

Interactive comment on “Projecting flood hazard under climate change: an alternative approach to model chains” by J. M. Delgado et al.

Anonymous Referee #5

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In their manuscript, Delgado et al describe a novel chain for assessing the impacts of climate change on flood frequencies using a shortened model chain compared to the classical “emission scenario – global climate model – downscaling, possibly including bias correction – hydrological model – flood frequency analysis” approach. In my opinion, the paper is scientifically novel and rigorous, well-written, and warrants publication in NHESS.

I only have six specific comments, all of which are minor, and several minor technical corrections

Specific comments

1. On page 7359, lines 1-2, the authors state that “There is abundant evidence that
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climate variability and climate change modify the frequency of extreme hydrologic events”, citing a few papers. I feel that this statement requires some more nuance, and should refer also to the results/reviews carried out by IPCC in the Fourth Assessment Report (AR4) and the IPCC’s “SREX report”. For example, the Summary for Policy for SREX states “Projected precipitation and temperature changes imply possible changes in floods, although overall there is low confidence in projections of changes in fluvial floods. Confidence is low due to limited evidence and because the causes of regional changes are complex, although there are exceptions to this statement. There is medium confidence (based on physical reasoning) that projected increases in heavy rainfall would contribute to increases in local flooding in some catchments or regions”.

2. On page 7360, first paragraph, the authors state that ENSO has been linked to flooding in several regions (citing Peru and USA). It is probably useful to also cite a recent study showing the strength (or absence) of this relationship for basins around the entire world (Ward et al., 2014).

3. In section 3.3, the authors examine possible changes in the 100yr flood at Kratie under scenarios of climate change. The results are given for 2050. Is it possible to also give results for later projections (end of century), since several studies have shown the potential impacts of climate to be higher by end of century (e.g. Hirabayashi et al., 2013)? If not, please include a discussion of this issue.

4. On page 7371 it is stated that the only study (of the Mekong) that focuses explicitly on the variance of floods is that of Arora (2001). The paper of Räsänen et al. (2013) examined variability over the past (paleo) time-period though indeed not for the future. It may be useful to note this.

5. In my opinion, the “Conclusion” as it stands is not really a conclusion. It appears that many new ideas and literature are introduced in this section, and limitations are discussed. To me, this makes it difficult to distill the actual main findings/conclusions of the paper. I would propose shortening the conclusions section, and placing the

“new” information in the discussion.

6. Finally, but one of my main lingering concerns, is the statement in both the conclusions and abstract, that the new approach forms a worthwhile complementary approach to the traditional typical model chains, rather than a substitution. It would be useful if you could provide some specific detail on how you envisage this. Which parts would be “complementary”? Would the idea be that the 2 parts lead to some kind of “consensus” view? Or is the idea more that the new approach could be used to generate a larger number of scenarios, whilst the “traditional” approach would presumably still serve some other propose? Please provide some discussion (though only a few lines would be required).

Minor technical corrections

1. P7359, L18: replace “understanding how” with “understanding of how”
2. P7360, L17: replace “avoids to rely on” with “avoids relying on”
3. P7362, line 10: it would be useful to put the a and b between some kind of marker to enable reading, e.g. “. . .over ‘a’ minus the averages over ‘b’ “. Or better still. “. . .over region a minus region b. . .”.
4. P7362, L13: “cera database”. Should this read “CERA database”?
5. On the “printer friendly version”, the equations appear with strange symbols, though they are OK on the regular version. Is suspect this has to do with the typesetting process.
6. P7368, L26: replace “parameters” with “parameter”
7. P7371, L2: replace “predicted” with “projected”

References

Hirabayashi, Y., Roobavannan, M., Sujan, K., Lisako, K., Dai, Y., Satoshi, W., Hyungjun,

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K., Shinjiro, K., 2013. Global flood risk under climate change. *Nature Climate Change*, 3, 816-821, doi:10.1038/nclimate1911.

Räsänen, T.A., Lehr, C., Mellin, I., Ward, P.J., Kummu M., 2013. Paleoclimatological perspective on river basin hydrometeorology: case of the Mekong Basin. *Hydrology and Earth System Sciences*, 17, 2069-2081, doi:10.5194/hess-17-2069-2013.

Ward, P.J., Eisner, S., Flörke, M., Dettinger, M.D., Kummu, M., 2014. Annual flood sensitivities to El Niño Southern Oscillation at the global scale. *Hydrology and Earth System Sciences*, 18, 47-66, doi:10.5194/hess-18-47-2014.

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