Flood frequency analyses with annual and partial flood series

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The objective of the study was (1) to analyse the influence of time scale of the data on the results, (2) to analyse the relations between discharge, volume and time of flood waves of the Sava river at Litija (Slovenia), (3) to perform flood frequency analyses of peak discharges with annual and partial data series and compare the results and (4) to explore the influence of threshold value by POT method.

Calculations and analyses were made for the period 1953-2010. Daily scale data sets (considering also local maximum) were used. The flood frequency analyses were based on anual and partial data series.

The differences between daily and hourly time scale data sets were explored. Daily and hourly time scale hydrographs were compared and differences were analysed. Differences were adequately small. Daily time series with included maximums were logical choice because of the length of the daily time series and because hourly time series were not continuous due to gauging equipment failures.

Important objective of the study was to analyse the relationship between discharge, volume and duration of flood waves. Baseflow was separated from continuous daily discharge measurements on simple and complex hydrographs. Simple graphical method with three points was used. Many different coefficients like base flow index were calculated and different combinations of correlation coefficient of wave components were examined. Annual maximum series were used to study the relationship between wave components.

Flood frequency analyses were made with annual maximum series and partial duration series. Log-normal distribution, Pearson distribution type 3, log-Pearson distribution type 3, Gumbel distribution, exponential distribution, GEV distribution and GL distribution were used for annual maximum series. Simple equation of linear transformation was used to determine the design discharge and procedure which is proposed in Flood Estimation Handbook was used with GEV and GL distribution. Results were then compared with those from partial duration series. Poisson distribution, binomial distribution and negative binomial distribution were used to describe annual number of exceedances and exponential distribution was used to model the magnitude of exceedances. The method of annual series is mostly used in flood frequency analyses in Slovenia because of its simplicity. Main advantages of partial duration series were shown on practical example. Distributions for modeling annual number of peaks over threshold were also compared.

Influence of threshold value on analyses results for the partial duration series was also explored. Many suggestions for the choice of the threshold were found in literature. Differences in design flood with various threshold values were analysed. Program Hydrospect was used to determine peaks over threshold data for as many different thresholds as possible.