



The Public Defense of the Doctoral Dissertation in Medieval Studies

of

Kiss, Andrea

on

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

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Nádor u. 9, Budapest

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Chair György Endre Szőnyi (Central European University)

Members József Laszlovszky – Supervisor
 (Central European University, Budapest)
 Karl Brunner
 (University of Vienna, Austria)
 Balázs Nagy
 (Central European University, Budapest)
 Lajos Rácz
 (Central European University, Budapest)
 László Veszprémy
 (Museum of Military History)

External Readers Karl Brunner (present)
 (University of Vienna, Austria)
 István Tringli
 (Hungarian Academy of Sciences, Budapest)

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Doctoral Dissertation Abstract

Kiss, Andrea:

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

In the present work a basic, first attempt is made to provide a concise database and an analysis of medieval flood events in the Carpathian Basin, based primarily on documentary evidence. Among other (short-term) natural phenomena, a flood is one of the most frequently mentioned dynamic natural phenomenon in medieval Hungary. Moreover, changing flood frequencies and flood extremes can be treated as indicators and show strong connection to climate variabilites and changes. Thus, even if the main source type of climate reconstruction, namely domestic narratives, are almost completely missing in medieval Hungary, flood reconstruction has good potentials due to an unique source type, namely charters.

Even if some flood events can be traced in the previous centuries, due to the availability of contemporary source evidence, the database and mass analysis are mainly restricted to the 14th and 15th centuries. Since the last two centuries of the Middle Ages act as a transitional period after the Medieval Climate Anomaly (MCA), and already belong to the so-called Little Ice Age (LIA), the great number of information on the changing frequencies, magnitude and impacts of flood events might provide significant improvement in the better understanding of this – in climatic sense – rather special late medieval period.

General background: flood characteristics, medieval environment and human impact

The dissertation is divided into six chapters. Additionally, an extensive catalogue and analyses of individual flood events also form an integrate part of the work. In chapter one an overview is provided on the main aims and questions of investigations, also discussing the structure and divisions of the dissertation.

In the first part of chapter two an overview of historical flood-related scientific literature on a millennial European scale is provided. In European research, large parts of Central Europe were primarily involved, and hold strong positions in historical flood research. In the second part a general background on basic hydrological characteristics of main rivers and catchment areas of the Carpathian Basin is introduced, with special emphasis on the present-day as well as the historical flood characteristics of the rivers and waterflows mentioned in medieval documentation.

An important third part of chapter two deals with the general socio-economic, landscape and environmental changes, the level and significance of human impact in medieval Hungary. Previous investigations suggest an intensive human impact and the transformation of landscape and the environment, which took place the latest from the last century(s) of the high medieval and in throughout the late medieval period. Even if these changes and the intensive human impact on landscape and hydrology had to have a strong effect on water regimes prone to flood events, climate variability is primarily

responsible for the appearance of periods with high(er) flood frequencies and with great magnitude flood events.

Long-term results of multidisciplinary investigations

Since an adequate flood analysis cannot be provided without the understanding of long-term hydrological processes, results of archaeological, historical and natural scientific investigations discussing the possible variabilities and changes of water levels of lakes and other water bodies also have fundamental importance. These investigations, mainly carried out by historians, archaeologists and natural scientists, on a multi-centennial and multi-decadal level are discussed in chapter three.

Based on the temporal resolution of the available reconstructions, one can distinguish among four levels of information. Multi-centennial, documentary-based information suggested that lakes were probably in their wet phase in the 13th-15th centuries. Other, mainly archaeology-based investigations proved a slow, long-term, constant (average) water-level rise in case of the high- and late-medieval Balaton and late-medieval Danube. On a hundred-year resolution, palaeoenvironmental research on Lakes Baláta and Nádas provided evidence on a dry period occurred in 1000-1300. Whereas 14th century appeared with its low prevailing water-level conditions, 15th century meant to be a wet phase with a prevailing high water level of Lake Nádas. The stalagmite-based wetness reconstruction, carried out on a decadal level, concluded a short wet-warm period around 1000-1150/1200, and a long transitional period of mixed dry and wet periods until 1500/1550.

Sources and a practical mass analysis of documented medieval flood events

After an overview of long-term hydrological changes based on the results of multidisciplinary research in chapter three, the first part of chapter four is concentrated on the types and nature of documentary evidence which the flood analyses of chapter five are based on. The main sources of flood-related information are (domestic) charters: in most cases it means perambulation charters. In addition, economic evidence and (foreign) narratives are also important, but some additional source types, such as the documentation of canonisation trials or poems, have to be also considered. The second part of chapter four is dedicated to methodological issues. In this chapter, among others, medieval flood terminology is discussed. Moreover, due to the different nature of Hungarian medieval documentary evidence, even if partly applying west-central European methodology, a new classification and (3-scaled) indices on flood magnitudes were initiated.

Based on the individual case studies of the Catalogue (attached at the end of the dissertation), carried out on each flood records, the analyses presented in chapter five are concentrated around eight topics of basic importance. After discussing flood frequency, seasonality and magnitude issues over the last 300 years of the Middle Ages in Hungary in general, an analysis of the floods of great rivers and that of the most significant periods of high flood frequencies are presented in more detail (for an overview of data, see *Fig 1*).

Based on the, sometimes rather detailed, documentation on the circumstances of individual flood events, in some cases it is possible to detect or reconstruct the types or main causes of flood events with high probability. As such, several cases of presumable ice floods,

floods caused by snowmelt, flash floods and/or torrential waters as well as floods as a result of prolonged (summer) rainfall are listed. On the one hand, the detection of flood types and their main causes provide an essential help in the better understanding of flood events and the circumstances related. On the other hand, important weather-related information can be earned while investigating flood records which, especially in case of winter and partly of summer floods, provide us with the possibility of utilization of flood evidence in further climate reconstruction.

Since information on previous flood events as well as long-term changes is also available, it is possible to settle some conclusions on flood frequencies over the annual level and/or multi-decadal level. Furthermore, another important group of topics is concentrated on the short-, medium- and long-term impacts of flood events or the series of flood events.

Based on robust flood frequency and magnitude issues, two main flood peaks and high flood-frequency periods, namely the 1330s-1350s and the 1390s-1430s can be detected. Whereas the first flood period appears to be more characteristic in the Tisza catchment with a clear peak in the 1340s, but especially in years 1342 and 1343, in the second main period the floods of the Danube are more pronounced, even if Tisza catchment flood events (especially multi-annual information) still play an important role. While in case of the first main flood peak spring and winter floods dominate and very few summer floods were recorded, in the second main flood peak summer floods of the Danube are also significant.

Additionally, the traces of a third high flood-frequency period, already well-known from the areas west to us, can be also detected in the last decade(s) of the 15th century (with a continuation in the early 16th century). The same important periods are highlighted by the undated (only *terminus ante quem* dates are known) or multi-annual information on past flood events, the reported hydromorphological impacts such as riverbed change or intensified sedimentation, together with majority of the damages in the human environment.

Human response

This later conclusion leads us towards the response of human society: not merely the impact of floods on the physical, but also on the human environment and society comprised an important part of the analysis. Thus, flood damages in the human environment, the short-, medium- and long-term practical (administrative, economic, legal) reactions as well as flood symbolism in literary works are equally discussed.

Although less in quantity compared to other, Central European investigations, main types of flood damages are also available in the medieval Hungarian flood documentation. These damages could mean the destruction that could have short- or long-term reasons and/or consequences in the built-up environment such as the damages occurred in buildings or technical equipments. On the long term, however, impact of floods could be more detected in the non-built-up environment, with special consideration on land use, agricultural lands as well as on roads.

Nevertheless, probably the largest number of impact-related documentation refers to the cases when flood obstructed actual, ongoing human activities such as travel or the completion (and thus, delay or cancellation) of a legal process. An important long-term consequence, often combined with other reasons, is administrative changes: documented in high flood-frequency periods, county boundaries changed and new parishes emerged. Based on the

available flood-related evidence, short-term impacts of climate variability could be detected only in few cases, even if hydrological changes on the long term may be important in general.

Flood events do not merely appear in the documentation when a legal process is obstructed, but it may also act a symbol and a frequently applied tool in metaphors of medieval religious documentation (canonization trials, legends) as well as in literary works. Flood as a natural phenomenon, but also as a divine intervenient, a heavenly sign appear in late 13th-century canonization trials and later legends. In the late 15th-century humanistic literature of Antonio Bonfini, nevertheless, it appears as a conscious 'action' of a living river, while in Janus Pannonius' poetry flood acts as a sign and a chief reason in an 'environmental crisis/catastrophe domino', leading towards an approaching apocalypse.

Comparison with other long-term hydrological reconstructions

As an overall conclusion, we can say that the long-term statistical results, based on frequency, magnitude and impact-related issues on main flood peaks in the Carpathian Basin coincide with results available concerning the other, more westerly parts of Central Europe (e.g. Czech Lands, Austria and German areas). An important difference is, however, that the mid-14th-century flood peak does not appear to be so pronounced in Austria and the Czech areas than in the Carpathian Basin.

Another important general point is the comparison with the results of medium- or high-resolution natural scientific research, carried out in the Carpathian Basin. On the hundred-year basis the flood frequencies of the Danube show some coincidence with the high water-level conditions of the Nádas Lake (and probably of other lakes) in the 15th century.

On a decadal resolution, connections can be traced with the moisture/wetness reconstruction based on stalagmite records: overlaps may be detected in the late medieval period, namely in case of the late-14th- and early 15th-century, and the late 15th-century flood peaks. Despite weak documentation, some coincidence between stalagmite-based moisture reconstruction and documentary-based flood evidence can be presumably traced even in case of the mid-13th- and early 14th-century flood peaks. It is, nevertheless, a rather interesting fact that the mid-14th-century flood peak – although appear rather pronounced in documentary evidence – is entirely missing from the stalagmite record.

Outlook

Even if significant efforts have been made to provide a concise medieval flood database, it has to be stressed that, due to temporal limits and those of technical possibilities (e.g. lack of available information on many original charters and the vast amount of unpublished, contemporary economic evidence) the present Catalogue and Analyses are not based on all medieval documentary evidence preserved in the Carpathian Basin. Therefore, even if the majority of medieval flood evidence is (hopefully) already included in the investigation, further flood-related data may modify the picture, provided in the dissertation.

Therefore, an important further aim is to continue data collection; further systematic investigations on medieval charters (at present with unknown content) as well as on economic evidence should be carried out in the future. Moreover, this present research can and should be followed by the systematic analysis of medieval climate in the Carpathian Basin.

CURRICULUM VITAE

WORK & EDUCATION

- 2010– research fellow. Dept. of Physical Geography and Geoinformatics; Dept. of Historical Auxiliary Sciences, University of Szeged (SzTE), Szeged
- 2009-2010 research fellow. Institute of Habsburg History, Budapest
- 2002-2010 lecturer in Historical Geography&Environmental History. Dept. of Physical Geography and Geoinformatics, SzTE, Szeged
- 1998-2002 PhD Course in Medieval Studies. Dept. of Medieval Studies, Central European University (CEU), Budapest
- 1995-1999 PhD Course in Geography and Geosciences. Dept. of Climatology and Landscape Ecology, SzTE, Szeged
- 1997-1998 MA in Medieval Studies. Dept. of Medieval Studies, CEU, Budapest
- 1994-1996 MA in Hungarian Medieval Studies. Dept. of Medieval and Early Modern Hungarian History, SzTE, Szeged
- 1992-1996 Certificate in Latin, (BA level) Latin s. Studies. Dept. of Classical Philology, SzTE, Szeged
- 1990-1995 MSc in Geography, MA in History, and Teacher's Training Course. Faculty of Sciences: School of Geography and Geosciences; Faculty of Arts: Institute of Historical Sciences, SzTE, Szeged
- 1986-1990 I (Szent) István Secondary School, Budapest.

PROJECTS, EDITORSHIP

Project participation (1999-):

1. participant – project title: Reconstruction of wetland habitats in the Fertő-Hanság region, Fertő-Hanság National Park, Sarród, Hungary (OTKA State research project; 1999-2002).
2. participant – project title: Landscape aesthetics in Hungary: the Karancs-Medves area (OTKA State research project; 2004-2007).
3. contract partner in the EU-project (6th Framework Programme) 'Millennium' – The past climate and its dynamics (2006-2010).

Editor (2008-) of the *Journal of Environmental Geography*.

SCHOLARSHIPS/FELLOWSHIPS

- 1997: TEMPUS scholarship: Dept. of Geography, Faculty of Humanities, Nottingham Trent University, UK.
- 2000, 2003: Czech-Hungarian state scholarships: Dept. of Geography, Faculty of Sciences, Masaryk University, Brno, Czech Republic.
- 2001-2002: Doctoral Support Program, CEU-Open Society Foundation:
Dept. of Archaeology and Prehistory, University of Sheffield, UK;
Dept. of History, Vrije Universiteit, Amsterdam, The Netherlands;
School of Geography and Archaeology, University of Exeter, UK.

2002: Collegium Hungaricum scholarship, Vienna, *Austria*.

2005-2006: Swiss-Hungarian state fellowship: Institute of History, University of Bern, *Switzerland*.

MEMBERSHIPS

Hungarian Geographic Society (1988-); 'Geo-environ' (Hungarian) Society for Environmental Protection (1994-); Hungarian Meteorological Society (1995-); European Society for Environmental History (2002-; 2009-Regional representative, Board member); International Association of Urban Climate (2005-); European Geosciences Union (2009-); International Commission on the History of Meteorology (2009-); International Water History Association (2010-).

PUBLICATIONS

Number of scientific papers published: 53; submitted/accepted papers: 6.

Book, special issue editions: 2.

Publications in .pdf available: <http://www.geo.u-szeged.hu/~kissandi/CV-publ/>

SOME RECENT, DISSERTATION-RELATED PUBLICATIONS

Kiss, Andrea. Duna árvizek Magyarországon a középkori források tükrében (Floods of the Danube in the light of medieval documentary evidence). Submitted to: Kiss, P. Attila, Ferenc Piti, György Szabados and Beáta Vida (eds.). *Középkortörténeti tanulmányok 7* (Studies in medieval history 7). Szeged: Szegedi Középkorász Műhely (to be published in 2011)

Kiss, Andrea. Árvizek és magas vízszintek a 13-15. századi Magyarországon az egykorú írott források tükrében: Megfoghatók-e és mi alapján foghatók meg rövid, közép és hosszú távú változások? (Floods and high water levels in 13th-15th-century Hungary, in the light of contemporary documentary evidence. Is it possible to detect short-, medium- and long-term changes?). In: Kázmér, Miklós (ed.). *Környezettörténet* (Environmental history). Budapest (2010; in press)

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Kiss, Andrea. Historical climatology in Hungary: Role of documentary evidence in the study of past climates and hydrometeorological extremes. *Időjárás* 113/4 (2009): 315-339

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Figure 1 Floods, related hydromorphological events, damages and social changes reported in medieval Hungary

