Review for manuscript "A new dataset of river flood hazard maps for Europe and the Mediterranean Basin region"

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Summary

The authors present a new flood hazard map dataset for Europe and the Mediterranean region for different return periods up to 500 years. They evaluate modeled flood extents using existing national flood hazard maps. They show that the new data product over- or underestimates flood extents depending on the region considered and consider the dataset to be valuable in regions where no more detailed national flood hazard maps exist.

General remarks

The paper is clearly structured and has generally a good reading flow. The dataset presented improves the spatial coverage of existing flood hazard maps. However, the paper lacks methodological detail not evident to readers unfamiliar with previous work published by the authors. In particular, important information on hydrological model evaluation with respect to high flows and the statistical models (i.e. Gumbel distribution and hydrograph construction procedure) is missing.

Major points

1) What kind of new features that the latest version of the LISFLOOD model have that make it more suitable to derive flood hazard maps than previous versions (l. 83-86)?
2) I guess that the official hazard maps were derived using locally-calibrated hydrological models and are therefore considered to be more reliable than maps derived using global models (and are therefore chosen as a reference). This is not evident though and should be mentioned somewhere (l. 89-91)
3) The authors briefly describe how the LISFLOOD model has been calibrated (l. 124-126), however, I could not find any information about how the model was validated and what the outcome of the validation step was. It would be important to provide some validation results with respect to high-flow simulation performance in order to establish trust into the streamflow simulations used for the hazard assessment.
4) The authors estimate 500- and 1000-year floods using a sample consisting of 26 annual maxima only (l. 151). Such extrapolations are extremely dangerous because of large sampling uncertainty. I would therefore limit the analysis to extremes with 100-year return period.
5) The Gumbel distribution is chosen for extreme value analysis. I have my doubts that this 2-parameter distribution is a good fit for the data. Goodness-of-fit testing is required here to show the suitability of the Gumbel distribution to model annual maxima. If it is rejected in many cases, I would rather use the more flexible GEV distribution.
6) I do not fully understand how the design flood estimates were derived (l.156-165). The description of how event duration is included needs more/clearer explanation because the FDC itself is only a CDF of daily flow and does not really say anything about event duration:

How is event duration derived? How is event volume derived? How is the event shape derived?

7) I find it a inconsistent to compare existing flood risk maps which have been derived taking flood protection measures into account to estimated flood risk maps derived ignoring these measures (l.365-369). This seems as if you were comparing apples with pears instead of apples with apples. Wouldn't a flood risk map not considering protection measures depict a wrong (and overestimated) picture of flood risk?
8) Overall, a more nuanced discussion of different uncertainty sources not limited to uncertainties related to the hydraulic modeling step would be required. Such uncertainty sources include hydrological model performance, statistical modeling, design hydrograph estimation, …
9) Some additional language editing would further improve the reading flow.

Minor points

- L. 109: when was LISFLOOD last updated?
- L. 118-120: can you please provide the data sources for all these datasets?
- L. 156: what do you mean by 'long-term' simulation?
- Figure B1: color legend is missing.
- Suggestion for slight title adjustment: 'A new dataset of river flood hazard maps for Europe and the Mediterranean Basin' or 'River flood hazard maps for Europe and the Mediterranean Basin: a new dataset derived using LISFLOOD'