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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.

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GENERAL COMMENTS:

In this article the authors carry out an assessment of the probability of future damaging events in two Western Mediterranean regions in Spain, considering both climate change and changes in exposure according to different socioeconomic scenarios. Although the results show a promising methodology for predicting flood damage, several suggestions should take into account before the work will be publish.

A)

1. Introduction.



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“In Spain, the findings of Barredo et al. (2012) align with these results; they find no significant trend in adjusted insured flood losses between 1971 and 2008. These studies show the need to include exposure and vulnerability changes in future risk projections, which clearly contribute substantially to changing risks.”

I think that relevance given to social variables (exposure and vulnerability) in this work is very correct. In recent years, they have acquired as much or more importance than the physical ones within the risk formula. However, from my point of view, according to the results and the significance of these social variables in the models obtained, these social variables should be better explained. Therefore, I would like to see a paragraph in the introduction of the new version of the work that deepens in this regard. Some bibliographical references such as the following could be useful:

López-Martínez, F.; Gil-Guirado, S. y Pérez-Morales, A. (2017). ÂńWho can you trust? Implications of institutional vulnerability in flood exposure along the Spanish Mediterranean coastÂż. Environmental Science & Policy, 76, 29-39. 10.1016/j.envsci.2017.06.004

Pérez-Morales, A., Gil-Guirado, S., and Olcina-Cantos, J., 2018. Housing bubbles and the increase of flood exposure. Failures in flood risk management on the Spanish south-eastern coast (1975–2013). Journal of Flood Risk Management, 11 (S1), S302–S313. 10.1111/jfr3.2018.11.issue-S1

Raschky, P.A., 2008. Institutions and the losses from natural disasters. Nat. Hazards Earth Syst. Sci. 8 (4), 627–634. http://dx.doi.org/10.5194/nhess-8-627-2008.

Fekete, A. Int J Disaster Risk Sci (2019) 10: 220. https://doi.org/10.1007/s13753-019-0213-1

B)

4. Limitations and future research.

“Future research should focus on incorporating further variables into the model to re-

produce the complexity of flood risk. flood damage caused by other types of flood events, such as those caused by heavy precipitation episodes (surface water floods), and also taking into account the changes in the population in the analysis”

On the other hand, I suggest to the authors that, for the improvement of the models in future works, take into account those variables more related to building. Cadastre offers high-resolution temporal space data very useful in this regard. Although variables such as the number of inhabitants, population density per square kilometer, etc. can be significant, they are frankly improvable due to their level of temporal space aggregation. This implies an important generalization that does not correctly represent the exposure, much less vulnerability. In the case of flooding hazard, cadastre and the variable "number of buildings per census tract" of the INE are much more precise. In fact, Cadastre is much more related to the database of damages registered by the insurance consortium, since these indemnities are associated with insurance policies connected to buildings or homes with cadastral references.

C)

2.2 Data. Line 21. “The population data corresponds to the year when the flood event took place”.

According to this, the availability and source consulted year by year must be indicated. Municipal Register of inhabitants or Population Census.

D)

2.3.1 Generalized Linear Mixed Model.

As far as my knowledge on the subject goes, it would be convenient to carry out a spatial autocorrelation test (Moran’s I) to rule out the assumptions discussed in the text of the paper. Likewise, it would be convenient to compare the accuracy of the results with other models such as Geographically Weighted Logistic Regression (LGWR) since, as indicated in the work, there is very strong spatial autocorrelation that could reduce the

accuracy of the results.

The LGWR models are effective to solve spatial autocorrelation and non-stationarity, or regional variation, of some variables. Thus, the results of the GLMM models could be improved since it is possible to differentiate the local spatial variations of the parameters estimated by means of the implementation of a kernel function, that allows to make estimations adjusted to each observation giving greater influence on the closer observations.

E)

3.2.3 Future probability of damaging events. Regional rivalry (SSP3)

Population scenarios and, specifically SSP3, which represents a decrease in damage should be explained in greater detail by relating the comment within the context of the study area. In fact, this aspect is crucial, since it is a good find from which to establish these adaptation measures or strategies to climate change impacts.

SPECIFIC ASPECTS:

A) Figure 2. Map of both regions of study (put white lines of the provinces)

B) “The solid line indicates the best estimate while the shaded blue bands indicate the 95 % confidence interval”. This phrase is repeated both in the body text and in the figures caption. Consider removing from the body text.

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