (Nitra-Sk); *oppidum Zambokreth* (Nyitrazsámbokré; Žabokreky nad Nitrou-Sk); *Wyfalu* (Divékújfalu; Diviacka Nová Ves-Sk); *Rwdna* (Divékrudnó or Rudnószabadi; Nitrianske Rudno/Rudnianska Lehota-Sk) all located in former Nyitra county, today's south-central Slovakia. Presumably the flood affected areas along the Divék (Diviak-Sk) river.

Spring flash flood causing local disaster in Central Transylvania: artificial with natural?

An interesting addition is that, reported in mid spring (6 April), a local disaster, in the form of flash flood destroying two settlements (*Borsa et Walazwth*), occurred in Central Transylvania, in medieval Doboka county. As a main reason, clearly a large fishpond and its too high damming was blamed for the tragedy which not only caused great financial damages but also killed several inhabitants of the villages (women and children). Nevertheless, in the light of the previous cases there is also a possibility that, apart from mismanagement, the catalyst of the tragedy was a natural flood event. Thus, probably mismanagement combined with natural flood (probably flash flood) together resulted the damage of damming on the fishpond.¹¹⁸³ Due to the fact that no firm conclusion can be drawn in this question, this case is not included in the later, main analyses.

Tamen secundo die ex impetu pluuiarum Inundacioneque(?) Aquarum, ipsa piscina per ipsum Aggerem distractum funditus simulcum piscina protunc in eadem habitus effluxit. ..." Hungarian regesta: Borsa 1991, ch. 605, p. 220.

¹¹⁸² DL 95737 (19.09.1499): "Nos Capitulum Ecclesie Nitriensis Memorie commendamus quod Emericus de wyfalu ad nostram personaliter venien() permodum protestacionis nobis significare curauit ... quam inter ipsam ab vna et Nobilem Bernard() de Rwdna ex altera partibus. In quadragesima feria quintam ante festum Annunciationis domine marie In oppido Zambokreth arbitrj per ipsas partes clementi fecissent et ordinassent ... tum propter infirmitatem peruentam teneretur propter maximas Inundaciones aquarum nequiuisset datum feria quinta ante festum beatj Mathei apostoli et Ewangeliste. Anno domini Millesimo quadragesimo Nonagesimo Nono."

¹¹⁸³ Varjú 1908, ch. 286, pp. 352-354 (09.04.1499): "Petrus comes de Sant Georgio et de Bozjn waÿvoda Transsylvanus et comes Siculorum egregiis ac nobilibus viris comiti vel vicecomiti et iudicibus nobilium comitatus de Doboka debitam reverentiam cum honore. Dicitur nobis in personis egregiorum Francisci, Stephani, Johannis et Emerici Banffy de Losoncz, quomodo his proxime praeteritis temporibus egregius Simon Erdeg de Eskellew unam piscinam in territorio portionis suaee possessionariae in possessione Wýfalw vocata in comitatu de Doboka existente habitam adiacentem contra ipsorum exponentium saepissimas prohibiciones praeparare, ac in tantum aggerem recludere et elevare fecisset, quod agger seu clausura piscinae p[ro]ae multitudine seu magnitudine aquae vehementi torrenta et magna inundatione et aggeris evulsione certas domus et celaria iobagionum dictorum exponentium in possessionibus ipsorum exponentium Borsa et Walazwth vocatis in dicto comitatu de Doboka existentibus subversae et distracta atque abolita fuissent, in quibusquidem domibus et celariis fruges et vina dictorum iobagioum per inundationem et torrentiam dictae aquae in nichil redacta et deperdita extitissent,

9.5.10.5 Strong flux of the (Triple-)Körös river in 1500

Caused by the strong flux of the (Triple-)Körös river at Sima (between Endrőd and Mezőtúr) in Békés county, one part of the herd (of horses) as well as cattle got drowned in the Körös river, taken by the strong flux of the water ('*vehemens impulsio*').¹¹⁸⁴ The charter reports on a situation when water had power strong enough to take away larger domestic animals which case might suggest a high-water event of the Körös river, which is quite interesting, because in normal case, this river in its lowland part between Endrőd and Mezőtúr is slow due to little difference in elevations.

necnon mulieres et pueros ac infantes in subversione domorum mortui fuissent, in quibus praemissis dempta interemptione dictarum mulierum e puerorum iobagiones praefatorum exponentium in praetactis possessionibus Borsa et Walazwth commorantes plusquam mille et quingentorum florenorum auri dampna suscepissent. His minime contentus, iterum post dilacerationem et dilavationem dicti aggeris praetatae piscinae idem Simon Erdeg eundem aggerem iterum disponere et preleri fecisset per cuius tandem aggeris disruptionem et dilavationem vehemens inundatio et torrentia aquae quamplurimas domos iobagionum dictorum exponentium in dictis possessionibus commorantium subvertisset, vinaque et fruges ac frumenta tam in acervis, quam etiam in cophinis et vasis existentia anichilata et omnino dissipata et perdetita fuissent, in quibus modo simili iidem iobagiones dictorum exponentium ultra quam mille et quingentorum florenorum auri dampna perpessi fuissent, " Hungarian regesta: Szabó 1890, ch. 424. pp. 89-90.

¹¹⁸⁴ DL 20973 (15.10.1500): "... scilicet dicti exponenti commoranti, trans fluuum Crisij ad predictam possessionem Sijma in prefato Comitatu de Bekes existentem abegissent, in quo fluuio Crisij pre vehementi impulsione ipsorum equorum equitatorum ac pecudum et pecorum porti ex eisdem aqua suffocati mortui exititissent" For more information on the medieval Hármas-Körös charters, see: Jankovich 1996, p. 313. For location, see Györffy 1987 Vol. 1, p. 512.