

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2
<https://doi.org/10.5194/nhess-2021-181-RC2>, 2021
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Comment on nhess-2021-181

Anonymous Referee #2

Referee comment on "Generating reliable estimates of tropical-cyclone-induced coastal hazards along the Bay of Bengal for current and future climates using synthetic tracks" by Tim Willem Bart Leijnse et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-181-RC2>, 2021

Literature reviews are not enough:

For STC, Nakajo et al. (2014) is preferable.

Nakajo, S., N. Mori, T. Yasuda and H. Mase (2014) Global stochastic tropical cyclone model based on principal component analysis with cluster analysis, *Journal of Applied Meteorology and Climatology*, American Meteorological Society, Vol.53, pp.1547-1577.

For the second-order hazard due to TC, the paper should include recent studies using datasets of a STC model and climate change experiments, for example, the following references:

Yasuda, T., S. Nakajo, S. Kim, H. Mase, N. Mori and K. Horsburgh (2014) Evaluation of Future Storm Surge Risk in East Asia based on State-of-the-art Climate Change Projection, *Coastal Engineering*, Volume 83, January 2014, Pages 65–71

Mori, N. and T. Takemi (2016) Impact assessment of coastal hazards due to future

changes of tropical cyclones in the North Pacific Ocean, *Weather and Climate Extremes* (review paper), Vol.11, pp.53-69. doi: 10.1016/j.wace.2015.09.002

Mori, N., M. Kjerland, S. Nakajo, Y. Shibutani and T. Shimura (2016) Impact assessment of climate change on coastal hazards in Japan (review paper), *Hydrological Research Letters*, Vol.10(3), pp.101-105. doi: 10.3178/hrl.10.101

Yang, J.A, S.Y. Kim, N. Mori, H. Mase (2018) Assessment of long-term impact of storm surges around the Korean Peninsula based on a large ensemble of climate projections, *Coastal Engineering*, Elsevier, Vol.142, pp.1-8. doi.org/10.1016/j.coastaleng.2018.09.008

Mori, N., T. Shimura, K. Yoshida, R. Mizuta, Y. Okada, M. Fujita, T. Temur Khujanazarov, E. Nakakita (2019) Future changes in extreme storm surges based on mega-ensemble projection using 60-km resolution atmospheric global circulation model, *Coastal Engineering Journal*, Taylor & Francis, 61(3), pp.295-307.

Yang, J.A, S.Y. Kim, S.Y. Son, N. Mori, H. Mase (2020) Assessment of uncertainties in projecting future changes to extreme storm surge height depending of future SST and greenhouse gas emission scenarios, *Climatic Change*, pp.1-18. <https://doi.org/10.1007/s10584-020-02782-7>

Sooyoul Kim, Jihee Oh, K.D. Suh and H. Mase (2017) Estimation of climate change impacts on storm surge: Application to Korean Peninsula, *Coastal Engineering Journal*, 59, 170004, 10.1142/S0578563417400046.

In 55, the authors mention "local design values" for wave heights. But you investigate them in the relatively deep water. What kind of "local design" is the purpose? It should be clear.

When we say a "coupled model", we mention physical processes through coupling. How did you make the coupled model physically?

When we consider waves in storm surges, we think of radiation stress in the momentum equations for storm surges. Also, we can consider wave runup/overtopping for coastal floods. Why did you consider waves / why did you use a coupled model in your study? Is any typical reason for it?

In 140, why did the authors choose POT for statistical analysis? How did you determine the threshold value for each station/location/region? Did you consider other methods, likely the annual maximum series? Why did you use a Generalized Pareto Distribution? Is it a representative in this region?

In 3.1, the authors investigate the wind speed. But I am surprised why the pressure/central pressure of TC is not studied. The driving force of the wave is absolutely the wind speed. BUT that of the storm surge is the wind speed and the pressure of TC. Therefore, the PRESSURE has to be verified for discussing the storm surge. It is the most significant lack point in this paper. Without discussing the central pressure of TC, the discussion of the future change of storm surges has no meaning.

In 275, the validation process has to include the effect of the central pressure of TC on the storm surge.

In 390, I disagree with these words because the central pressure is omitted.