



## **An Innovative Method for Flood Peak Event Separation from Discharge Time Series**

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In extreme value theory, Peak Over Threshold (POT) method is recognized to make a better use of available data with respect to Block Maxima (BM) method, as it allows to retain all relevant observations for frequency analysis, provided that an appropriate threshold is selected. Definition of a proper threshold, able to identify independent events, is in general a critical issue. In addition, in many hydrological applications, such as flood frequency analysis, threshold levels are usually site-specific. This could be a strong limitation when comparing the flood responses of different river basins within a large geographical area.

In the present study, an attempt is made to develop a relatively simple criterion for the determination of different thresholds to separate relevant flood events from a large dataset of daily discharge time series recorded at European scale. The proposed method arises from the theory of stochastic processes in the frequency domain, which can provide a meaningful description of the characteristics of the series. In particular, from the analysis of the power spectral density function and the signal of the process (e.g. narrowband or broadband), it is possible to define crossings (i.e. peaks) in clusters or independent crossings of the threshold. More specifically, such a selection process of significant events may help to understand whether relatively close peaks can be referred to a single flood event or independent events.

Also in the frequency domain, a mean frequency of the random process can be defined for each series to be used as a possible common criterion for the definition of the different thresholds for flood peaks selection. The advantages of this method compared to other methods, such as traditional POT, lie in the fact that it establishes a robust procedure for the separation of independent events in time series, by means of the analysis in the frequency domain. Furthermore, the choice of the threshold for the selection of significant events in each series is no longer arbitrary.

Validation of the proposed method is carried out by comparing theoretical versus empirical frequencies of observed peak flows selected from discharge series recorded in different river basins in Europe. The results reveal a better performance of the proposed method compared to the traditional POT method.