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# Return period estimation of extraordinary flash flood events in Slovakia: regional frequency analysis using a Bayesian MCMC approach

L. Gaál (1), E. Gaume (2), A. Viglione (3), J. Szolgay (1), and G. Blöschl (3)

(1) Slovak University of Technology, Faculty of Civil Engineering, Bratislava, Slovakia (ladislav.gaal@stuba.sk), (2) Laboratoire Central des Ponts et Chaussées, Nantes, France, (3) Technische Universität Wien, Institut für Wasserbau und Ingenieurhydrologie, Wien, Austria

A regional frequency analysis including reconstructed major flash flood events on ungauged catchments that occurred in Slovakia during the past few decades is carried out. These events are characterized by extremely high discharge values, largely exceeding the highest the values recorded on the gauged catchments (e.g., the Štrba Creek event, June 24, 2001, had a peak discharge of 65 m3/s related to the catchment area of only 2.5 km2).

The regional analysis is based on 40 small catchments from the northern and north-eastern parts of Slovakia that belong to the arch of the Western Carpathians. Groups of sites (regions) are delineated, which meet (i) the criterion of regional homogeneity of the dimensionless growth curves of flood peaks, assessed by the H1 test of Hosking and Wallis, and (ii) the hypothesis of unique scaling relation between the index flood and the catchment area assessed using a modified Wilcoxon-Mann-Whitney test. The observations within a given region rescaled by the index flood are then merged with the rescaled extraordinary flood events that have been observed in ungauged basins in the same region.

In order to better estimate the return period of these reconstructed flash floods, a sensitivity analysis is conducted using a Bayesian Monte Carlo Markov Chain (MCMC) approach that allows for a joint analysis of the systematic information from a regular network of streamflow gauges, and extraordinary events either from ungauged sites or historical records on gauged sites. Problems of the assumption of the simple scaling, the extrapolation to the domain of the very small catchment sizes, and the choice of the fitted statistical distribution function are discussed.

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