Reply to Editor and Reviewers

Editor's comment

Dear authors,

Thank you for the submission of your revised manuscript "Towards global sensitivity analysis of large-scale flood loss models" to NHESS.

The two reviewers have now provided feedback on your revisions. While both reviewers are generally satisfied with the response, reviewer 2 raises 4 specific points that they believe still require further attention. After re-reading the manuscript and the points, I concur with the reviewer that these points should still be addressed. In particular, the paper requires more information on the JBA flood loss model – the section on flood loss models now focuses mainly on approaches in a general sense, but it should summarise more the key points of the particular model used (while obviously not repeating everything in detail, which is in the references cited). Also the other points raised should be addressed in a revision.

I look forward to seeing the next version of your manuscript which I will then either assess myself, or send out for further review to the previous reviewer (if they agree) or a new reviewer if I feel that this required to make a final decision.

Please be aware, that this is most likely the last possibility for you to change and improve the manuscript. Thus, I suggest that you carefully go through the manuscript again and improve everything which you still find useful to improve (even if the referees have not pointed it out).

Best regards
Philip Ward

Reply: Dear Editor, thanks again for your feedback, the reviewer' comments, and the opportunity to address them and further improve our manuscript. We have prepared a new version we hope can address the remaining issues. Please also find below a summary of how we tackled these issues in our point-by-point response to the Reviewer.

Reviewer 2 comments

I am generally satisfied with the authors' response, though a few issues remain:

1) In the methods, some details were added, but the description of the JBA model, which the authors say they added, is still missing. This needs to be corrected.

Reply: We have further revised this section to distinguish a bit better when we are describing the general structure of "typical" flood loss models used in the insurance sector (which is our main goal, as now explicitly stated on L. 132 onwards) and when we

are reporting the key points of the specific implementation of that general framework into the JBA model. The main revisions/additions (on the flood inundation model underpinning the hazard maps, the flood defence datasets, the construction of the event set, and the vulnerability curves) are highlighted in yellow.
We hope this new version will help maintaining the description general enough for readers to see commonalities with other existing models, and at the same time provide key information and references on the specifics of the JBA model.

2) There should be an indication where the flood protection data come from, what are the possible uncertainties (qualitatively) and how they could be quantified (in the discussion).

Reply: This has now been added in various points throughout the manuscript – see yellow highlights around lines L.180, L. 440, L. 530.

3) The authors write that they defined the uncertainty ranges using a "systematic literature review", in the text citing one of the author's PhD thesis. In the thesis, only one study is mentioned to have used 50% ranges, and that study itself provides no explanation at all for this choice. Only for exposure and vulnerability, after reading the thesis, the rationale becomes clear (but not to the reader of the paper). More information about the origin of the uncertainty ranges has to be provided in the paper.

Reply: We agree that our explanation was incomplete. We have now expanded the description of the literature review that led to the definition of uncertainty ranges (see yellow highlights in Sec. 5.1). We hope that, along with the reference to the open-access Thesis, the interested reader will be able to access all details.
The Reviewer is right that the justification for a range of +/-50% around baseline value of return periods is tenuous, as we fully acknowledge in the text. However, this is a situation that most GSA users will have to confront with: the difficulty of establishing uncertainty ranges for sampling, with little data/information to back up the choices made. This problem has been acknowledged by others (e.g. Metin et al 2018) and is discussed several times through the paper (Sec. 4.3, Case study sections, Outlook Conclusion). A key point of the Rhine River case study is precisely to showcase an example of how GSA users can, at a minimum, analyse the impacts of the assumptions made (Fig. 5b).

4) Further, only in the revision is mentioned at one point that the paper draws heavily from the cited PhD thesis (the entire Rhine case study). The paper also includes figures adapted from the thesis (5,6), Proper attribution of the source material should be made.

Reply: Yes, the reviewer is right that Figure 5a and Figure 6 are re-elaborations of some of the Thesis figures (Figure 5b is new). We have now clarified this in the captions.