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Comment on nhess-2021-94

Anonymous Referee #1

Referee comment on "Statistical estimation of spatial wave extremes for tropical cyclones from small data samples: validation of the STM-E approach using long-term synthetic cyclone data for the Caribbean Sea" by Ryota Wada et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-94-RC1>, 2021

General comments

The proposed manuscript deals with the estimation of return levels (or high quantiles) in regions affected by tropical cyclones.
The paper focuses on using a synthetic database of cyclones to validate the proposed method, developed in other papers, namely the STM-E approach.
The paper is well organized with clear motivations, sensible application of the method, and an important issue in tropical areas.

Specific issues

Near L.200, the sentence " There is no obviously no spatial dependence between the size of STM and its location" is quite unclear to me. The figure clearly shows that the locations of STM are unevenly distributed in space, in particular, the points are located on the boundary of the domain, although there is no discussion about this repartition.

Figure 6, 7,8,9: Quite difficult to read... What do the black boxplots correspond to? I think if the whole database is considered, the 500-year return level should be only one value per location, with associated CI?

There is no clear dependence of the depth here, nor is it included in the model, so maybe the authors should comment on why they include this covariate in the figures, or if it is a perspective for future work.

In the paragraph starting L290, the authors claim that they study the relationship between STM and Exposure in Figure 11, but the figure only shows two distributions for

maximal and minimal STM, maybe a more quantitative assessment with parametric models would help understanding the (absence of) relation.

The authors look at a very high quantile (500-year return level), while it is of more common practice to estimate the 100-year return level: the conclusions may be rather less clear due to the uncertainties linked to estimation of such high quantiles.

There is constant under-estimation of the return levels as seen in the figures and table 1. Is there a way to decide if it does come from the STM part of the model or the Expose part? Maybe the authors could provide keys to understanding where do the limitations come from.

Technical corrections

Figure 10: the 0 on the x-axis should be a 1,200? Again, how do you obtain de box-plot here?

Table 1 may be more clear if the number of observations is replaced by the corresponding years.