

Ref.: <https://doi.org/10.5194/nhess-2020-74>

“A New View on Risk 1 of Typhoon Occurrence in the Western North Pacific”
by Kelvin. S. Ng1, Gregor. C. Leckebusch

This study presents and discusses a computationally inexpensive method to build a very large data set of high impact typhoon events. The availability of this data set allows improving the assessment of the risk associated with the occurrence of typhoon landfall in the Western North Pacific area. The method is based on the application of the impact-oriented tracking algorithm named WiTRACK, adapted to the tracking of Tropical Cyclones (TCs). When applied to the THORPEX Interactive Grand Global Ensemble (TIGGE) archive, the presented method allows creating a database of non-realised typhoon event-data equivalent to more than 10,000 years of TC events. The spatial and temporal characteristics of these non-realised but physically possible events are consistent to the historical typhoon climatology in the WNP, as obtained from the JRA-55 reanalysis. Furthermore, it is shown that the created data set contains up to about 100 times more very-severe and violent typhoons than the historical record and that, consequently, it allows a more reliable and less uncertain estimate of the return period–return level of TC associated extreme wind events.

General Comment

I think that the topic of this study is of great interest and relevance, and that it is suitable to NHESS. Besides, the paper is generally well written, the methodology clearly illustrated and the results well presented and discussed. However, there are also a few (minor) corrections and some improvements of the text that could be made to further improve the manuscript before to proceed with its publication.

Therefore, my recommendation is to accept the manuscript for publication after **minor revisions**.

Specific Remarks

1. Page 1, line 14: “... characteristics of the new event set is consistent to the...” should read “... characteristics of the new event set are consistent to the...”
2. Page 1, line 24: “... 67.1 billion RMB ...” Many readers could be helped to understand the economic significance of this figure by accompanying it with the corresponding value in US Dollars or Euros.
3. Page 2, line 45: “... (ii) the storms in the typhoon event set might not be physically consistent.” Please, clarify what do you exactly mean here with “physically consistent”?
4. Page 2, line 63–64: “*In this study, we show the TPEPS event set has much higher information content: more TC events and more extremely high impact TC events.*” Higher and more than what?
5. Page 4. Line 126: “*WiTRACK identifies windstorm events of all kind, including MEPS TCs, PEPS TCs, MEPS extratropical cyclones.*” I suppose it identifies also PEPS extratropical cyclones.

6. Page 4, line 175: *“The removal of these events ensures the TPEPS event set is independent of any pre-existing weather patterns.”* The goal here is to build a large set of typhoon events in order to provide a solid statistical evaluation of their characteristics, so why is it so important that the considered TPEPS events are independent of any pre-existing weather patterns?
7. Page 6, line 193, Figure 1: please add the units to the colour bar.
8. Page 6, line 197, Table 5: Why there is such a large difference in the number of simulated TC wind storms between the TIGGE models? Is this due to the different number of ensemble members of the EPSs? The large majority of the considered TPEPS are from two EPSs: the ECMWF and the NCEP. What consequences could this fact have on the analysis results?
9. Page 6, line 202: Fig. 1d, should read Fig. 2d.
10. Page 6, line 203: Fig. 2 should read Fig. 3.
11. Page 6–7, line 212–220: I’m not sure I fully understand the explanation the authors provide for the discrepancy between the spatial distribution of the TPEPS event set and JRA-55 events as shown in Figure 2 (panels c and f). The fact that the JRA-55 event set can be considered as a subset of the TIGGE event set does not explain the difference in spatial distribution. According to this view, in fact, the JRA-55 events can be seen as randomly selected from a larger set (the TIGGE set), and thus they should also be spatially distributed as this event set. Also, why the higher level of the 98th percentile values of the JRA-55 wind should explain the lower number of typhoons in this area?
12. Page 7, line 248–249: As formulated here, this sentence seems to imply that TCs with weaker winds are also less spatially extended, which is not true.
13. Page 7, 252–255: *“... impact (Befort et al., 2020). Many of the low impact TCs ...”* should probably read *“... impact (Befort et al., 2020), many of the low impact TCs ...”*.
14. Figure 8: In the text of the manuscript, there are references to panels labelled with letters (a, b, ... f), but the panels in Figure 8 are not labelled.
15. Page 9, line 317: *“... based on minimisation of the root-mean-square-error (RMSE) of ...”*. Of what?