Manuscript: **Assessing potential storm tide inundation hazard under climate change: a case study of Southeast China coast** by Bingchuan Nie et al

NHESS – 2019 -284

December 2019

Authors present a methodology for delineating storm induced inundation including the role of Tropical Cyclone Intensification and Sea-Level-Rise. The methodology is then applied to assess the effects of TCI and SLR on storm-induced inundation in the SE China coast. The topic is in line with one of the main targets of NHESS and, in this sense, it could be of interest for NHESS's readers. However, the manuscript present some points that need further development before being published.

In what follows, some observations/comments/suggestions are given.

[C-1] According to the authors, the main aim of the manuscript is to present a methodology to account for the role of TCI and SLR on storm-induced inundation. This methodology will also consider the role of waves on inundation. After reading the manuscript is not clear which is the originality or innovation of the work. Authors apply a standard approach where they use a widely employed hydrodynamic model suite and just modify forcing/boundary conditions. Then, they apply the methodology to a specific site for 1 reference scenario + 3 modified ones. Thus, in reality, the main contribution of the paper seems to be assessing the changes in storm-induced inundation in a specific site under different scenarios. However, if this is the real objective of the paper, selected scenarios need to be better defined/selected or justified and the analysis must be deeper covered.

[C-2] Methodology

This section must be improved. Although the main objective is to present and apply the methodology, the half of the section (from lines 80 to 90) is not giving any details about methodology but providing some general text. The rest of the text is just giving a brief outline overview on some used tools/models. At its present form, this section can be fully removed without affecting the manuscript. The best option should be rewriting this section by putting emphasis on describing the general methodological framework (e.g. to describe steps in figure 1) and how to apply it. For instance, authors select as a base case scenario conditions recorded during a TC and then, they propose some scenarios. It is VERY important to properly describe how to build future scenarios to cope with time variation in TCI and SLR. At present this info is partially (insufficiently) covered in section 4, but needs to be included here. All these steps need to be well justified and well described and, since this is an IMPORTANT part of the analysis (scenario selection), this section is the best place to describe how to do it.

[C-3] Hydrodynamic surge-tide-wave coupled model

This section is superfluous. Since authors do not modify the model and the model is widely used and very well-known and referenced, it would be enough to mention it with proper referencing. The most important part is how to select conditions to be simulated and, details on model setting (grid, boundary conditions, etc.). All this info could be integrated within section 2 (Methodology).

[C-4] Case study

4.2 The first part of this section needs to be better described and included in methodology (section 2). You mention that you have segmented time series in 50-years long time series which are fitted to an extreme distribution (Weibull). Why Weibull? Is this the best distribution? How can you justify it (r^2-values)? Once you have fitted all time series, what to do next (step 3)? Are you doing trend-analysis on fitted parameters to see time evolution of distribution's parameters? If yes, please be explicit. The text does not clearly describe this step.

4.3 Why did you select a specific TC to do the analysis. Conditions for this TC does not seems to be really strong since recorded wind speed (60 m/s) are weaker than the wind speed associated with a return period of 20 year (figure 3). Please comment about this.

The selection of SLR scenario is just an extrapolation of recorded local conditions. This is a very simple approach and it need to be better justified. It has to be considered that using this approach is not accounting for any possible acceleration in SLR and, in this sense, it has not too much meaning to compare with IPCC scenarios as authors do in lines 190-193. In any case the ideal situation will be to add to local SLR the expected changes due to CC which would result in rates larger than the used by authors.

Considering the previous comments, scenarios used by authors need to be reformulated or much better justified. It should be great if authors dedicate a larger effort to this task. They need to consider that since no significant novelty in methodology is provided, the best contribution they can do is to perform a solid assessment. Otherwise it would be an academic exercise without too much practical interest.

4.4 Results presented in Fig 5 could be much better compared if you use the same scale for all figures. Also, which is the relevance of representing water level at the sea, especially when you are also plotting the component associated to astronomical tide? If you mention that one of the advantages of your approach is accounting for the wave contribution, why do not show wave heights? They will be modulated by water level and, thus, you can assess how the hazard component associated to waves does change from one scenario to other one.

It has not too much meaning to compare different scenarios at different tide conditions unless you want to specifically assess the role of the astronomical tide. If you want to assess the contribution of TCI and SLR you just need to concentrate in compare any scenario under the same tide condition. Please, simplify.

Are water levels represented in Figure 7 also including the wave contribution (run up)? If so, which is the difference in this contribution between scenarios? Thus, you can account which is the contribution of each component (TCI, SLR, waves to differences in total water level)? Why don't you include all graphs within a single figure (it should be the best way to compare them)?

4.5 Results showed in this section are only relevant if tested scenarios are relevant/representative.

[C-5] Conclusions

This section needs to be modified after implementing previous recommended changes.

Figure 10 is not needed.