

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2
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Comment on nhess-2021-271

Anonymous Referee #2

Referee comment on "Partitioning the contributions of dependent offshore forcing conditions in the probabilistic assessment of future coastal flooding" by Jeremy Rohmer et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-271-RC2>, 2022

The paper "Partitioning the uncertainty contributions of dependent offshore forcing conditions in the probabilistic assessment of future coastal flooding at a macrotidal site" by Rohmer et al. presents an analysis of future flooding probability at Gâvres (France).

Lot of work have been put in the paper, which introduces several results that are exhaustively explained and discussed (perhaps even too much! see below). The research topic matches well the scope of the journal and the analysis presented seem to be correct. However, there some flaws that make the manuscript hard to follow and some aspect must be clarified. Therefore, I believe that the paper should undergo a major revision before it is accepted for publication. See below for a list of comments:

- The abstract is too long. If I remember correctly, NHES recommends that it does not exceed 200 words. Perhaps you could shorten the paragraph starting at line 16; in fact, there is no need to provide so many details on the SLR contribution, given that you also introduce other variables further on the paper. Analogously, you could shorten the title (which is also rather long), removing information that are given in the text, e.g., the terms "uncertainty", "dependent", "at a macrotidal site" could be left off (but this is just a suggestion)
- Why did you not account for river discharge? Isn't it relevant? You should at least provide some information on the mean discharge and explain why it is not considered in the analysis.
- I believe that Sect. 2 and 3 should be reorganized, as right now it is hard to understand what has been done. The data should be introduced in a dedicated section, introducing the study area and describing the hindcast, current sea level, projected sea levels. Next, the workflow should be detailed in a separated "Method" section, presenting first the hydrodynamic model and its validation (at least introduce appropriate references); next, the GP Metamodel should be described along with the selection of the events used to validate it against the hydrodynamic model. Then you can introduce the steps

needed to force the validated GP Metamodel and analyze the results, that is Sect. 3.2 and 3.4. Finally, you could wrap up the section with a summary merged with what is now Sect. 3.5. Please make sure that all the different bootstraps are clearly explained in the Methods section, i.e., the N realizations of the forcing conditions, the B repetitions to compute the Shapley effects, the 20 repetitions to mimic the variability of waves. In the current form of the paper, it is quite hard to understand the methodology.

- Please fix the legend in Fig. 3. Lines of the 90% CI should be dashed if I understand correctly. Also, in panel a) it seems that the upper bound lies outside of the realization ensemble (it cannot be).
- Are you sure the offshore variables are dependent? In other words, is there the need to use a different equation rather than Eq. 5? Looking at the scatter plots of Fig. 4 I cannot appreciate any significant correlation pattern. Please provide some measure of the dependence between the time-series of different forcing.
- It is unclear to me why and how SWL and SLR contributions are split. Please clarify how you group the contributions of water levels between the two effects in the Methods section.
- Fourteen plots are a lot, make sure the total size does not exceed the journal recommendations while guaranteeing appropriate resolution of the figures. For example you could put Figures 9, 10, 12, 14 in the Supplement and summarize the related results in a single section. This way results would be more directly interpreted and their importance would be better framed.
- Please review the English grammar. I am not a native speaker but I found quite a few typos here and there.