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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Understanding epistemic uncertainty in large-scale coastal flood risk assessment for present and future climates" *by* Michalis I. Vousdoukas et al.

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The manuscripts quantifies different types of epistemic uncertainties and the effects they can have on the results from broad-scale flood risk assessments. Here, the authors focus on two case studies, one relatively small (which I wouldn't necessarily refer to as "large-scale") and the other one much larger, covering the Iberian coast. Uncertainties are assessed for most of the key variables involved in flood risk assessments. I find the manuscript really interesting and well written. The analysis is technically sound using the latest data sets and the conclusions are supported by the results. I only have some minor comments which I would like to see addressed in a revised version. Au-

thors: we would like to thank the reviewer for his positive feedback and the constructive comments, which we did our best to address. In our opinion none of our case studies are really 'large-scale', but they serve for validation and sensitivity analysis of a methodology applied at continental and global scale.

1-26 and elsewhere: check order of references

Authors: All references are imported using reference manager software using the journal's template which means that they should be included properly. In case this is not true we will correct accordingly.

2-14 Was there a specific reason for using 25 km?

Authors: The decision to do the analysis in 25 km was considered as a good compromise, as it allows for (i) acceptable calculation times for the flood simulations (which increase exponentially with the size of the domain; especially when the model Lisflood is used (Vousdoukas et al., 2018;Vousdoukas et al., 2016)) and sufficient resolution in the impact results for large scale standards (considering that previous global analyses are at 100 m). It is also important to highlight that the principal analysis takes place at 100 m.

2-25 I didn't understand the reference to "ten years into the present century" in the context of the sentence.

Authors: We added 'every' before the sentence and we hope it now reads better.

4-13 This approach seems a bit outdated and could be removed without losing any relevant information.

Authors: Following both reviewers' suggestions we have excluded Snh from the revision.

5-23 It wasn't clear to me what kind of tidal signal is used here and where it comes from. Is the tide level assumed constant throughout an event?

Authors: This comment is relevant to comment 4 from reviewer 1 and we hope it has been made clear in the revision.

6-7 I am wondering what the predominant type of protection is in the study areas and whether or not it could make sense to actually try and calculate runup (e.g. with the Stockdon formula) for places where dunes are the primary defense and where erosion (and possibly breaches) are initiated with overtopping. I am not saying the authors need to change their approach, but interested to hear their thoughts on this.

Authors: The issue of considering run up is recurring in most of our papers and has also been discussed in some of them. The use of the generic approximation for wave setup comes as an inevitable simplification given the absence of data on the beach face slope needed to estimate wave runup. In terms of hydrodynamics we have all the data required to apply a more elaborate method, and the leading author has substantial experience on swash zone processes(Vousdoukas, 2014;Vousdoukas et al., 2014;Vousdoukas et al., 2013;Almeida et al., 2012;Vousdoukas et al., 2012a;Vousdoukas, 2012;Schimmels et al., 2012;Vousdoukas et al., 2012b;Vousdoukas et al., 2012c;Vousdoukas et al., 2011;Vousdoukas et al., 2009), however essential topographic data are missing. In the absence of the latter we have applied the generic approximation for wave setup as we also find that it is more compatible with the current state of the art in flood and risk assessments. Most studies apply the static inundation approach which anyway overestimates flood extents(Vousdoukas et al., 2016). The wave runup height is not persistent during an extreme event and its use would result in further overestimation. Even in studies which apply hydrological models for coastal inundation(Ramirez et al., 2016), the time steps of the simulations are not small enough to resolve wave oscillations and wave runup would be an overprediction of the forcing water level. For that reason wave setup, being a slower, more persistent episodic elevation of the sea level than wave runup, was chosen.

7-1 I think this needs a reference.

Authors: References have been added.

10-10 “in large-scale: : :”

Authors: The text has been corrected accordingly.

12-14/15 This sentence needs rewording, I didn’t understand what it is telling me.

Authors: The reviewer is right and the text has been corrected accordingly.

Fig 3 Not all curves are visible in each panels, do they overlap? Maybe consider using dashed lines for some of them.

Authors: In line also with comment 7 from reviewer 1 we have added dashed lines.

Fig A1 Needs numbers on the x-axis.

Authors: In line also with comment 7 from reviewer 1 we have tick labels in Fig A1.
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