

Interactive comment on “Evaluation of floods in Western/Central Europe: the role of index design” by Blanka Gvoždíková and Miloslav Müller

Anonymous Referee #1

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The paper addresses the topic of identification of flood events in western and central Europe based on multiple series of mean daily discharge for a period of 61 years. Building on the method of Uhlemann et al. (2010) the authors aim to highlight the influence of different parameter choices on the the flood severity index which in turn influences the event identification.

Extending the analysis of Uhlemann et al. 2010 to a larger study area, i.e. identifying a true central European event set of large flood events is a valid objective. However, the paper lacks scientific rigour and presents little novelty on the event severity assessment. I therefore do not recommend the paper for further publication in HESS. In the following, I will outline my key criticism and encourage the authors to commence with their research on the important topic of understanding flood event frequency, severity and causes in central Europe.

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Uhlemann present a thorough sensitivity analysis of the severity index already and present the impact of different thresholds and input data on the resulting event set. The work presented by Gvoždíková only addresses the sensitivity of two parameters: subcatchment area and flood discharge limit (which is a threshold of flow expressed as the ratio of the peak flow at a gauge against the mean annual maximum flow of the entire time series at that gauge). The selection of the parameters and the chosen range in which they are being tested is not supported by argument. I.e., what is the hypothesis for defining the three variants of the thresholds of what is called the discharge limit (Q_s/Q_{ma} ; $Q_s/Q_{ma} > 1.2$; $Q_s/Q_{ma} > 1.5$)? Likewise, choosing either the subcatchment area, its root or logarithm as range for testing the impact of the spatial weight on the severity index is arbitrary. The event sets identified are limited in a first step to 80 events, and then, for comparing results of the different variants of the index, to 30. Why is that so? My strongest criticism is with the principle choice of subcatchment area as spatial weighting factor to account for the relative contribution of a peak recorded at a river gauge to the overall flood severity. This is a classical regionalisation problem in hydrology. Subcatchment area however fails to address this problem and introduces a severe spatial bias into the analysis. Unlike precipitation, for which area indices are well suited, floods are not a space-filling phenomena. In particular, peak flows recorded at downstream gauges of the large streams Rhine, Elbe, to some degree Danube, Weser, and Meuse are in most cases not caused by inflow from their intermittent catchments but are a result of the flood wave propagating from further upstream. Also, when choosing subcatchment area, the density of the gauge network and particularly the uneven distribution of gauges in the river network becomes relatively more important in the severity index calculation and needs sensitivity testing. The original severity index presented by Uhlemann 2010, and also the application of the index in Schröter et al. 2015, provide a method for regionalisation of peak flows to the river network rather than to the subcatchments. I strongly recommend the authors to review their method for computing the spatial extent of the flood events in any further study. In summary, the conclusions reached on the best suited variant of the severity index and

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resulting event set need thorough reworking. In fact, I think, that the sensitivity study provided in Uhlemann et al 2010 provides all the necessary findings to allow for a fairly straight forward adoption of the severity index to the context of identifying flood events in central Europe. In the final paragraph of the paper the authors highlight that they want to commence with an analysis of the hydro-meteorological causes of large flood events in central Europe. I think, this is where the innovation will come and I highly encourage the authors to proceed on this avenue. The assessment of the severity of events and consequently the identification of the relevant flood events in the region can be natural part of any paper submitted on this.

On the aspect of analyzing severe floods in W/Central Europe in their frequency and severity and also in their spatial-temporal patterns and potential changes of these + attribution of these changes to causes: Reading the title I had expected to see the Odra basin included in the study. This basin forms the eastern boundary of the very wide transitional zone between atlantic and continental influences on flood genesis and at present I expect that in particular some of the summer flood events are insufficiently represented in the event set(s). Also, extending the event analysis to the most recent period, e.g. 2015, would add value to any change detection and finally attribution. In principle, I think Central Europe is the better description for the area under study.

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