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Improving flash flood frequency analyses by using non-systematic dendrogeomorphic data

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Flash floods have a rapid hydrological response in catchments with short lag times, characterized by “peaky” hydrographs. The peak flows are reached within a few hours, thus giving little or no advance warning to prevent and mitigate flood damage. As a result, flash floods may result in a high social risk, as shown for instance by the 1997 Biescas disaster in Spain. The analysis and management of flood risk are clearly conditioned by data availability, especially in mountain areas where usually flash-floods occur. Nevertheless, in mountain basins there is often short data series available that are not accurate in terms of statistical significance. In addition, when flow data is ready for use maximum annual values are generally not as reliable as average flow values, since conventional stream gauge stations may not record the extreme floods, leading to gaps in the time series. Dendrogeomorphology has been shown to be especially useful for improving flood frequency analyses in catchments where short flood series limit the use of conventional hydrological methods. This study presents pros and cons of using a given probability distribution function, such as the Generalized Extreme Value (GEV), and Bayesian Markov Chain Monte Carlo (MCMC) methods to account for non-systematic data provided by dendrogeomorphic techniques, in order to asses flood quantile estimates accuracy. To this end, we have considered a set of locations in Central Spain, where systematic flow available at a gauging site can be extended with non-systematic data obtained from implementation of dendrogeomorphic techniques.