Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2019-253-RC2, 2019

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Changes in flood damage with global warming in the east coast of Spain" *by* Maria Cortès et al.

Anonymous Referee #2

Received and published: 10 October 2019

The paper presents an analysis of the expected change of flood damages under future climate scenarios for two regions on the North-East of the Iberian Peninsula. The authors present a model to estimate the probability of occurrence of damaging events based on daily precipitation and population. The model is calibrated for observed events in the two regions and then it is used to estimate changes in the probability of occurrence of damaging events with a global warming of 1.5, 2 and 3 °C and population estimates consistent with SSPs. The topic is relevant because the scientific community is currently addressing flood risk changes under climate change incorporating exposure. In my opinion, the main contributions of the paper are the application of the Generalized Linear Model to obtain the probability of a damaging event and the set of results obtained for the two regions under different scenarios. I also found

interesting the discussion on the role of explanatory variables (precipitation and population) on determining the flood risk. These results are relevant for scientists working on climate risks and the methodology can be extended to other domains.

Overall, the manuscript is correctly organized and well written, adequately illustrated with figures and tables. The topic fits well within the scope of Natural Hazards and Earth System Sciences, the objectives are clear and well identified and the conclusions are adequately supported by the results and discussion. Therefore, I think the paper deserves publication in NHESS. I am just offering a few suggestions for minor revisions that could improve the manuscript with a little further work.

In my opinion the presentation of the formulation and validation of the GLM model could be improved with some additional explanations. I found the problem formulation a bit confusing. The authors mention "the probability of large damaging events occurring given a certain precipitation amount". The "large damaging event" is related to a certain quantile of the sample of insurance compensations. I understood that the "certain precipitation amount" is 40 mm in 24 h. Therefore, the model estimates the probability of having damages exceeding the threshold when mean precipitation exceeds 40 mm in 24 h. However, as shown in the appendix, basin populations are very different and damages should be evaluated according to the population. How do you account for the fact that basins are heterogeneous in size and have different population densities? Do you assume that the entire basin population is affected by the flood? The second question is related to model validation through the ROC diagram. I got the impression that the same sample was used for model fitting and for model validation. Could the authors please clarify this point? The third question is related to model application in climate scenarios. The results shown correspond to changes in the probability of damaging events. How are those changes computed? The GLM produces the probability of having a "damaging" event, given a precipitation amount P and a basin population R. Therefore, it produces one probability per event. Since the number and nature of events are different in the control and in the future periods, how are the changes in

probability computed using the GLM? I would appreciate if the authors could elaborate on this, since the Methodology section ends abruptly after the presentation of precipitation and population projections.

Regarding the climate projections, the authors mention that they selected 30-year periods of EURO-CORDEX simulations starting from the year when the 20-year running mean exceeds the temperature thresholds. These periods are shown on Table 1. However, the SSP population projections are time dependent, but not temperature dependent. Where the analyses made with a different population for each model? Is this a methodological inconsistency? Could the authors provide a brief discussion on this?

Regarding data, the authors mention several data sources to identify flood events in the two regions (INUNGAMA, PRESSGAMA and FLOODHYMEX). They seem to use the events identified in these datasets to obtain the damage data provided by the Insurance Compensation Consortium, with a continuous record 1996-2015. Did you check if there are events with relevant damage data in the ICC dataset not included in the other data sources?

Apart from the above points, there are a few practical details that could improve the paper:

Pag 3, line 14, “summarises”. . should be “summarise”? Pag 13, lines 2-3, “which was affected by 69 flood events between 1996 and 2015, resulting in 171 flood cases”. .Which is the difference between a “flood event” and a “flood case”? Pag 16, line 15, “showed”. . . should be “shown”? Pag 22, line 17, “capture”. . . should be “captured”? Pag 26, Basin 130 is missing from the list in Table A2.

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