Hydrology and Earth System Sciences Discussions

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# Comment on hess-2021-466

Anonymous Referee #1

Referee comment on "Flood frequency analysis using mean daily flows vs. instantaneous peak flows" by Anne Bartens and Uwe Haberlandt, Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-466-RC1, 2021

The manuscript "Flood frequency analysis using mean daily flows vs. instantaneous peak flows" by Anne Bartens and Uwe Haberlandt investigates the difference in using mean daily flow series (MDF) instead of instantaneous peak flow series (IPF) for flood frequency analyses and proposes an approach to correct MDF series and flood statistics, based on the ratio between flood peak and flood volume. The analysis is carried out for several gauges in five German regions. The study is interesting for practical applications. Language is sometimes not precise and unclear, and, in my opinion, it can be improved. I have some major and specific comments to the manuscript. Please find my comments below.

Major comments:

- The proposed correction method is compared in terms of mean annual maximum flow and flood quantiles with the slope correction method (Chen et al., 2017). A broader comparison including more than one method would be beneficial for the discussion and assessment of the proposed correction method. The comparison with benchmark methods is limited (also in the introduction, where little space is dedicated to previous literature on this topic) and gets lost through the paper.
- Lines 81-84: it is unclear how you match the true IPF events with the MDF to be corrected. Do you compare the true IPF and the corrected MDF that correspond to the same event, instead of correcting the maximum of the MDF (because they may not occur on the same day/event)? If this is the case, it would be also interesting to see the results of the correction for the second case (i.e., correcting the annual maxima of the MDF). This is because, in a practical case, we typically have (or consider) the series of maxima of MDF only and, ideally, we would apply the proposed correction method to this series directly.
- Line 192: In order to separate flood events induced by convective rainfall events vs flood events with significant volumes caused by snowmelt or stratiform rain, a pretty rough criterion based solely on seasonality is used (i.e., half year May-October events are classified as summer events and November-April as winter events). This rough

classification is likely to cause many events to be misclassified, e.g., not all flood events occurring in summer are due to convective precipitation, especially with the assumed duration of the summer season (i.e., 6 months, from May to October). June-July-August are typically considered summer months for Europe and December-January-February as winter months. More accurate criteria for separating flood events induced by convective vs stratiform rain should be adopted (e.g., based on precipitation data). An improved classification may also result in a more visible difference between summer and winter events in Figure 3.

- Table 1: a justification for the models used (linear models) and for the chosen (or excluded) predictors should be provided.

Specific comments:

- Line 18: 'the dimensions and variability of these maxima'. Do the authors mean 'the magnitude and variability'?
- Line 55: I would also mention climatic conditions in addition to the physiographic ones.
- Line 64: I suggest adding an L-moments definition (or a reference).
- Line 67: the peak-volume ratio is calculated from the average daily time series. As a consequence, it is not surprising that the correction does not perform well for small catchments. What if the ratio is calculated from the instantaneous series?
- Line 68: could you define 'direct peak' and 'direct volume'? Are they the peak and volume after baseflow subtraction?
- Line 77: is 'the event correction method' the name of your proposed method? Please clarify.
- Line 84: please clarify what you mean by 'inconsiderable daily peaks'
- Line 91: 'these averages'. This was not clear to me. Do you mean 'these statistics'?
- Line 91: 'these major events'. It is not clear what it refers to. In the sentences before there is no mention of major events.
- Line 93: 'this approach appears to be the most sensible here'. This sentence is unclear to me. Please define sensible in this context.
- Line 103: check the reference 'institute of hydrology (1980)'.
- Section 2.2: the event separation is a crucial part of the analysis, since it has a clear influence on the resulting event discharges used for flood frequency analysis and event characteristics (peak and volume) used for the correction. The description ofthe method used for event separation is however very short and partly unclear. Is the event separation carried out on daily data? What about event definition on the instantaneous flow data? It's not clear if you adopt the same approach for both or different. Perhaps different event separation approaches are more appropriate for MDF vs IPF.
- Line 109-111: what is the fraction of events with 2 peaks in the data analysed? Does it vary across space and seasonally? This information would be useful to assess the effect of your assumption.
- Line 126: this was unclear to me. Please clarify
- Line 153: database sources should be referenced in this section too.
- Line 158: 'average precipitation'. Do you mean average annual precipitation?
- Figure 1: 2 subsets of stations for calibration and validation respectively are indicated. It is not clear how you have identified the validation subset and the two phases (calibration and validation) are not clearly identifiable in the manuscript.
- Line 172-173: it is unclear why you need to select an overlapping and common period for the flood series (that leads to significant data reduction). Time is not considered in your regression, but only catchment descriptors are.
- Figure 3: do the values of elevation shown here represent the elevation of the

catchment outlets or the mean elevation over the catchments? Please clarify it.

- Line 207-209: it's not fully clear how falsely attributed events are defined. Do I understand correctly that you compare the season of the maxima of IPF and the maxima of MDF series? Is this comparison carried out for each year separately? How is the number of events falsely attributed to summer/winter aggregated over the entire time series? In other words, if in one catchment some events are misclassified as summer and others misclassified as winter events, do we see only one corresponding circle in Figure 4a or two circles for that specific catchment (i.e., one for the nr of peaks misclassified as summer and another for winter)?
- Line 243: the authors refer to a set of stations, however it's not clear what stations they refer to and where in the manuscript they were previously identified.
- Line 251-252: it is not clear why the overall performance can only be assessed for events corresponding to the monthly maxima. Isn't the correction applied to all events?
- Line 261: is the PBIAS and average bias over all events in a site?
- Line 287: I could not really see shape parameter close to zero for high altitude catchments from figure 8. For what concerns the statement b), it is not valid for the lowest elevation group (yellow in fig. 8). Isn't it?
- Line 324: I believe that sample size plays a role here too in estimating large flood quantiles and associated errors.