Natural Hazards and Earth System Sciences Discussions

Nat. Hazards Earth Syst. Sci. Discuss., author comment AC2
https://doi.org/10.5194/nhess-2021-308-AC2, 2021

Reply on RC2

Qing Liu et al.

Author comment on "Assessing tropical cyclone compound flood risk using hydrodynamic modelling: a case study in Haikou City, China" by Qing Liu et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-308-AC2, 2021

This paper presents a study on compound flooding in coastal regions. Using Haikou as a case study area, the authors couple a storm surge model and overland flooding model based on Delft3D Flexible Mesh model to investigate the compound effect of tropical cyclone flood hazards. It is an interesting and well-written paper. This paper is on a topic of interest to the audience of NHESS. The modeling and analysis methods are scientifically sound. The results provide helpful insights about coastal compound floods. I only have a few minor comments that I hope the authors could address in their revision:

Specific comments:

- It would be helpful to have a figure showing location of tide and rainfall gauges in the bigger graph of figure 1. I am not very familiar with the geography of the region and I suspect many readers may not be either.

We have modified the figure to show the location of tide and rainfall gauges in the paper.

- Section “TCs influencing Haikou” on lines 212-215: The TCs that pass through the region (18-22°N, 109-113°E) and stay over 24 hours have an apparent effect on Haikou. Therefore, 66 TCs from 1960 to 2017 are selected in this study (Figure 2), …. I suggest that the authors explain clearly about the selection criteria.

Thanks for the suggestions. We included more details on this in the revision:

Line 214: The TCs that pass through the region (18-22°N, 109-113°E) and stay over 24 hours have an apparent effect on Haikou (Ding, 1999; Wang, 1998; He, 1988). According to this, we analyze historical TC tracks and give the priority to the TC that passing between latitudes 18°N and 22°N and longitudes 109°E and 113°E. TC tracks lasting less than 24 hours in this region are removed in this study. Therefore, 66 TCs from 1960 to 2017 are selected in this study (Figure 2), and we construct typhoon wind fields and

simulate the storm tide of these TCs. Each TC event has a code, for example, the ninth typhoon in 1963 is coded as TC6309.

- It would be interesting to see the impact of climate change on compound flood. The authors may add some discussion related to this topic.

Thanks for the suggestions. We discussed more about the impact of climate change on compound flood.

Line 388: For future research on extreme TC compound flooding, climate change factors should be taken into consideration, such as sea level rise and land subsidence, and copula function can be applied to study the statistical dependence between heavy rainfall and strong storm surge under the changing environment to reveal extreme flood risk in coastal cities.

- This paper conducts a probability distribution of storm tide, while doesn't consider the rainfall probability distribution. I think it is one of limitations in this study, the authors should give some additions about this limitation in the conclusion part.

Thanks for the suggestions. We have included this in the paper as follows:

Line 380: In this study, we selected the typical TC scenarios based on storm tide probability distribution. The high storm tide has been confirmed to be the main driving factor of flooding in previous studies (Xu et al., 2019, 2018; Lian et al., 2017). Considering that rainfall is also the driving factor of TC compound flooding, we will focus on the joint probability distribution of rainfall and storm tide in future research.

References:

Xu, H., Xu, K., Lian, J., et al.: Compound effects of rainfall and storm tides on coastal flooding risk. Stoch. Environ. Res. Risk Assess, 33, 1249–1261, https://doi.org/10.1007/s00477-019-01695-x, 2019.

Xu, H., Xu, K., Bin, L., et al.: Joint Risk of Rainfall and Storm Surges during Typhoons in a Coastal City of Haidian Island, China. Int. J. Environ. Res. Public. Health, 15, 1377, https://doi.org/10.3390/ijerph15071377, 2018.

Lian, J., Xu, H., Xu, K., et al.: Optimal management of the flooding risk caused by the joint occurrence of extreme rainfall and high tide level in a coastal city. Nat. Hazards, 89, 183–200, https://doi.org/10.1007/s11069-017-2958-4, 2017.