

Interactive comment on “HESS Opinions “More efforts and scientific rigour are needed to attribute trends in flood time series”” by B. Merz et al.

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We thank Günter Blöschl for his thoughtful and encouraging comments. Below we address each comment and explain how we revise the manuscript in response:

p. 1346, l. 7: The terms “proof” and “prove” are used here and many times throughout the paper. I do not think these are the right words. Proof has a clear mathematical or logical connotation which is not justified here. Existence of trends or the effect of drivers cannot be proven. There may exist “evidence” for trends or for drivers but no proofs. I suggest to replace these terms by something like “check” or “evidence” depending on the context.

Response: We are very grateful for this hint. We agree that the connotation of the term

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proof is too strong. We will revise the manuscript accordingly, e.g. substitute “proof” by “evidence”.

p. 1346, l. 20: Detection and attribution are one-sided terms, at least linguistically. The authors may want to add here the possibility that there are no trends and no evidence for attribution.

Response: We have restricted the discussion in the opinion paper to the situation when a significant change is detected and attribution is sought (as consequence of positive detection). We prefer to limit the paper to this issue. There is the error type 2 in trend tests (failure to detect an existing change), and there are many flood trend studies that have not identified changes. But we think that the discussion of these aspects would possibly not contribute to our key message.

p. 1349, l. 23: Here, and a number of instances later in the paper, the authors refer to Hundecha and Merz (2012) which is a paper under review. I think it is not appropriate to cite a paper under review and I suggest that reference to this paper is removed throughout the manuscript.

Response: Meanwhile, the Hundecha and Merz manuscript is in press and will be printed in 2 weeks. Hence, the Hundecha and Merz paper will be published before the hess opinion paper, and it will be properly referenced in the hess paper.

p. 1350 and 1350: The authors seem to imply (although they do not say so explicitly) that the focus is on flood peak discharges. I think that other flood characteristics can be even more informative than flood peaks such as the time of year the floods occur and the flashiness of the runoff regime. Parajka et al. (2010) and Holko et al. (2011) have demonstrated that these variables allow very useful insights into flood processes related to change.

Response: We did not intend to imply a focus on flood peaks, however, we agree that it is very helpful to include a statement about the usefulness of other flood characteristics.

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We will add a short statement including a reference in the revision.

p. 1351, l. 2: Again, “unequivocal” and “proof” is just not the right wording here (and it is inconsistent with the confidence aspect proposed by the authors themselves).

Response: Will be changed as explained above.

p. 1351, l. 20: “likelihood statement .. that a certain driver .. caused the observed change” Perhaps add: “given the available data”. The likelihood will invariably depend on the data that are available for testing the hypothesis. If longer flood records are available evidence for trends may appear or disappear as the case may be.

Response: added as proposed

p.1359, l. 1: One of the uncertainties that could be mentioned here are that the model parameters of rainfall-runoff models tend not to be stable if the hydrological situation changes (eg. Merz et al., 2011).

Response: This is a good example, however, as this is just one type of the uncertainties, we prefer not to include this example.

p. 1359: The question remains how the hypothesis testing can be framed. I am sure this is something the authors will work on in the near future and there are European projects currently being launched on this topic such as the ERC FloodChange project at the TU Wien.

Response: We admit that much has to be done to bring forward the proposed hypothesis testing framework. We are working on this, but as Günter Blöschl remarks, there are other projects which work in this direction. We think that the improvement of flood trend attribution needs the engagement and collaboration of many scientists.

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