

## **Reconstruction of peak water levels, peak discharges and long-term occurrence of extreme- as well as smaller pre-instrumental flood events of river Aare, Limmat, Reuss, Rhine and Saane in Switzerland. Part I**

Oliver Wetter (1) and Daniel Tuttenuj (2)

(1) University of Bern, Institute of History, WSU, Bern, Switzerland (oliver.wetter@hist.unibe.ch), (2) University of Bern, Institute of History, WSU, Bern, Switzerland (daniel.tuttenuj@hist.unibe.ch)

Part I:

Dr. Oliver Wetter. (Oeschger Centre for Climate Change Research, University of Bern, Switzerland)

Part II:

PhD student Daniel Tuttenuj (Oeschger Centre of Climate Change Research, University of Bern, Switzerland)

The methodology developed by Wetter et al. (2011) combines different documentary and instrumental sources, retaining relevant information for the reconstruction of extreme pre-instrumental flood events. These include hydrological measurements (gauges), historic river profiles (cross and longitudinal profiles), flood marks, historic city maps, documentary flood evidence (reports in chronicles and newspapers) as well as paintings and drawings. It has been shown that extreme river Rhine flood events of the pre-instrumental period can be reconstructed in terms of peak discharges for the last 750 years by applying this methodology to the site of Basel. Pfister & Wetter (2011) furthermore demonstrated that this methodology is also principally transferable to other locations and rivers. Institutional documentary evidence has not been systematically analysed in the context of historical hydrology in Switzerland so far. The term institutional documentary evidence generally outlines sources that were produced by governments or other (public) bodies including the church, hospitals, and the office of the bridge master. Institutional bodies were typically not directly interested in describing climate or hydrological events but they were obliged to document their activities, especially if they generated financial costs (bookkeeping), and in doing so they often indirectly recorded climatologic or hydrological events. The books of weekly expenditures of Basel (“Wochenausgabenbücher der Stadt Basel”) were first analysed by Fouquet (1999). He found recurring records of wage expenditures for a squad of craftsmen that was called up onto the bridge with the task of preventing the bridge from being damaged by fishing out drifting logs from the flood waters. Fouquet systematically analysed the period from 1446-1542 and could prove a large number of pre-instrumental flood events of river Rhine, Birs, Birsig and Wiese in Basel. All in all the weekly led account books contained 54 Rhine flood events, whereas chroniclers and annalists only recorded seven floods during the same period. This is a ratio of almost eight to one. This large difference points to the significantly sharper “observation skills” of the account books towards smaller floods, which may be explained by the fact that bridges can be endangered by relatively small floods because of driftwood, whereas it is known that chroniclers or annalists were predominantly focussing on spectacular (extreme) flood events. We [Oliver Wetter and Daniel Tuttenuj] are now able to present first preliminary results of reconstructed peak water levels and peak discharges of pre instrumental river Aare-, Emme-, Limmat-, Reuss-, Rhine- and Saane floods. These first results clearly show the strengths as well as the limits of the data and method used, depending mainly on the river types. Of the above mentioned rivers only the floods of river Emme could not be reconstructed whereas the long-term development of peak water levels and peak discharges of the other rivers clearly correlate with major local and supra-regional Swiss flood corrections over time. PhD student Daniel Tuttenuj is going to present the results for river Emme and Saane (see Abstract Daniel Tuttenuj), whereas Dr Oliver Wetter is going to present the results for the other rivers and gives a first insight on long-term recurring periods of smaller river Birs-, Birsig-, Rhine- and Wiese flood events based on the analysis of the weekly led account books “Wochenausgabenbücher der Stadt Basel” (see also Abstract of Daniel Tuttenuj).