CALCULATION OF FLOW EVENT EXCEEDANCE PROBABILITY ON SAVA RIVER USING PEAK OVER THRESHOLD METHOD

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Abstract

Estimation of high water discharges described by their reoccurrence frequency is important for many aspects of water management, most of all for flood protection. Implementation of flood protection measures relies on flood hazard assessment used in decision making which justifies the costs of such measures. A scientific approach called probabilistic design has been widely applied to optimize such decision making process. Commonly used methods identify a magnitude of discharge for its probability of occurrence in any given year or the time in years during which an annual maximum exceeds the assessed severity limit once in the mean. The allowable risk depends on the related human safety aspects, the planned lifetime and cost of the structure, as well as the indirect adverse effects of the damage.

There are several approaches to simulate the frequency of extreme events from measured time series data and Annual Maximum (AM) method is commonly used. AM method uses annual extremes as input and therefore can disregard significant events and dive biased estimation of extreme values. Peaks over Threshold (POT) method uses as input all observed independent peaks from time series data which exceed a defined threshold. The POT method is a formal statistical model, consisting of a Poisson process for the occurrence of an exceedance of a high threshold and a generalized Pareto (GP) distribution for the excess over the threshold. The POT models are generally considered to be the most useful for practical applications, due to their more efficient use of the (often limited) data on extreme values.

This paper evaluates applicability of AM and POT methods on calculation of extreme event discharges on Sava River in Croatia. Data used from analysis are historical long-term daily water levels recorded on gauging stations. Predicted magnitude of extreme events using both methods is compared and differences quantified. Watershed area that produces runoff at each gauging station is taken into account to show impact of tributary inflow on flow calculation. Results of this study can be used to improve flood risk assessment in Croatia.

Keywords: flood hazard, flood risk, peak over threshold, exceedance probability, Sava River