



Perspective of frequency modelling of floods caused by levee breaching

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The main cause of floods in Poland is the breaching of dikes weakened by the prolonged high waters. It usually happens when the flood waters fall. To deal with it, the authors introduced the model 'Duration – flow – Frequency' (DqF) which bases on block maxima and the longest duration of floods over the alarm level. However, often flood waves occur one by one, and the successive wave attacks the levee already soaked and weakened which, finally, gives in. As a result, the statistical inference needs to be performed on the base of all flood events that exceed alarm level (i.e. POT approach), the inter-arrival time being of particular interest. Since the magnitude of floods waves affects the stability of levees, not only the duration should be taken into account, but also the peak flow of flood. This leads to two-dimensional frequency distribution with dependent marginal variables (duration and peak flow). We applied classical method of joint normal distribution with normalized marginals and copula functions. We focus on distribution of the flood duration conditioned on any peak flow higher than the assumed value which gives us insight into the flood wave shape and its volume assessment, as well as, their changes in time. The theoretical considerations are supported by the case study results for Poznan gauge at the River Warta in Poland which show the perspective of presented approaches and enable to evaluate the possibility of their implementation in the applied hydrology.