Comments from the reviewer are shown in black and our modifications are given in blue.

We express thanks to the reviewer for their thoughtful comments as we note in the acknowledgements.

Reviewer comments on ”Hurricane impacts in the United States East Coast offshore wind energy lease areas”

This study is one of the first to use a coupled atmosphere-ocean-wave model to study the interactions between hurricanes and offshore wind turbines. I think this is very relevant as the deployment region is often subject to hurricanes. The research questions are very clear and are addressed by the results. However, I think the structure of the results section could be improved. In addition, the inclusion of a more recent roughness length parameterization of the wind wave alignment could strengthen the study's alignment with the stated research objectives.

Major comments:

One of the main objectives of this paper is to identify high wind wave misalgnments, which is essential for understanding structural loading. Therefore, I propose to use a wind-wave aware roughness length parameterization for a more accurate representation of this process. For example, Fu et al. (2023) show that including such a parameterization improves wind estimates, which I assume is important for this study. An alternative could be the parameterization presented by Porchetta et al. (2019), which has also shown improved hub height wind speeds compared to older schemes. Integrating either of these would likely increase the relevance and impact of the current work.

Fu, S., Huang, W., Luo, J., Yang, Z., Fu, H., Luo, Y., and Wang, B. (2023) Deep leaning-based sea surface roughness parameterization scheme improves sea surface wind forecast. Geophysical Research Letters, 50(24), e2023GL106580. https://doi.org/10.1029/2023GL106580

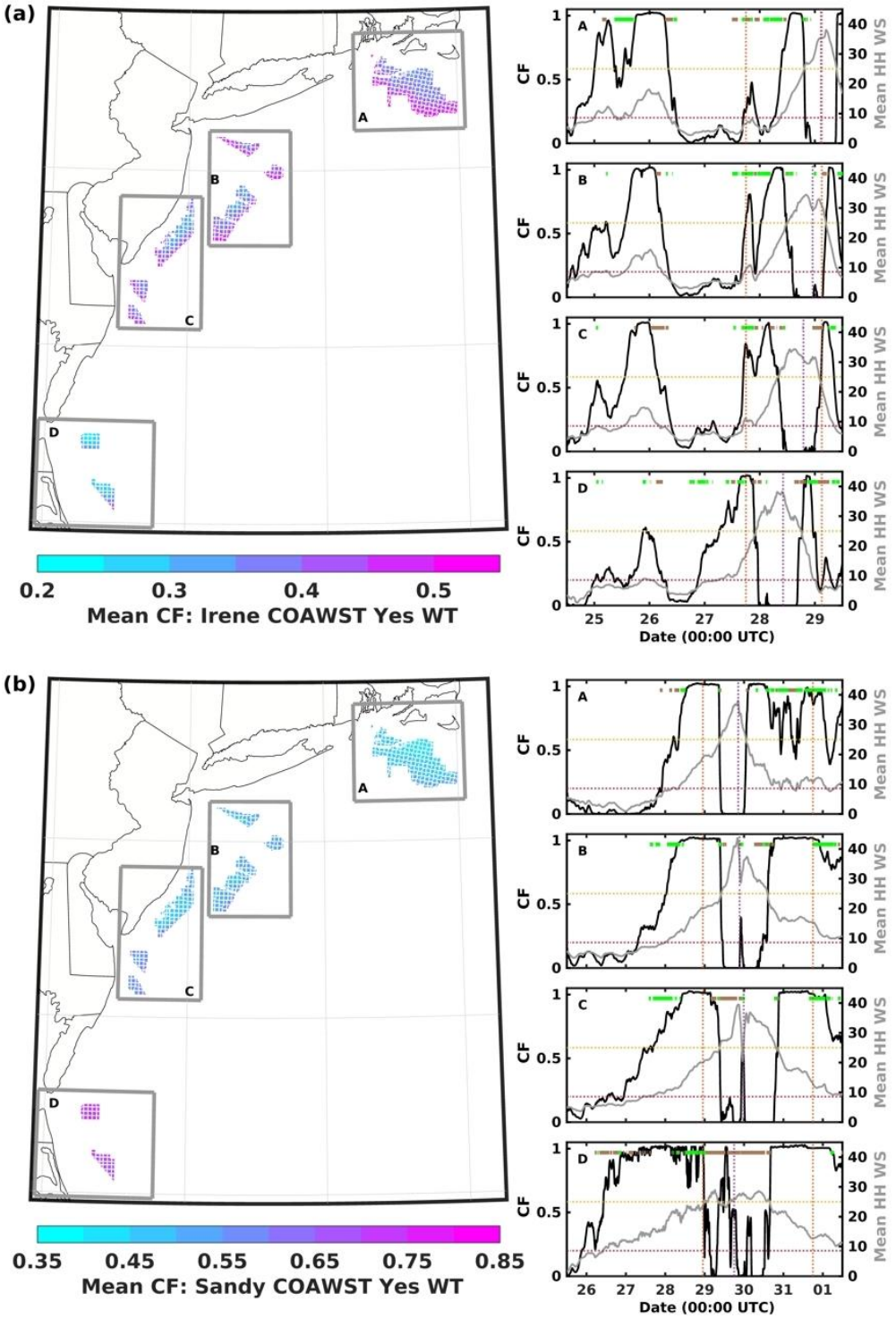
Porchetta, S., Temel, O., Munoz-Esparza, D., Reuder, J., Monbaliu, J., van Beeck, J. and van Lipzig, N. (2019) A new roughness length parameterization accounting for wind-wave (mis)alignment. Atmospheric Chemistry and Physics, 19(10), 6681–6700. https://doi.org/10.5194/acp-19-6681-2019

Naturally there is a need for further exploration of alternative model configurations, including alternative roughness length parameterizations. Such a comprehensive analysis is beyond the scope of this work but would be extremely valuable. We explicitly note this in the conclusions sections where we write: “Undertaking comparable simulations of additional extreme cyclones and simulations with different configurations including alternative z_0 parameterizations (Porchetta et al., 2019; Fu et al., 2023) and a wave boundary layer model within SWAN (Du et al., 2017) would also be useful in determining if findings presented herein are generalizable and to quantify the degree to which the meteorological and oceanic extreme conditions vary according to the precise model formulation.”

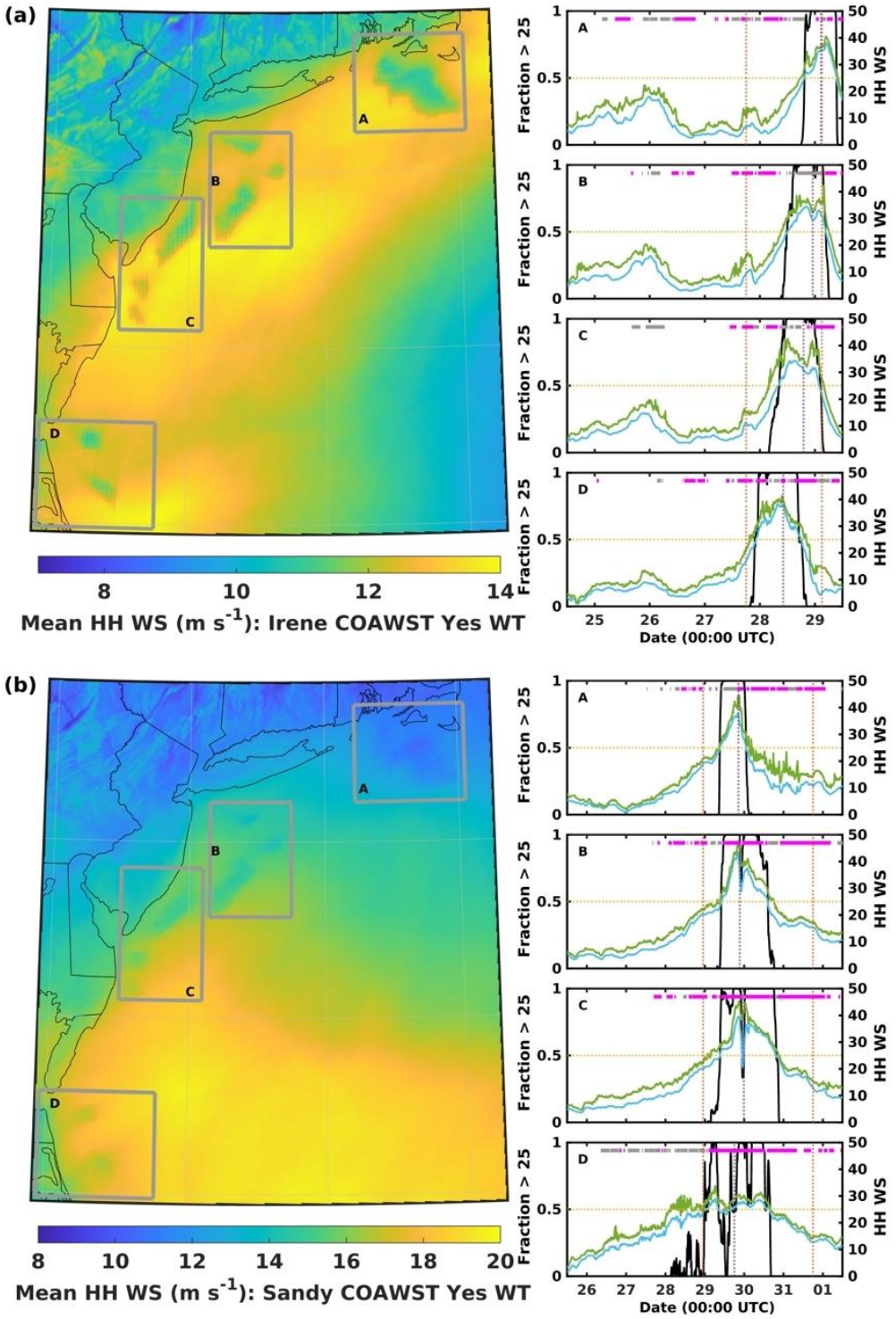
It may be helpful to separate the results and discussion sections, as the current layout makes it difficult to follow. I also recommend improving the structure within the results section. It currently includes comparisons between two hurricanes, multiple models (WRF (WFP), COAWST (WFP)), and different parameters, which makes it dense and sometimes inconsistent. Consider focusing on the main results and moving supporting but non-essential material to the appendix. I also suggest rethinking the figures and their layout - while the content is valuable, the presentation makes it hard to digest. Emphasizing the differences between model results or including bias/RMSE metrics may improve clarity.

We regret that the results section is difficult to follow. Section 3 "Results" has been renamed "Results and discussion". The section is structured to address the three numbered objectives from section 1.2 in order, and chronologically (i.e., Irene then Sandy) within each of the objectives. Subsection names and numbers have been modified to make the order clearer: 3.1 Evaluation of simulations without the action of wind turbines, 3.1.1 Hurricane Irene, 3.1.2 Hurricane Sandy, 3.1.3 Synthesis, 3.2 Wind turbine power production and operating conditions, 3.2.1 Hurricane Irene, 3.2.2 Hurricane Sandy, and 3.3 Wind turbine impacts on hurricane properties. By including discussion points within the results, we hope to address comparisons to previous studies, highlight important features, etc., as soon as they relate to the results as opposed to including duplicate text from the results in a separate section prior to the inclusion of discussion points.

Figure 1 has been separated into two separate figures. See "Figure 1:" below for additional details. Figures 3, 6, and 7 (now 4, 7, and 8) now only show two of the four panels – those for COAWST. For CF (Fig. 7), the time series plots show the respective COAWST values, and now also highlight when the WRF CF exceeds the corresponding COAWST CF by > 0.05 in brown and when the COAWST CF exceeds the corresponding WRF CF by > 0.05 in green. For HH WS (Fig. 8), the time series plots show the respective COAWST values, and now also highlight when the WRF HH WS exceeds the corresponding COAWST HH WS by > 0.5 m s^{-1} in gray and when the COAWST HH WS exceeds the corresponding WRF HH WS by > 0.5 m s^{-1} in magenta. Four panel plots with both WRF and COAWST are now located in Supplemental Materials. Please see Figs. 7 and 8 below.



Modified Figure 7



Modified Figure 8

Minor comments:

Line 10: Please specify what is meant by "high resolution" in this context.

We have reworded this paragraph to read: “Four sets of high-resolution simulations are performed for two category 3 tropical cyclones that tracked close to current offshore wind energy lease areas to assess the possible impacts on, and from, wind turbines. Simulations of Hurricanes Irene and Sandy are performed at convective permitting resolution (grid spacing in inner domain of 1.33 km) with both the Weather Research and Forecasting model (WRF, v4.2.2) and the Coupled Ocean-Atmosphere-Wave-Sediment Transport (COAWST, v3.7) model to characterize geophysical conditions of relevance to offshore wind turbines.”

Line 13: Could you add the version numbers of the models used?

The sentence has changed as noted above

Figure 1: The figure is hard to interpret. The plots do not speak for themselves - please clarify what is being shown (e.g. sum or difference of precipitation) and make it more readable without relying solely on the caption.

Figure 1 has been separated into two figures. The new Figure 1 includes the hurricane tracks and the new Figure 3 includes panels containing precipitation. With Figure 3, the colorbar descriptions are now “Accumulated Precip (mm): IMERG”, “Precip (mm): WRF No WT Minus IMERG”, and “Precip (mm): COAWST No WT Minus IMERG”.

Line 110: Could you explain why the wave boundary layer model was not used in your setup?

There are indeed many options and we stuck with formulations close to those that had been previously used but have noted in the conclusions; “Undertaking comparable simulations of additional extreme cyclones and simulations with different configurations including alternative z_0 parameterizations (Porchetta et al., 2019; Fu et al., 2023) and a wave boundary layer model within SWAN (Du et al., 2017) would also be useful in determining if findings presented herein are generalizable and to quantify the degree to which the meteorological and oceanic extreme conditions vary according to the precise model formulation.”

Table 2: Consider removing this table if it is not essential to the main results.

Table 2 has been moved to Supplemental Materials (Table S2).

The following sentences have been modified and added to the first paragraph of Section 2.2: “At this coupling interval, a number of variables that are critical to air-sea coupling and lower atmosphere structure and/or WT design standards are exchanged between the model components

(Fig. 2b, Fig. S3, and Table S2). The selection of these variables is based on previous research (Warner et al., 2010; Zambon et al., 2014b) and include sea surface temperature (SST) that is passed from ROMS to WRF, 10 m u- and v-wind components which are passed from WRF to SWAN, plus Hs and Tp (period or peak energy in the wave spectrum) that are passed from SWAN to WRF and ROMS."

Line 240: It may be worthwhile to briefly mention the limitations or uncertainties of the evaluation data sets used.

The following has been added to the end of Section 2.3 Evaluation data sets:
"These data sets do have some inherent constraints, which include use of; subjective smoothing to produce representative 6 h best track data which does not necessarily equate to a precise storm history (Landsea and Franklin, 2013), spatial averaging on the gridded IMERG data which can underestimate high precipitation rates compared to point measurements (Hu and Franzke, 2020; Nie and Sun, 2020; Huffman et al., 2024), and the limited number and spatial coverage of buoys (NDBC, 2009)."

Line 255: What is meant by "3x3 smoothing"? Please clarify.

This sentence:
"Hurricane centroid locations are computed every 10 minutes as the minimum SLP after 3x3 smoothing is applied to the model output and are used for comparison with the NHC best track information."

has been modified to read:
"Hurricane centroid locations are computed every 10 min as the minimum SLP after 3×3 smoothing is applied to the model output (a mean value of SLP is computed for each grid cell based on output for that grid cell and the eight adjacent grid cells) and compared with the NHC best track information."

Line 298: This section seems to mix results and discussion - consider separating them for better flow.

Please see the above reply in the "Major Comments" section.

Line 300: The evaluation here is quite dense, with several variables and metrics presented at once. A clearer structure for comparisons would help.

With Section 3, subsections have been added and renamed to provide more clarity.
3.1 Evaluation of simulations without the action of wind turbines
3.1.1 Hurricane Irene
3.1.2 Hurricane Sandy

3.1.3 Synthesis
3.2 Wind turbine power production and operating conditions
3.2.1 Hurricane Irene
3.2.2 Hurricane Sandy
3.3 Wind turbine impacts on hurricane properties.

Line 300: It's hard to see this clearly in Figure 1a. How is "fidelity" defined in this context?

We have modified this sentence to read: “As shown in detail below, simulations of Hurricane Irene exhibit lower fidelity than those of Hurricane Sandy.”

Line 304: Can bias be quantified and presented in a table?

We have sought to clarify this in the text rather than adding another table.

Line 313: What does "R18" refer to? Please define.

We do define it where we write: “The mean outermost radius of tropical storm force WSs at 10 m (R_{18}, 18 m s^{-1}, Fig. 4) is computed using azimuth sectors of 10° (Powell and Reinhold, 2007) for all sectors where the distance from the cyclone centroid to the d02 boundary is ≥ 200 km and used as a measure of cyclone size.”

Lines 496-510: Could the observed changes in wind speed be related to differences in roughness length? This may be worth investigating as it may help explain some of the results.

Possibly, though we did not find a clear/definitive signal in local z_0.

Line 541: Should this be "except"?

Thank you for pointing this out. It has been corrected.

Line 574: It is unclear which model setup provides better hurricane estimates - please clarify.

We have added this information in section 3.1.3:
“Evaluation of the WRF and COAWST simulations of Hurricane Sandy thus indicates relatively high fidelity. Nevertheless, the fidelity is lower for simulations of Hurricane Irene and biases relative to observations provide important context for the following analyses which focus on power production and extreme conditions at prospective offshore WT locations. Due to the presence of errors in tropical cyclone tracking in the simulations, in the following discussion of geophysical conditions we consider not only grid cells with WTs in the LAs, but also ocean-

based grid cells nearby. In terms of agreement with; observed precipitation, cyclone size (R_{18}), near-surface WS and cyclone tracking, COAWST simulations exhibit higher skill than those with WRF."

We base this assessment on the following summary of information presented in the manuscript:
Irene:

- WRF precipitation within 300 km range of centroid better agrees with IMERG.
- COAWST R_{18} better agrees with HURDAT2
- COAWST exhibits better agreement with buoy observations of near-surface wind speeds

Sandy

- WRF and COAWST comparable agreement in terms of precipitation within 300 km range of centroid relative to IMERG
- COAWST better agreement in terms of centroid location v HURDAT2
- COAWST better agreement with buoy observations of near-surface wind speeds

Line 590: Be consistent in terminology when referring to hurricanes versus cyclones.

The sentence has been changed from: "Thus, based on these simulations of these intense tropical cyclones there is no evidence of a need for hurricane hardening of wind turbines deployed in the current offshore lease areas."

to: "Thus, based on these simulations of these intense hurricanes there is no evidence of a need for hurricane hardening of WTs deployed in these LAs."

Could input files be provided in order for others so that they can repeat the work if necessary.

This information was given in Supplemental Materials but we have now also added the link to a persistent repository that provides input files to the "Code and data availability" Section.