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Discussions

Interactive comment on "Effects of variability in probable maximum precipitation patterns on flood losses" *by* Andreas Paul Zischg et al.

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Dear reviewer, Thank you very much for helpful remarks. Below you find a response to the points made.

-Concept of PMF:

We agree that the concept of the PMF is debatable, from several points of view. Hence, we aimed at adding two further aspects to the discussion on methods for stress tests or flood loss analyses at river basin scale, i.e. the role of the spatio-temporal variability of rainfall and the relationship between PMF discharge at catchment outlet and the flood losses.

-Space-time separability and storm movement:

Our concept considers the variability of rainfall of both in space and time. Thus, the storm movement is implicitly considered in our approach. We added plausibility checks for the selection of the stochastically generated rainfall patterns, e.g. the concentration of rainfall in neighbouring catchments in space and time. Furthermore, the storm movement in our case study is influenced by the mountain crests that divide the sub-catchments. Thus, intense precipitation could be concentrated in a few neighbouring catchments. The temporal component of our rainfall distribution model corresponds to the observed ones. Conclusively, we preferred the Monte Carlo approach against a storm movement approach. Full details on this are given by Felder and Weingartner (2016, 2017). We will add more detail about this discussion in the paper.

-Flow velocities:

We do not consider flow velocity because the chosen flood models are not validated against flow velocities in the floodplains. Furthermore, the majority of vulnerability functions does not consider flow velocity. Thus, we focused on comparable vulnerability functions. We will motivate our choice in the paper.

-Uncertainty analysis vs. sensitivity analysis:

Thanks for this advice. We will define the terms uncertainty, sensibility and variability precisely and we will use them in a concerted way throughout the paper.

-Assessing uncertainties in the model output:

We will define what we consider as model output in the paragraph before this sentence to ease readability.

-RUR:

That's right. The sum of RUR for the different factors does not equal 100%. Consequently, the RUR of a subset of models shows the relative role of this uncertainty source to the total uncertainty of all model runs. The RUR is related to the total uncertainty range of all models but is not relative to the RUR of other subsets. The RUR does not isolate all the contributions of the different components to the total uncertainty but they remain intertwined, except the selected uncertainty factor. However, the RUR values are comparable. We will add more detail on this in the paper and define the relative contribution more precisely.

-Probabilistic inundation maps:

Exactly, the inundation maps are estimates of a conditional probability of inundation, conditional to the rainfall sum in the catchment within a selected time period. Thanks for this hint, we will reformulate this in the paper.

-Total uncertainty range:

In a strict sense, we do not model statistically the uncertainty with probability distributions. However, we quantified the variability related to selected uncertainty factors. In contrast to sensitivity analyses for a single model, we investigate selected uncertainty sources in flood loss assessment in a multi-model framework. Thus, different concepts are combined. However, as stated before we will define precisely the terms variability, uncertainty and sensitivity analysis.

-Superimposition of flood waves:

We can quantify the superimposition of flood waves at every location within the catchment. We will think about how to visualize this superimposition at selected representative locations within the river basin and we will add an additional figure.

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