

## ***Interactive comment on “Flood risk along the upper Rhine since AD 1480” by I. Himmelsbach et al.***

### **Anonymous Referee #1**

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Some general remarks about your paper

The paper is based on a strong and rich data set, and highlights interesting results concerning flood events along the upper Rhine. The trans-boundary situation of the studied area, characterized by a complex administrative context, contributes to the originality of the study and is especially significant in regard to the European Flood Directive. The transdisciplinary approach, studying both hazard and vulnerability aspects of the flood risk, also needs to be noticed as a strong point of the article. In my opinion some points have however to be developed in order to improve the quality of the paper. My principal remark relies on the main scientific objectives of the paper: these objectives should (in my opinion) figure more clearly, starting from the abstract and the introduction. Some parts of the article suffer then from a lack of connection

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between them, which contributes to reduce the organization and the coherence of your results. For instance, the link between underlying the meteorological causes and the risk management analysis should be developed and argued. The general visibility of the Figures has to be improved (use a bigger font, localize the examples on your studied area by adding a small map in a corner of the figure, use a more contrasted colour for the “natural flood plain” of the Rhine river). Some general remarks for each section

The title of the paper may be judged as too neutral and doesn't point totally out your approach. Maybe consider to change it for a more relevant one. The abstract is too short, and doesn't seem to represent all the objectives of your study. You should maybe give more details on your methodology and your results in order to incite the reader. Insist more on the originality of the studied area and of the solicited approach in a such way to promote the scientific interest of the paper. During the introduction you point out the interest of studying small catchments area but don't develop this aspect anymore in the rest of the paper, and especially in the conclusion. As in the abstract, the main purpose of the study should clearly figure and be developed within the introduction (historical analysis of floods events and relation between floods risk and vulnerability, flood risk management?).

Concerning the methodology and the data set, the paper makes reference of the several classifications schemes used in historical climatology and seems especially based on the works of Glaser. It firstly would be necessary to develop the main criteria used and show the main limits of each class. For instance, we don't know exactly the difference between the class “average damage” and the class “severous damage” without looking at the referenced articles. It would be a good idea to represent these limits inside the Table 1 (?). Secondly, the uncertainties about dealing with historical information are not mentioned. These uncertainties are yet a significant parameter to point out in order to criticize the methodology (especially for quantitative data such as return periods or economic values). For instance, comparing economic value of disasters from different temporal and spatial scales raises many questions such as the data availability

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through centuries.

The analysis of the evolution of meteorological causes triggering to floods points out some interesting points. It should however be relevant to bring some conclusions at the end of this part and link this part with the vulnerability analysis. I would be more critic about this second part of your results. In fact, you mainly compare the vulnerability face to flood taking mainly into account the inundated area and the damages and don't really take into account the land-use evolution (except for the case study of Mulhouse which is more detailed and quite clear). It would be interesting to link more the land use and flood risk management evolutions in consideration for the two first case studies. The second needs in that way to be more developed (it doesn't seem very useful in comparison with the others which are more detailed). We don't know of which part of the studied area you make reference within this part (it is the same for Fig. 15). The studied of trans-boundary aspects should me bore linked to the rest of the study. You mention many interesting points but the text should be related to the precedent points developped in the paper (Why the study of local flood risk management is interesting and influence or is influenced by the floods chronology?) Maybe the title of this part should be review and focusing more on rivers and flood risk management? You could also post section 6 before section 5, in order to explain the administrative differences between France and Germany.

Finally within the conclusions, some on the main results should be resumed and more developed in order to illustrate why this paper can be considered as an original article and is relevant for improving flood risk analysis (or depending from you initial objectives). The conclusions given are not substantial and need to be revised. Some perspectives should also appear.

Specific remarks

P178, L21-26: You give some examples about flood risk management on small catchment area in France. How is this management in Germany? P179: Maybe insist on

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the historical context of the studied area. How this historical context significant in your analysis? For instance you didn't mention that Alsace was attached to the German government for almost 50 years. I would suggest to also insisting on the originality of the studied area: a local context marked by the presence of a significant river (the Rhine) and a cross-border location. Concerning the meteorological aspects, maybe a map could illustrate the annual rainfall on the studied area in order to shed the light on the rainfall characteristics? You indicate the presence of numerous stakes inside the region: are they spread over the territory in a homogenous way? (I especially think about the little tributary of the Ill River)?

P180, L19: You wrote 15 tributaries instead of 14 mentioned on the page 179.

P180, L24: The sentence "Had as of yet" seems incorrect. I suggest "Had yet been conducted"?

P181, L1: The dash for "Flood-risk-management" seems unnecessary.

P181: The data should be more detailed as well as it limits (cf. General remarks).

P181: I disagree with your affirmation indicating that most of the floods events in France can be found before the 19th century. According to the table, it seems that there are 402 events from the 15th to the 18th and 799 events from the 19th to the 21th century right? Next sentence: does the figure 2 only points out the gauge data or is it also about written sources? (cf. remarks on methodology)

P182: It would be better to give the number of the Figure after the date of the concerned flood instead of at the beginning of the section.

P182, L15: What is the general meteorological pattern responsible for this kind of flood? I know it is located outside of the studied area but I would be interesting to notice it from the literature.

P182: End of 5.1 section, Remark: A table similar to the table 2 and including the number of floods within each group (and associated with the class of severity) would

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be interesting to create in order to go further in the analysis.

P183, L15-17: Why is it important to collect data on timing and meteorological causes? It would be necessary to affirm the aim of this information and link it to the objective of your analysis.

P184, L2: Are the changes in Fig. 7 statistically significant or simply due to sampling variability?

P185, L11: Syntax problem: A link word seems missing between “modern” and “the hydrological budget

P185: I think the term of “vulnerability analysis” has to be taken with precaution. Maybe give more examples of how useful can be your work for studying flood vulnerability? In the same order, you may mention your methodology clearly: comparing the inundated area from different floods on a same territory and analysing the damage location in order to see the changes and the possible influence of risk management policies and land use?

P186, L6: FIG. 14: You need to locate the village mentioned in the text on the map, unless we cannot verify your point.

P186, L13: “The pattern of this region has not changed very much between 1896 and 1991” seems in contradiction with you last paragraph explaining the changes. Maybe that’s an assessment to do at the beginning of the section?

P185, L20: “Established” without the “c”.

P186, L25: Spelling mistake: “an analysis”

P. 186: “After 1991” isn’t supposed to be “After 1896”? We cannot judge of the situation after 1991 from the map? What is the return period of these two events according to your analysis (I think it has to be indicated)? What are the differences on damages between these two floods?

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P186, section 5.3. As suggested on general remarks, I would suggest developing or deleting this point. The merits of this case study are not clearly shown from your comments.

FIG. 15: We don't know exactly where the area is located. You need to put another map on the left high corner in order to locate this region in you study area. We don't know which river this point is focusing on: is it still on the Dreisam River or is it one of its tributary?

P187, L1: I suggest to date the last major flood event (1924 according to the figure).

P187, L25: Maybe indicate the subject of your comparison: "flood risk management?" or "rivers management"? On" the research area instead "of" seems better.

P188: The older example of prevention cited is 1716, but the study is starting in 1480 : What was the situation before ? In a general way, how can you link this part with the first ones and with the scientific interest of your study?

P188, L22; P189, L14; P189, L24: after ":" do not start with a capital letter.

P190: Your conclusions are short. I suggest developing briefly the main results coming from your research (changes in flood chronology, evolution in vulnerability (or non-evolution)?). You need to bring some new perspectives and highlights why the Transrisk project contributed to improve the methodology on flood risk analysis. Do these results can be used for Flood Directive?

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