Rebuttal letter manuscript “Simulating Synthetic Tropical Cyclone Tracks for Statistically Reliable Wind and Pressure Estimations”

Dear editor, dear reviewers,

On July 31, 2020, we have submitted the following manuscript to the Journal of Natural Hazards and Earth System Sciences titled: "Simulating Synthetic Tropical Cyclone Tracks for Statistically Reliable Wind and Pressure Estimations" (MS No.: nhess-2020-250). On October 7, 2020, we were informed that the first round of open discussion was completed. We resubmitted the revised manuscript on October 29, 2020 after recieving comments by two reviewers which provided a very positive feedback on the work done and valid suggestions. On January 14, 2020, we were informed that the second round of open discussion was completed. We received a few minor comments by one reviewer and the acceptance by the second reviewer. Below you find a point-by-point reply to all specific questions and suggestions. Attached you also find the revised manuscript with the changes made to address the review comments tracked.

Kind regards,

Kees Nederhoff

Referee #1: Mentaschi, Lorenzo

General Comments:

- Comment 5: Maybe a data-driven way to consider SST could be using a joint distribution space-SST for the genesis?

We agree with Reviewer #1. A joint probability map as function of SST, could be a possible way to estimate how changes in climate, via SST, affect TC generation. We have added this to the discussion section on P25-L3.

- Comment 7: Then a further quesion arises: the SST used as an input spans over e few decades, while TCWiSE can generate TC data over thousands of years. How are the years of the input SST matched with the ones of the similation? This should be clarified in the manuscript.

In each TCWiSE application, either based on current climate or climate projections, stationarity is assume. In other words, the cyclone and SST characteristics are not expected to evolve in time. The long periods for which data are generated, for instance 1,000 years are not to be seen a forecasts for such periods but the generation of low probability events, as the 1,000-year event of the current climate. See also the discussion section P24-L20.

- Comment 10: What the authors write is clear, but IMO the differences between wind maxima, wind swath and wind maps should be clarified further inside the manuscript, as now the reader has to guess: the wind swath is used the first time at P5 L20 without introducing it, and in the label of figure 4 it is stated that "the maximum sustained wind speed is the maximum wind speed per TC and not the same as the wind field and/or wind swaths"

We understand the confusion of Reviewer #1 and therefore went over the MS and clarified the language. Please see the revised MS and for example the caption of Figure 4.

- Maximum sustainted wind speed is the intensity of the eye.
- Time and space varying surface winds refer to the time-varying 10 m level (surface) wind fields (three-dimentional wind velocities). With field being used to describe space-

varying wind velocities (two-dimentional wind velocities).These are also referred to solely as (surface) wind fields in the MS.

- Wind swaths are maxima per TC (i.e. by computing at a certain location maximum in time of the wind velocity) and can also be associated to given probabilities (e.g. wind swath with a return period of 100 years). Wind swaths are also called wind extremes in the MS.

James Done (Referee #2)

All comments by James Done were addressed in the first round of revisions.