

Interactive comment on “Climate uncertainty in flood protection planning” by Beatrice Dittes et al.

Anonymous Referee #1

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General comments:

The manuscript presents a Bayesian approach to quantify the uncertainties of the flood protection levels required subject to climate change. The societal benefit of such an approach is obvious, since it helps to improve resilience against increasing flood peaks in a changing climate. The authors focus on the distinction between ‘visible’ and ‘hidden’ uncertainties. They provide an approach how to estimate and combine the two sources of uncertainty. The practical relevance is stressed by a case study. The paper demonstrates the strengths of using a Bayesian approach for the quantification of future uncertainties in peak flows. However, it is quite hard to follow the reasoning of the authors. Reordering certain sections and paragraphs may help to improve the quality of the manuscript. Also, the writing should be improved, in particular in sharpening the logical structure.

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Specific comments:

- General: It is difficult to follow the different steps and methods applied. Including an additional figure / flow chart illustrating the whole processing chain may help to understand the methods.
- Abstract: What is the goal of the paper? Is it introducing a new framework to model uncertainties in extreme discharges?
- Introduction: The authors thoroughly motivate the need for the study at hand, but they do not introduce the Bayesian decision making framework in enough detail. References and literature on quantitative Bayesian decision making should be added. Further, the choice of the method should be motivated based on a comparison with similar competing approaches.
- Section 2: Subsection 2.1 and 2.2 should be a separate section devoted to the description of the catchment considered and the data only.
- Section 2: Move Subsections 2.3 to 2.6 to Section 3 in order to gather all methods in a single section and hence improving readability.
- Section 2: Subsection 2.4 is too long and does not contain any new scientific findings. Should be shortened.
- Section 2: Subsection 2.5 How are the relative contributions of the different sources of uncertainty specified? Please clarify.
- Section 3: Subsection 3.1 contains a very general discussion comparing visible and hidden uncertainties. This should be move to the introduction Section 1.

Technical corrections:

- p1/l15: Rephrase. Maybe, a formulation like: "Therefore, planning authorities increasingly incorporate discharge projections into the assessment of future protection needs, rater..."



- p2/l12: Please put only the years into brackets, if the reference is part of the sentence. This should be corrected throughout the manuscript.

- p2/l17-23: Difficult to understand. Please clarify the framework in more detail.

- p2/l27-31: Paragraph out of sync. Either explain it in more detail here or move it to Section 3.

- p4/l11: What about rain on snow events?

- p6/l5-6: Why?

- p8/l1-6: How are the parameters estimated in this study? Is this source of uncertainty considered?

- p8/l20&29: Please provide another reference that is publicly available.

- Figure 2: Add a 2nd panel containing the same plot in absolute units in order to avoid misleading conclusions on the changes in uncertainties over time

- p10/l4&11: colons not needed

- p10/l16: viz. is a unusual abbreviation. Do you mean see/refer to? Please check this throughout the manuscript.

- p12/l9: the time index $t=1, \dots, N$ is confusing. Here it denotes future time steps, in Section 2.6 $t=1, \dots, N$ denotes historical years.

- p12/eq7: Do you mean $\Delta_{i,t} \sim N(0, \sigma_{i,t}^{(hidden)})$?

- p13/l11: “is applied”

- p16/l5: “which is common practice in the literature”

- p16/l7-9: duplicated citations

- p16/l20&21: Why? The error may be larger, but just not represented by the ensemble of climatological predictions.

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- p18/I17: "Hence, we recommend that planners make use..."
- p19/I14: Why is this expected?
- p19/I16-18: Could you elaborate a bit more on this topic, since it seems to be related to an important research question.
- p19/I19-21: Difficult to understand, please rephrase.
- p19/I24-25: Please rephrase.
- p20/I10-18: Also a bit difficult to understand, rephrasing it a bit may help.

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