Review Comment

Title: Quantifying Tropical Cyclone-Generated Waves in Extreme-Value-Derived Design for Offshore Wind

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General comment

This manuscript is discussed about the estimation method of extreme wave height for mixed climate (i.e. the region that both tropical cyclone and extra-tropical cyclone occurs) using different models and concluded with recommended modeling, extreme value analysis method and the number of data years used from extreme analysis for each extra-tropical and tropical cyclone. The conclusion is generally understandable and may help to backup industry's knowledge. However, it is difficult to judge the reasonability of methodologies and conclusions mentioned by authors because there is a lot of missing information.

In conclusion, a reviewer consider that MAJOR REVISION is needed for this manuscript.

Specific comment

Clause/ Subclause	Line number	Comments
2	79-80 81-85 Figure A	Proper extreme distribution may depend on site characteristic. Although authors discussed about only differences of extreme wave height obtained from Gumbel and Weibull distribution, these result itself doesn't explain the reason that Gumbel distribution is chosen. In other words, why didn't choose Weibull. It is better to draw raw data used for fitting in Figure A.
	85-88	The authors say "block maxima method was considered suitable for this study" by referring two papers, however, the reason is not clearly mentioned. What part of these papers are referred? Need explanation.
	Figure 2	The word "Calibration", which also appear in text many time

		is ambiguous. The authors have to explain the detail methodology or procedure.
	96	Appendix B -> Appendix C
	Table 2	These wave models need not only lateral boundary conditions but also bathymetry or sea surface boundary conditions. Table 1 may be used for sea surface boundary conditions for wave models in Table 2, however, it is difficult to understand it because no explanation made here. Computational area (i.e. domain) for each model is also important information. The authors have to explain about these modeling configurations.
2.1.1	108	Is Wrenger (2022) publicly available report? If not, the authors have to explain the relevant part in the report in Annex or somewhere.
2.1.2	116	"vertically nested domain..." is correct? Horizontal nesting to perform locally high-resolution simulation is more common way to use WRF. Explanation about computational domain is needed.
	116	"real lateral boundary condition..." mentioned here may be CFSR according to Table 1. However, it is difficult to understand that. It is recommended to mention as text clearly.
	120	Is Georgas(2023) publicly available report? If not, the authors have to explain the relevant part in the report in Annex or somewhere.
	109, 123	Because 62m and 40m are shallow water region, simulated wave height by wave model is very sensitive to water depth, especially in high wave height. Also, there are geographical distances between buoy and model grid. The authors have to explain the differences between real and modelled water depth.
	129	Explanation of abbreviation OWI3G is needed.
2.1.3	131	"100 years of tropical storms and 75 years of extra-tropical storms..." Use of as long as data has aspect to improve extreme value, however, old data may have quality

		problem. The authors have to discuss about data quality issue.
2.1.4	147 or Appendix C	There is no explanation about temporal resolution about buoy observation. Also, the authors have to explain how handled or corrected differences of temporal resolutions between each model and buoy observation.
	150, 158	Unit is needed for the RMSE values.
	143, 151	The authors have to explain the real and modelled water depth. According to line 109 and 123, water depths are 62m and 40m. Because these depths are shallow, simulated wave heights by wave models are very sensitive to water depth, especially for high wave heights. Also, according to Table 2 model resolutions are 400m for NA and 600m for MA, however, grid point 29km away from buoy are used for validation. The authors have to explain the reason.
2.2	160, 161	font of "x" in formula and text are different.
2.2.1	168, 171	"exp" and "ln" should not be italic letters.
	169	"empirical estimation" is not clear explanation. The authors have to explain more detail methodology.
	172	The authors explain "annual largest value" is used distribution fit. Does tropical cyclone occur and approach to site of interest every year? If not, authors have to explain how handled annual maximum value derived by tropical cyclone for zero tropical cyclone years.
	179	"Extreme Value Theory assumes that extremes are independent variables." I could understand that what the authors want to say but this sentence may be difficult to understand for some reader. it is suggested to explain a bit detail by changing "extremes are" to other word.
	199-201, Figure 3	What we can understand from figure 3 is only that extreme distribution obtained from GF models and high-resolutions model show qualitatively close values or distributions for extra-tropical cyclone. Because both these are obtained model, nothing explains storm physics are represented or not.

	Figure 3	Drawing annual maxima used for fitting of extreme distribution in Figure 3 is suggested.
3.1.1	205	Dolan-Davis scale and Saffir-Simpson scale are probably US specific. References to explain about these scales are needed.
	210	Duplicated "the".
	212, 213, Table 1	Although the authors explain "neither model...", lack of representation of high frequency wave could be caused by frequency range of wave model. Add information about the highest frequency in Table 1.
	Figure 4a, c	Why are wave height axis normalized? In general, higher wave height more difficult to simulate. For this reasons, magnitude of wave height is very important information and recommended not to be normalized.
	Figure 4d, Figure C1d	Need explanation why SWAN + WRF shows poor Tp resolution.
3.1.2	235, 240	The authors have to explain how inside/outside of storm fetch was defined in this manuscript. Also, explanations about closest approach distance and radius of maximum wind speed of cyclones are need as general information to judge inside/outside.
	Figure 5	Y axis of Figure 5a and 5b are cut off. Also, Tp=18 on Y axis in Figure 5c is missing.
	240-244	In general, wave periods in inside of storm are dominated by wind-wave and those for outside are significantly affected by wind field both inside and outside of cyclone. Is simulation period enough long, or simulation area enough large? It is suggested that draw wind field and wave height field and add explanation about simulation period about this cyclone. These may help to understand this phenomenon.
3.1.3	253-254	Add reference height of "storm winds (90 knots, or 46 m/s)"
	255	"Wave buoy measurements occurred on a 30-minute cycle, ..." Is buoy observation available for Hurricane Bob. If so, the authors have to show comparison with observation and modeled value such as Figure 4 and Figure 6b.

3.1.4	277-278	Although the authors considered "primarily to be a function of fetch or duration representation", development of cyclone or error of track depends on model horizontal resolution of weather simulation, or wind data etc. The authors have to understand and explain only wave models are "high resolution" in this study, not for wind models, which were used for input of wave model.
	279-286	There is no explanation about what Cd model used in this study. Although the authors show wind stress values in Figure 10, these values are strongly affected by Cd models or formula, and each wave models may use different Cd model. Need explanation.
3.2	311	It is not clear that the meaning of "higher-than-average tropical cyclone activity". If it means that annual occurrence is higher than usual, I comment that it is not affect extreme wave height because the authors use only annual maxima.
	314-315	The meaning of sentence "in fact..." is not clear. Are extreme distributions in Figure 11a and 12a based on "original high-resolution data set" or "post-processed high-resolution data set"? If the result mentioned in the sentence is not shown in graph, it is better to add word "not shown in graph" in the text.
	Figure 11, Figure 12	It is suggested to draw annual maxima use for fitting of each extreme distribution to understand reasonability, trend etc. of each distribution.
4	342	"ERA5-boundary conditions" -> "ERA5 wave boundary conditions" is suggested.
	359-367	It is understood that these four are main conclusions of this study, however, 1) it is questionable that how "200km or less" in bullet 1 is quantified (e.g. cyclone has radius more then 200km exist.)? There is no detail discussion or deep insight about this. 2) bullet 2-4 are already explained in IEC 61400-1 Annex J. Although the standard is about only for wind, not mentioned for wave, the authors should at least explain and

		refer in somewhere in this manuscript, then have to explain the differences or originality of this paper.
Appendix A	373	What value are used for threshold "u"? Need explanation.
Appendix C	Figure C1	Unit for RMSE is needed. Also, definition of NRMSE is needed.
	Overall	Because the authors decided to use annual maxima for fitting of extreme value distribution, the validation should be made for annual maximum wave heights. Otherwise, readers don't understand the reasonability of all results and conclusions.

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