Geophysical Research Abstracts
Vol. 17, EGU2015-14898, 2015
EGU General Assembly 2015

Use of indexed historical floods in flood frequency estimation with Fuzzy Bayesian methods

Jose Salinas, Alberto Viglione, Andrea Kiss, and Guenter Bloeschl
Vienna University of Technology, Austria

Efforts of the historical environmental extremes community during the last decades have resulted in the existence of long time series of floods, for example in Central Europe and the Mediterranean region, which in some cases range longer than 500 years in the past. In most of the cases the flood time series are presented in terms of indices, representing a combination of socio-economic indicators for the flood impact, e.g. economic damage, flood duration and extension, ...
In hydrological engineering, historical floods are very useful because they give additional information which will reduce the uncertainty in estimates of discharges with low annual exceedance probabilities, i.e. with high return periods. In order to use the historical floods in formal flood frequency analysis, the precise value of the peak discharges would ideally be known, but as commented, they are most usually given in term of indices. This work presents a novel method on how to obtain a prior distribution for the parameters of the annual peak discharges distribution from indexed historical floods time series. The prior distribution is incorporated in the flood frequency estimation via Bayesian methods (see e.g. Viglione et al., 2013) in order to reduce the uncertainties in the design flood estimates. The historical data used is subject to a high degree of uncertainty and unpreciseness. In this sense, a framework is presented where the discharge thresholds between flood indices are modeled as fuzzy numbers. These fuzzy thresholds will define a fuzzy prior distribution, which will requires to apply Fuzzy Bayesian Inference (Viertl, 2008ab) to obtain fuzzy credibility intervals for the design floods.

Viertl, R. (2008a) Foundations of Fuzzy Bayesian Inference, Journal of Uncertain Systems, 2, 187-191.

Viertl, R. (2008b) Fuzzy Bayesian Inference. In: Soft Methods For Handling Variability And Imprecision. Advances In Soft Computing. Vol. 48. Springer-Verlag Berlin, pp 10-15.

Viglione, A., R. Merz, J.L. Salinas, and G. Blöschl (2013) Flood frequency hydrology: 3. A Bayesian analysis, Water Resources Research, 49, 1-18, doi:10.1029/2011WR010782.