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Testing the value of historical information to estimate uncertainties in flood frequencies for the Kinzig River, Southwest Germany

Annette Bösmeier (1), Rüdiger Glaser (1), Kerstin Stahl (2), Iso Himmelsbach (1), and Brice Martin (3)

(1) Physical Geography, Institute of Environmental Social Sciences and Geography, Faculty of Environment and Natural Resources, Albert Ludwigs University of Freiburg, Freiburg, Germany (annette.boesmeier@geographie.uni-freiburg.de), (2) Environmental Hydrological Systems, Institute of Earth and Environmental Sciences, Faculty of Environment and Natural Resources, Albert Ludwigs University of Freiburg, Germany, (3) Geography, Centre de Recherche sur les Economies, les Sciences, les Arts et les Techniques, Université de Haut-Alsace, Mulhouse, France

Future estimations of flood hazard and risk for developing optimal coping and adaption strategies inevitably include considerations of the frequency and magnitude of past events. Methods of historical climatology represent one way of assessing flood occurrences beyond the period of instrumental measurements and substantially help to extend the view into the past. Historical information can moreover be of additional value in connection with a verification of modern risk assessments, as statistical approaches like Bayesian flood frequency analyses have shown during recent years. However, the derivation of quantitative values from vague, descriptive information of historical sources remains a crucial challenge, and spurious accuracies must be avoided. We explored possibilities of parametrization of descriptive flood data specifically for the assessment of historical floods in a framework that combines a hermeneutical approach with mathematical and statistical methods. In the case of the Kinzig catchment, historical flood events dating back to AD 1500 were linked with reconstructed flood peak discharges and systematic measurements. Subsequent flood hazard analyses systematically tested the sensitivity of peak values and return period estimates to the uncertainty of historic flood records and the incorporation of different types of information. The results show clearly that even a very rough estimation of the dimension of extreme historical floods leads to significantly higher flood peak estimates though with narrower uncertainty. The improvements found through this systematic analysis suggest that despite the large effort in gathering and coding historical data, there is considerable added value to reduce the uncertainty in flood frequency estimates for major flood events in particular.