

## ***Interactive comment on “Review Article: Validation of flood risk models: current practice and innovations” by Daniela Molinari et al.***

**Anonymous Referee #1**

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### General comments

The paper addresses a very important topic in flood risk assessment: the validation of the models. It is generally well organized and clear. The effort of the authors in collecting so many references is considerable. The paper could provide a substantial contribution to the understanding of the topic and a helpful guide to the reader in such a specific field, if the literature review was extended and summarized in more structured manner also by means of tables. Moreover, not all the flood risk model components are analyzed. Based also on what the authors wrote, the paper at present status is not precisely a review article, but rather a summary of the outcomes of two important workshops on the validation of flood risk models. On the one hand, it provides useful references in the literature; on the other hand, it gives extensive space to recommen-

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dations and authors' opinions or suggest priorities in the flood risk research and policy. This approach, although useful, is not usually adopted within a review article. Finally, often the problem of validation is assimilated in the paper to the problem of uncertainty estimation, while I believe they are two distinct problems. The paper is recommended for publication in NHESS after some minor revisions. I tried also to provide some suggestions that the authors are free to accept or reject.

### Specific comments

Title. I suggest taking out from the title “review article”. Moreover, I suggest substituting “current practice and innovations” with “practices, lacks and recommendations”

P1 L16-17. The components of risk modelling are not only flood hazard, defence failure and damage analysis. I think there are others like spatial and temporal correlation estimation, exposure or exposed values estimation, uncertainty estimation, stochastic events generation. Also, flood risk modelling could not be limited to damage analysis, but in general extended to indirect losses and social impacts.

P1 L28 – P2 L9. It is not clear the aim of the paper. The aim of a review paper is to summarize the existing literature on the topic. Instead in this paragraph, authors says that the paper aims at summarized the findings of two workshops and provide recommendations. I think it should be clarified better the role of these two workshops in the context of the paper. Maybe the aim could be addressed to how the findings of the workshops contributed to the understating and knowledge of the topic.

P2 L10-13. The key questions reported here are really useful to guide the reader through the paper. I suggest that each of the following paragraph replies to each single question: 1) What is validation ... -> paragraph 2 2) Which are the techniques ... -> paragraph 3 3) Which are the priorities ... -> paragraph 4

P2 L15 – 18. I think this paragraph starts from too far. I don't think it is necessary to go to the foundation of engineering science to define what is validation. Also, the

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analogy with a product is little bit out of context. Validation is a consolidated concept in science and in applied science. Nonetheless, I find interesting to define more closely the concept of validation in the context of flood risk modelling. I suggest modifying the introduction of paragraph 2 with something closer to the focus of the paper.

P2 L28-32. I find a little bit confusing to link the concept of validation with that of uncertainty estimation. I think they are two different concepts and it is necessary to clarify better what the authors really mean.

P3 L9-22. As said before, I suggest moving this part of the paragraph 2 to the paragraph 3.

P3 L14. I find what is stated in the parenthesis ("risk cannot be observed") quite imprecise. Risk is the probability of losses. The "modelled quantity" is loss which is measurable.

P3 L15-16. The sentence is contradictory. How could exist "validated" models if they are validated by comparison with other models?

P3 L19-23. This part of the paragraph is very useful to guide the reader into the different techniques described: i) objectives, ii) data, iii) techniques and iv) new developments. I suggest adopting those fields as the columns, and the flood risk model components as the rows, of a table that provides a general overview of the state of the art of flood risk validation as described in the paragraph 3.

Paragraph 3. There are very useful references in this paragraph. However, often the techniques are just mentioned but not explained or summarized. The benefit of this literature review would be to organize, to classify and to summarize the main contributions to the topic of flood risk model validation. Also, I think other important flood risk modelling components should be included. I think, the most relevant are: 1) the estimation of the temporal and spatial correlation of the flood events, 2) the stochastic generation of (synthetic) flood events, 3) the assessment of the exposure, 4) the

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estimation of the uncertainty associated with the risk assessment.

P4 L29-33 and P6 L22-24. As in a previous comment, I found confusing to assimilate the model validation with the uncertainty estimation.

P6 L25-28. I think that the discussion on the uncertainty of the model or outputs is out of the scope of this paragraph.

P6 L28-29. I think that what is interesting here is how this type of models is validated.

P7 L2-4. I think the topic of the model transferability is out of the scope of this paragraph.

P7 L13-33. I think that the discussion on the lack of data and future research should be moved on the paragraph 4. I suggest focusing in paragraph 3 only on the review of the existing techniques.

P8 L4. I don't agree with the statement "Risk validation by comparison with observed data is impossible", see comment above P3 L14.

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