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”
April 4, 2025

1 General comments

The manuscript ”Hurricane impacts in the United States East Coast offshore wind energy lease areas” by Thompson et al. presents simulations of two hurricane cases along the U.S. East Coast. Four model configurations are analyzed for each hurricane case, including atmosphere-only WRF simulations and atmosphere-wave-ocean coupled COAWST simulations. In addition, the effects of wind turbines on the hurricanes are analyzed using simulations with and without wind farm parameterizations.
The manuscript contains novel aspects such as 1.) the use of buoys and IMERG data to validate tropical cyclone simulations, 2.) the presented analysis of the atmosphere-ocean-wave-coupled modeling framework applied to tropical cyclone cases including wind turbine effects. The manuscript addresses three clearly stated research questions that are relevant to the wind energy sector and of broad international interest. The methods are well described and the analysis is valid. The title and abstract give a good summary of the manuscript, the manuscript is well written and overall well structured.
Many thanks for your positive comments and assessment.

The manuscript uses eleven rather long tables, and not all of them may be needed in the main article. Many figures show panels for both WRF and COAWST simulations, although in some cases the difference between the two is not easy to see (see specific suggestions in the Specific Comments section). At the same time, some figures contain a lot of information while being rather small.
We fully accept that the manuscript as submitted contained an atypically large number of tables (6) in addition to the 10 figures.
We provide details of our changes to Figures below. With respect to Tables:

1) Moved Table 1 to Supplemental Materials (Table S1)
2) Moved Table 2 to Supplemental Materials (Table S2)
3) Integrated Table 4 into the text. Thus, the text at the start of Section 2.2 changed from: “In this research, both WRF (v4.2.2) and COAWST (v3.7 and MCT v2.6.0) simulations use two domains (Fig. 2a) and the coupling interval in COAWST is 10 min (Fig. 2b). The source of boundary and initial conditions and key physics options (Tables 3 and 4) are informed by previous simulations of Hurricanes Sandy (Zambon et al., 2014b) and Irene (Mooney et al., 2016). The MYNN2 planetary boundary layer scheme is used due to the compatibility with the Fitch windfarm parameterization (WFP) (Fitch et al., 2012) that is

used here to compute power production, momentum extraction, and turbulent kinetic energy (TKE) induced by the action of wind turbines."

To:
"In this research, both WRF (v4.2.2) and COAWST (v3.7 and MCT v2.6.0) simulations use two domains (Fig. 2a) and the coupling interval in COAWST is 10 min. 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 of peak energy in the wave spectrum) that are passed from SWAN to WRF and ROMS. The source of boundary and initial conditions (Table 1) and key physics options are informed by previous simulations of Hurricanes Sandy (Zambon et al., 2014a) and Irene (Mooney et al., 2016). Physics settings include the WRF single-moment 6-class (WSM6; (Hong and Lim, 2006)) microphysics scheme, the Rapid Radiative Transfer Model (RRTM; (Mlawer et al., 1997)) for longwave radiation, the Dudhia scheme (MM5; (Dudhia, 1989)) for shortwave radiation, and the Unified Noah land surface model (Chen and Dudhia, 2001b, a; Ek et al., 2003; Tewari et al., 2004). The Kain-Fritsch (Kain, 2004) cumulus parameterization is used in the outer domain and no cumulus parameterization is used in the inner domain. The Mellor-Yamada Nakanishi and Niino Level 2.5 (MYNN2; (Nakanishi and Niino, 2006)) planetary boundary layer scheme is used due to the compatibility with the Fitch windfarm parameterization (WFP; (Fitch et al., 2012)) that is used here in both domains to compute power production, momentum extraction, and turbulent kinetic energy (TKE) induced by the action of WTs."

2 Specific comments

1. Introduction: Lines 34-40: You might consider extending this argument for tropical cyclone events, and include that tropical cyclones may not be adequately covered by available offshore measurements.

   Yes, quite. We have modified the text to read:
   "The offshore environment presents significant challenges for making long-term, climatologically representative robust measurements of properties such as wind speed at WT hub-height (HH WS) (Foody et al., 2024) that are critical for determining the wind resource and key aspects of operating conditions (IEC, 2019b, a; Mudd and Vickery, 2024). The relative paucity of measurements leads to financial uncertainty and thus potentially jeopardizes realizing national goals for achieving the energy transition (Hansen et al., 2024). It also means that numerical modeling is playing a critical role in projecting wind resource and operating conditions in offshore wind energy development areas (Kresning et al., 2020; Pryor and Barthelmie, 2021; Bodini et al., 2024; Pryor and Barthelmie, 2024a; Wang et al., 2024). Limited over-ocean observations also limit our ability to characterize the characteristics of high intensity hurricanes, including those of

relevance to the wind energy industry, particularly in environments such as the U.S. East Coast which has the potential to be impacted by tropical cyclones and/or transitioning tropical-extratropical cyclones (Xie et al., 2005; Baldini et al., 2016; Barthelmie et al., 2021; Wang et al., 2024) but experiences only relatively few such storms each century (Schreck III et al., 2021)."

2. Line 184: Note that the effective model resolution using WRF is about 7 times the grid spacing Skamarock (2004).

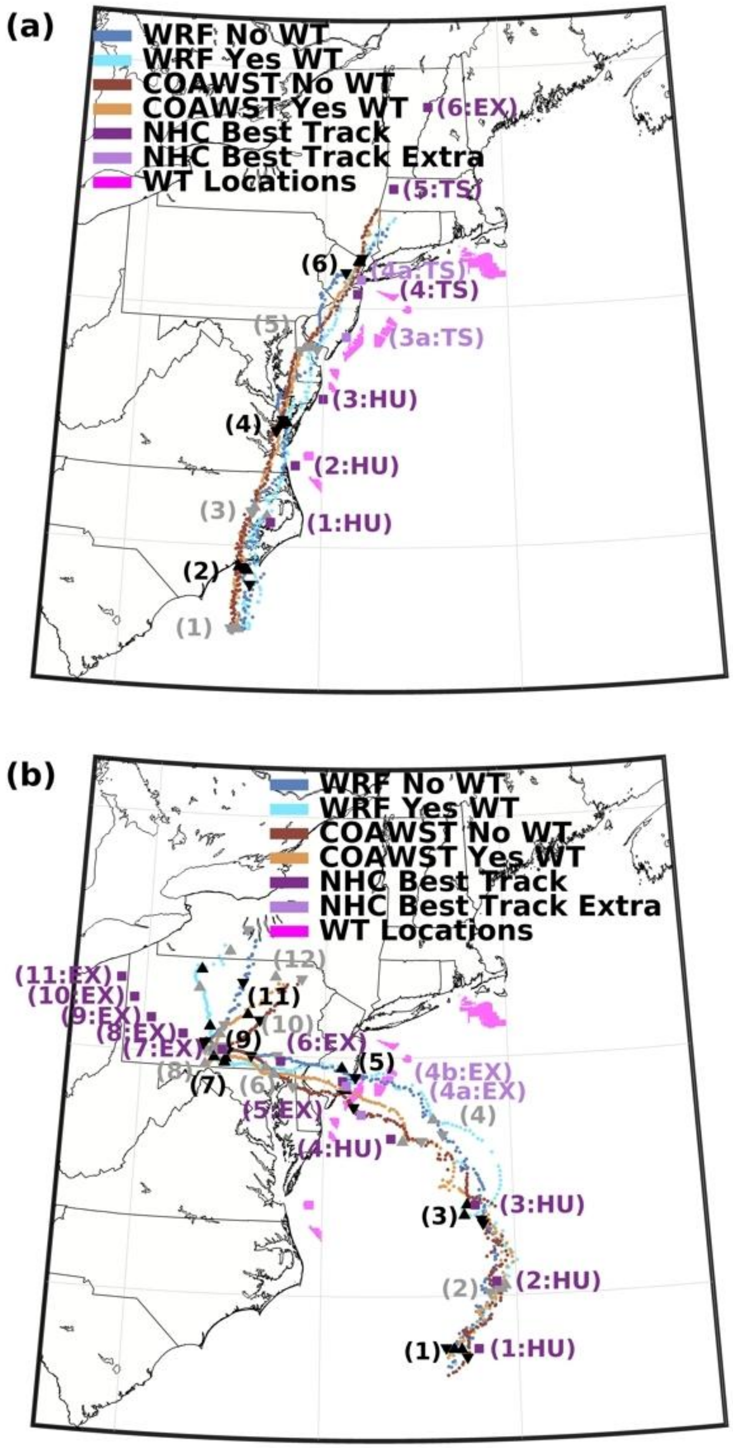
   Agreed. We have changed this sentence:
   "Note the wind speeds output from d02 are for a nominal model time step of 2 s but are representative of a spatial average of 1.33 km by 1.33 km, while the design standards are for a sustained wind speed at a point (Larsén and Ott, 2022).

   To read:
   "Note it is not an expectation that spatially averaged model output will perfectly match time-averaged point observations and further, the design standards are articulated for a sustained WS at a point (Larsén and Ott, 2022). The WSs presented here are output from d02, represent a nominal model time step of 2 s, and are from a grid cell with an area of 1.33 km by 1.33 km, but the effective model resolution is ~ 7 times the grid spacing (Skamarock, 2004) thus any spatial gradients will be under-estimated."

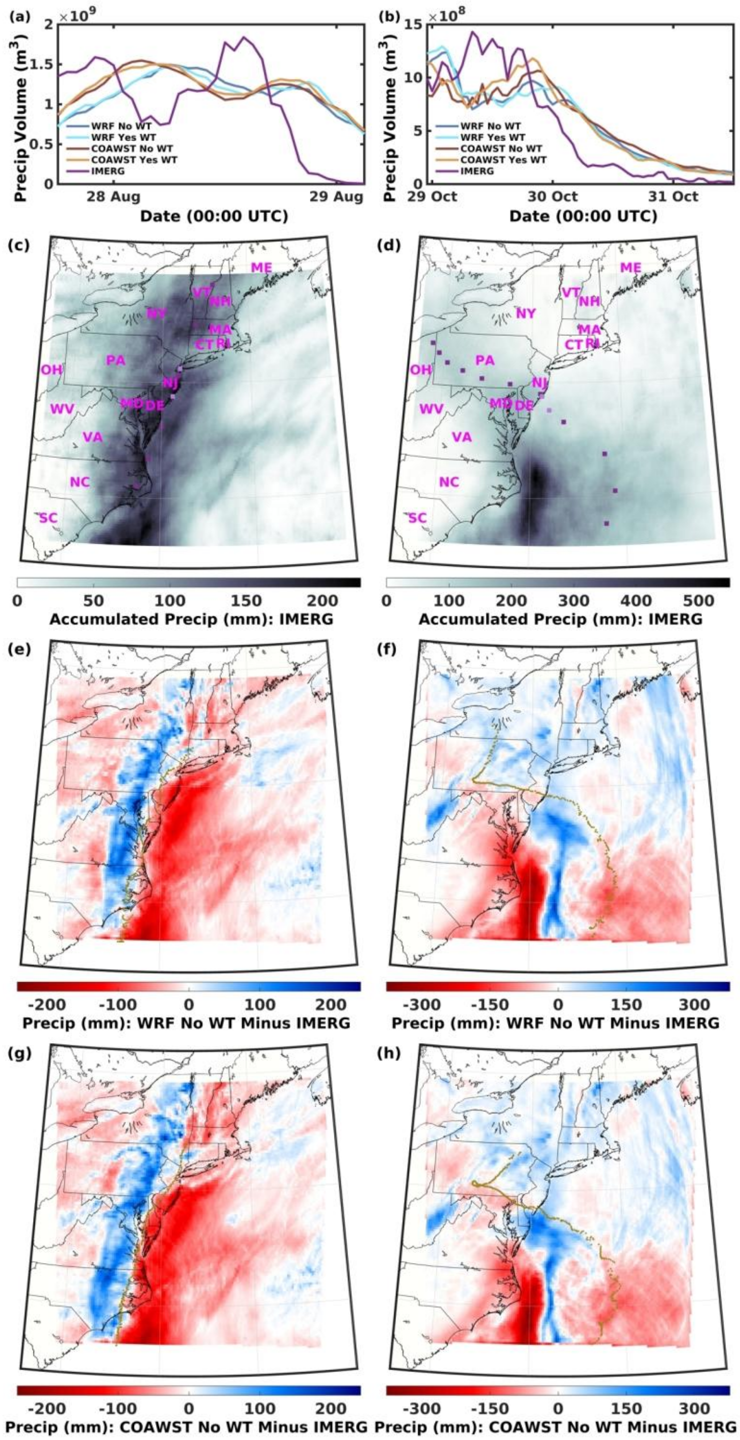
3. Figure 1a,b): I think it would be helpful to the reader to show these two panels larger in the main article. This would help to better see the agreement between the observed and simulated track, and you could also consider not showing Table 1. The precipitation time series is also shown in Fig. 10, I think one of the two figures should be sufficient.

   The hurricane tracks in panels (a) and (b) from Figure 1 have become a separate figure (new Figure 1) and the other figure panels are now their own figure (new Figure 3, see below). Table 1 is now located in the Supplemental Materials (Table S1) and key information from that table is now included in the Figure 1 caption (see below).

   Figure 10 and Figure 1 show slightly different time series. Figure 10 shows the 10-min precipitation volume within a 375 km radius of the minimum SLP and Figure 1 (now Figure 3) shows the 1-h precipitation volume within a 375 km radius of the minimum SLP.



Modified Figure 1



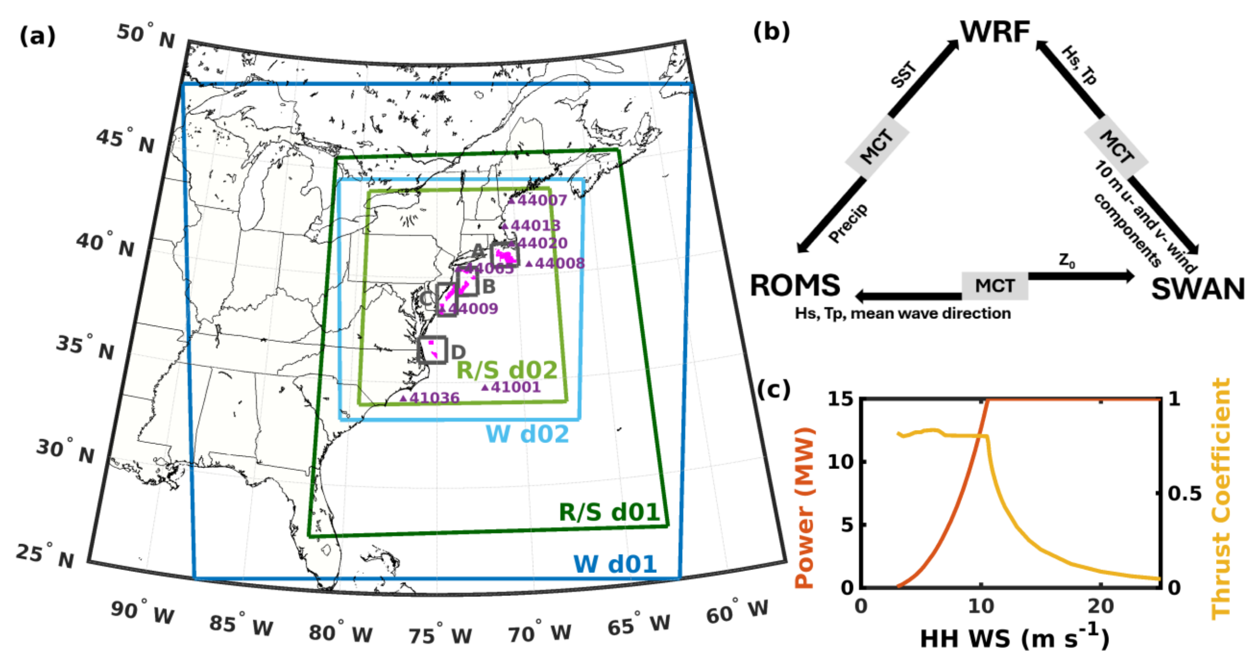
Modified Figure 3

4. Fig. 2b and Table 2), the scheme of COAWST is not further explained in the text. So I would suggest not to show Fig. 1 b and Table 2b in the main article, but to give them in the supplement.

We apologize – the text we provided was too brief. The first paragraph of Section 2.2 that began:
"The source of initial and lateral boundary conditions (Khaira and Astitha, 2023) and specific model configurations employed within WRF and COAWST (including the coupling system) have a critical impact on simulated flow conditions (Mooney et al., 2019). In this research, both WRF (v4.2.2) and COAWST (v3.7 and MCT v2.6.0) simulations use two domains (Fig. 2a) and the coupling interval in COAWST is 10 min (Fig. 2b)."

is now expanded to include this further sentence:
"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."

Panel (b) from what was Figure 2 has become Figure S3 and Table 2 has become Table S2. A new panel (b) has been included with only variables discussed in the main text and is shown below.



Modified Figure 2

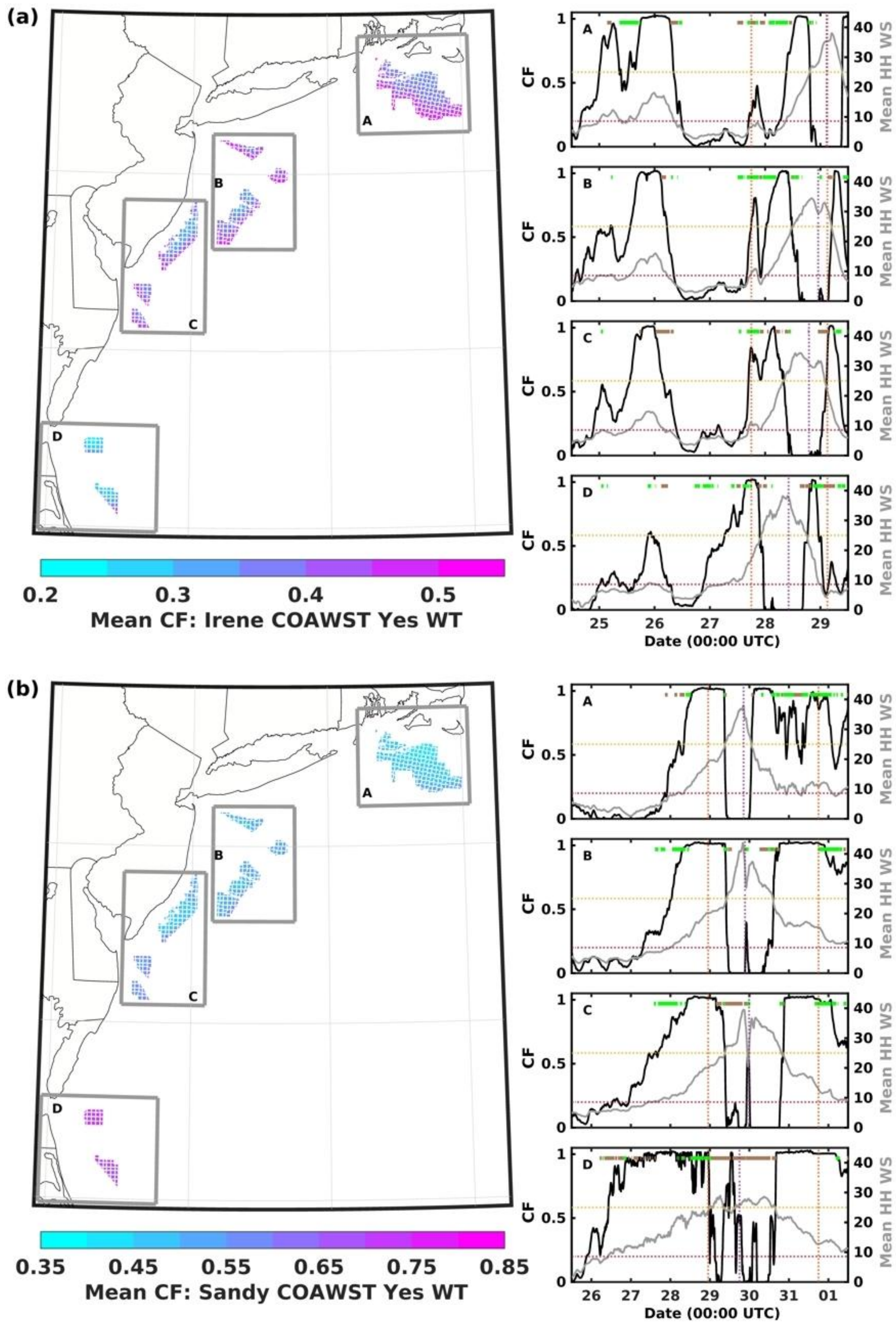
5. line 255: Could you explain what 3 × 3 smoothing means?

   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."

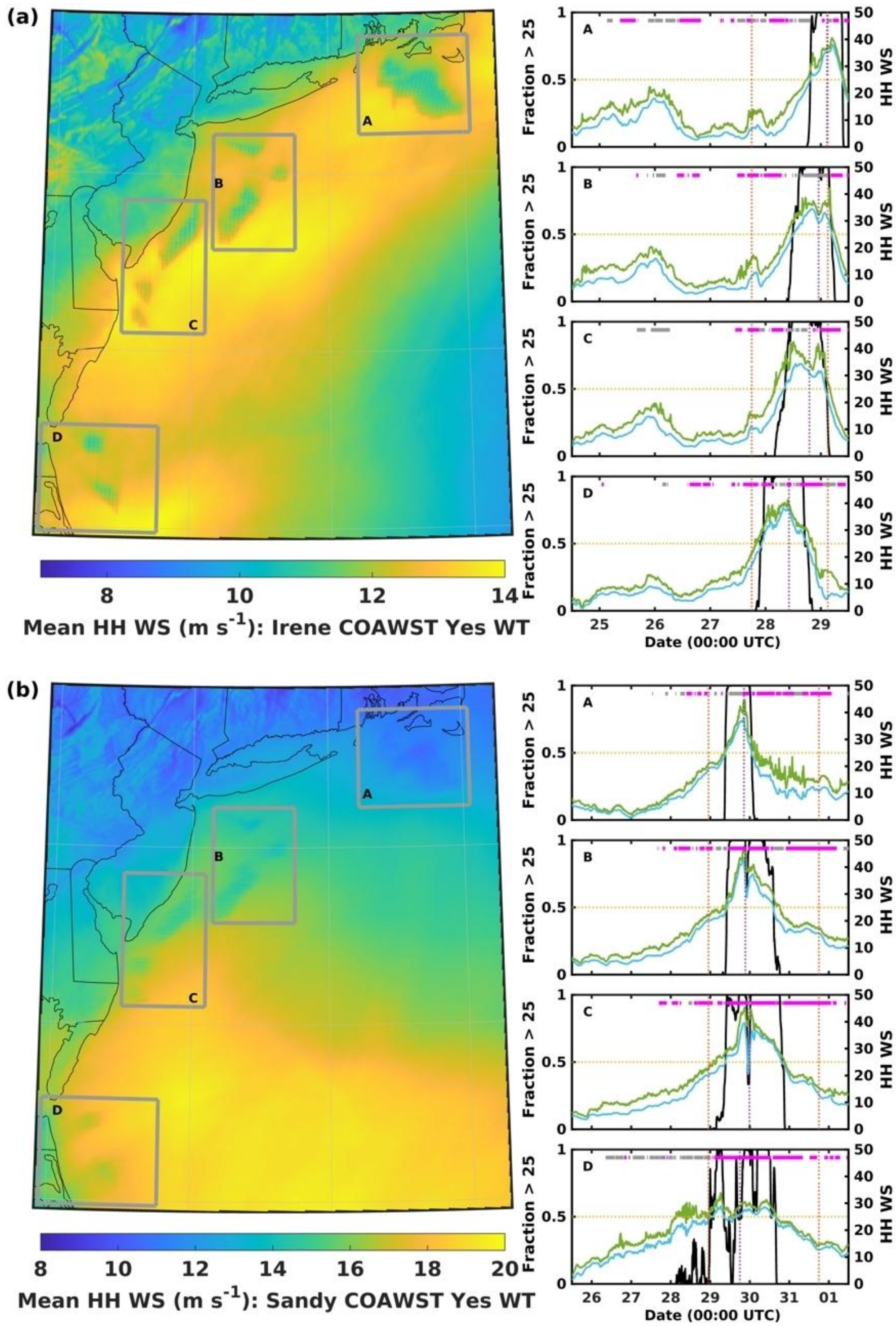
   has been modified to read:
   "Hurricane centroid locations are computed every 10 min as the minimum SLP after 3×3 smoothing is applied to the model output (a mean value of SLP is computed for each grid cell based on output for that grid cell and the eight adjacent grid cells) and compared with the NHC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

6. Figures 1, 3, 6, 7: The difference between the WRF and COAWST simulations is not easy to see in these figures. While the difference between the two is discussed to some extent in the text, one could consider not showing both panels in all cases, or showing the difference between the two. For Figures 6 and 7, you might consider showing the map and wind field for either the COAWST or WRF simulation only, while showing the time series for both in the same plot.

   Please see (3) above for changes to Figure 1. With Figures 3, 6, and 7 (now Figures 4, 7, and 8), the COAWST panels remain in the main text; all four (WRF and COAWST) panels are included in the Supplemental Materials (Figures S4, S12, and S13). With Figure 7, the time series plots now mark 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. With Figure 8, the time series plots now mark 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.



Modified Figure 7



Modified Figure 8

7. Figures 8, 9: It is difficult to read the Tp, HH WS, and Hs from the 3-D bubble plots. Can you consider a different visualization; this could be adding the Tp via contours or colors in the plots (e-h), or showing a separate joint probability of HH WS and Tp.

   3D plots are indeed inherently tricky. We did evaluate a range of different options before selecting bubble plots and frankly found the bubble plots to be the best option given; Tp is categorial (integer seconds) and contouring in 3D space is hard particularly when the data are highly "concentrated" – e.g., panel b and noting we wanted to preserve information regarding the co-occurrence of the three variables.

3 Technical corrections

1. Line 21: The abbreviation HH WS is used only once in the abstract. Therefore, I would recommend not introducing it.

   With apologies for our error, the abbreviation HH WS has been removed from the abstract.

2. Line 28: The abbreviation IC is used only once in the abstract. I would recommend introducing abbreviations only if they are used more than once.

   Thank you for pointing this out, we have corrected this.

3. Line 135: Personally, I have never come across the term "storyline simulations" and would prefer to use "case study" instead.

   "Storyline simulations" as a concept has evolved in the climate science community (see discussion in Doblas-Reyes, F. J., and Coauthors, 2021: Linking global to regional climate change. Climate Change 2021: The Physical Science Basis, V. Masson-Delmotte et al., Eds., Cambridge University Press, 1363–1512.). In brief, the difference between a case study and a storyline is that a case study is purely a geophysical event while a storyline inherently is a geophysical event that is "impact" or decision maker relevant. For this reason, we prefer the term storyline since we are explicitly considering these hurricanes in the context of risk to the renewable energy sector.

4. Section 2.1: You could refer to Fig. 1a and b when describing the hurricanes.

   Section 2.1, "Characteristics of the hurricanes considered herein", is a good location to refer to panels (a) and (b) of Figure 1 (which are now a separate figure – as noted in the third comment in the previous section) – this has been added.

Section 2.1 now reads:
"Research presented herein focuses on two recent hurricanes:

1) Hurricane Irene became a category 3 hurricane, with 54 m s^{-1} WSs at 10 m height in the Bahamas on 24 August 2011 12:00 UTC (Avila and Cangialosi, 2011). It made landfall at Cape Lookout, North Carolina on 27 August 12:00 UTC with 39 m s^{-1} 10 m WSs. After moving out over the water, it again made landfall, this time as a tropical storm, with 31 m s^{-1} WSs reported at Brigantine, New Jersey on 28 August 2011 09:35 UTC (Fig. 1a). The cyclone then moved over Coney Island, New York with 28 m s^{-1} WSs reported at 13:00 UTC. Simulations presented herein are initialized on 24 August 2011 12:00 UTC and run through 29 August 2011 12:00 UTC.

2) Hurricane Sandy became a category 3 hurricane, with 51 m s^{-1} WSs at 10 m height in eastern Cuba on 25 October 2012 05:25 UTC (Blake et al., 2013; Lackmann, 2015). It grew to have a roughly 1611 km diameter of tropical-storm-force WSs, before making landfall near Brigantine, New Jersey as a post-tropical cyclone with 36 m s^{-1} 10 m WSs and a minimum pressure of 945 hPa on 29 October 2012 23:30 UTC (Fig. 1b). Simulations presented herein run from 25 October 2012 12:00 UTC through 1 November 2012 12:00 UTC."

5. For the date format, e.g. in Table 1 and others, following the mathematical notation and terminology guidelines of wind energy science, I would recommend using "27 Aug 18:00" instead of "1800 27 Aug".

   Thank you for highlighting the guidelines for date and time. Throughout the manuscript, "dd month yyyy, hh:mm UTC" formatting is now used.

6. Line 179: I would suggest referring to Fig. 1c in a separate sentence, explicitly stating that the figure shows the power and thrust curves used for the Fitch parameterization.

   Reworded to read: "Following previous research (Pryor and Barthelmie, 2024a, b), we assume that all auctioned offshore LAs along the U.S. East Coast (Fig. 2a) are populated with 2642 IEA reference 15 MW WTs, each of which has a hub height of 150 m, and a rotor diameter of 240 m (see power and thrust curves in Fig. 2c), at a spacing of 1.85 km for an average ICD of 4.3 MW km^{-2}."

7. Table 3: The table shows not only the sources of the initial and boundary conditions but also the model resolution; could you update the title?

   The title for Table 3 (now Table 1) has been changed from "Sources of initial and boundary conditions for WRF and COAWST" to "Model configuration for WRF and COAWST simulations".

8. Line 150: The abbreviation WS has already been introduced in line 58.

   The duplicate explanation of wind speeds (WS) has been removed with our apologies.

9. Line 278: I think you meant to write ”of 3 - 10.6 ms−1,...”?

   Sorry for any confusion. To make the three class ranges more clear, “to” has replaced “–”: The sentence now reads “… in HH WS classes of 3 to < 10.6 m s^{-1}, 10.6 to 25 m s^{-1}, and > 25 m s^{-1}, to represent …” and follows the format in the caption and legend of Fig. 8 (now Fig. 9) and Fig. 9 (now Fig. 10). The sentences on lines 452 and 523 have been modified to also use “to” instead of “–” (10.6 to 25 m s^{-1}).

10. Line 275: I suggest introducing the peak period with a few more words, e.g. ”period of the peak energy in the wave spectrum”.

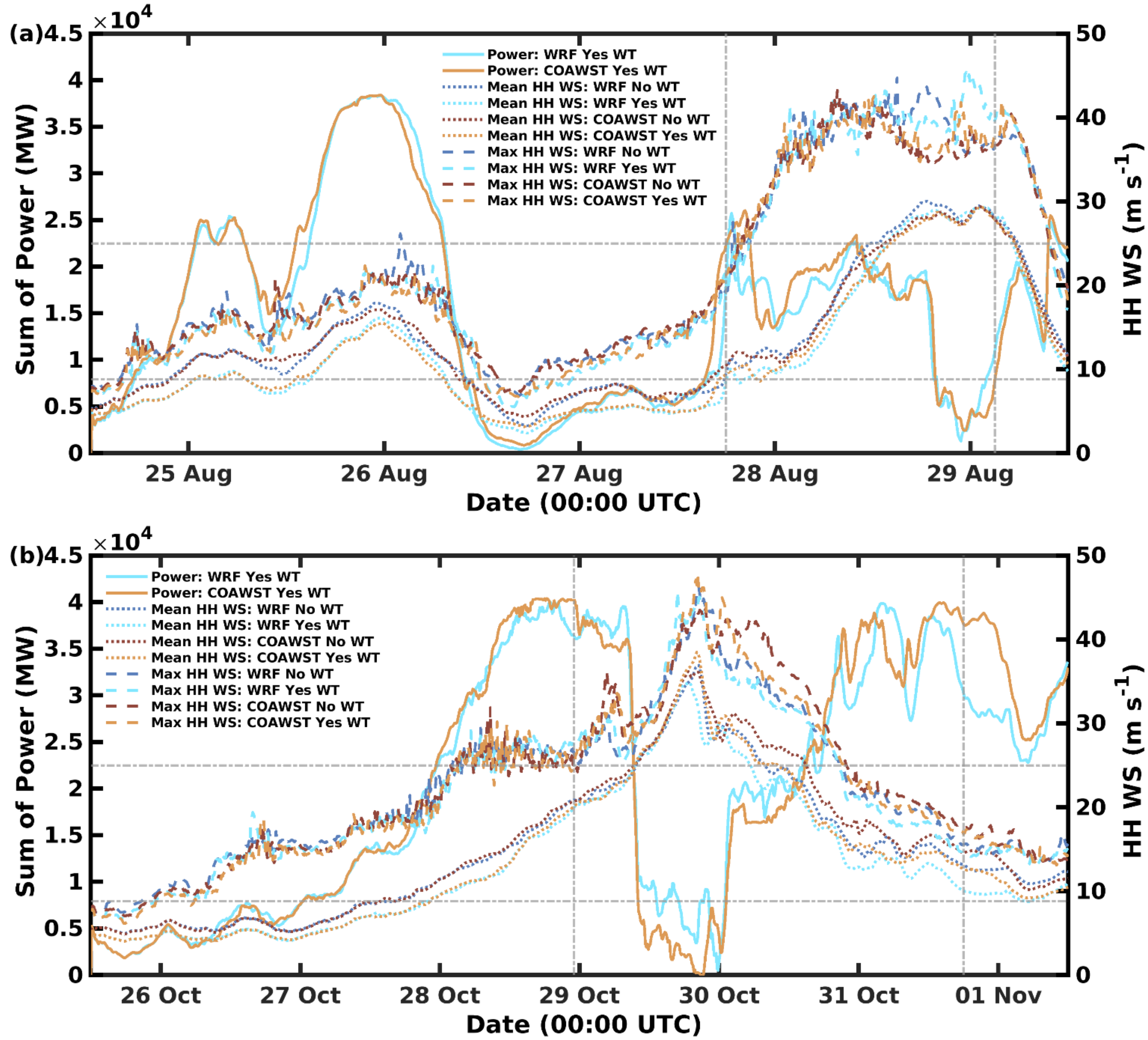
    Done

11. Table 5, 6: To help the reader, you might consider removing the horizontal lines between the buoy, WRF, and COAWST data of the same buoy location.

    Table 5 and Table 6 (now Table 2 and Table 3) have been modified to remove the horizontal lines between the buoy, WRF, and COAWST data of the same buoy location.

12. Fig. 5 and others: While the idea of grouping the colors is good, the colors between ”COAWST No WT” and ”COAWST Yes WT” and between ”WRF No WT” and ”WRF Yes WT” are too close together to be clearly distinguished.

    We want to make sure that everyone can clearly distinguish between the different colors. We have chosen a new color scheme (see below) that is also suggested in the Crameri et al. (2020) reference and is now used with the updated figures. Additional line styles are now also used in Figure 6 (previously Figure 5).



Modified Figure 6

References

Skamarock, W. C.: Evaluating mesoscale NWP models using kinetic energy spectra, Mon. Weather Rev., 132, 3019–3032, https://doi.org/10.1175/MWR2830.1, 2004.

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

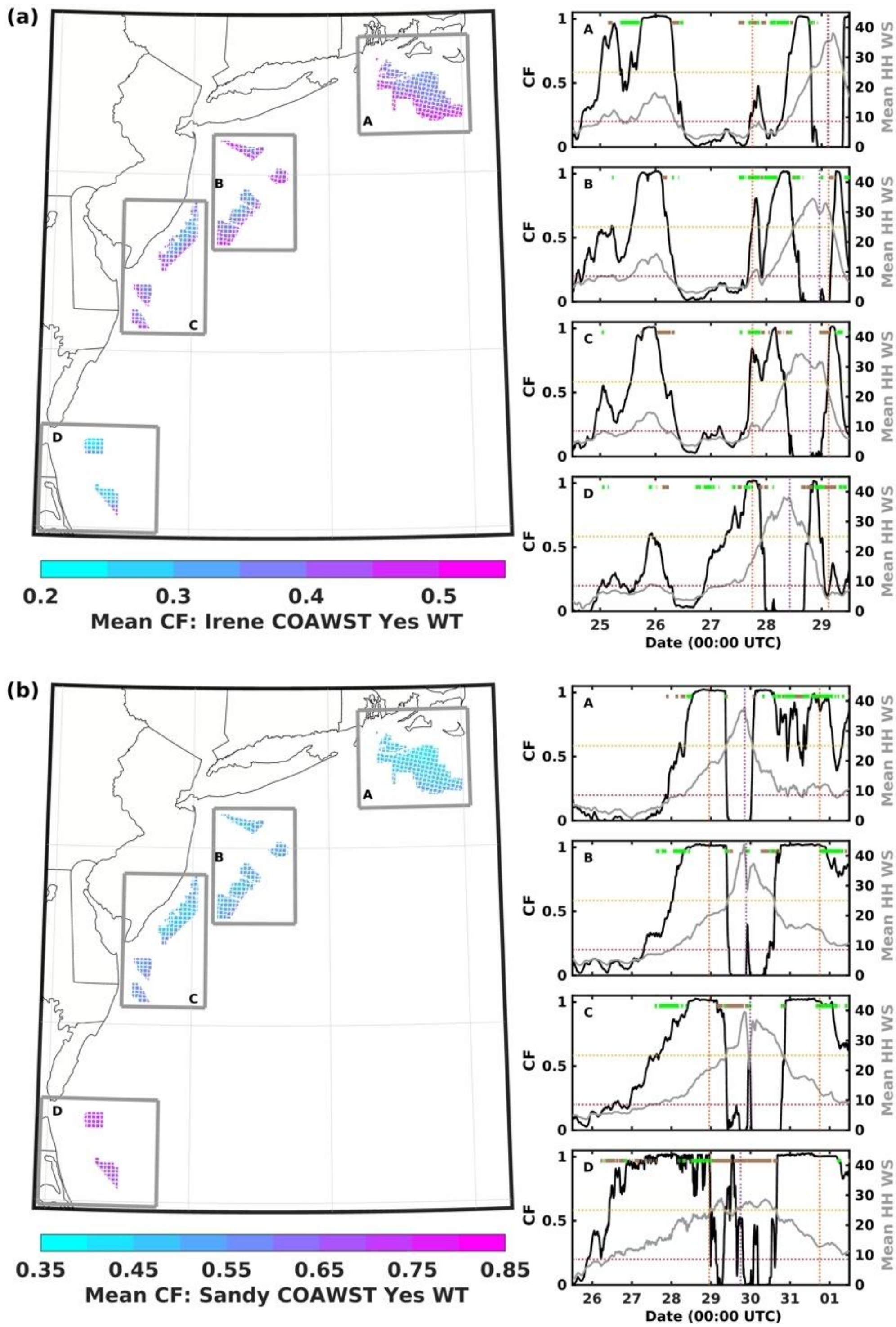
Porchetta, S., Temel, O., Munoz-Esparza, D., Reuder, J., Monbaliu, J., van Beeck, J. and van Lipzig, N. (2019) A new roughness length parameterization accounting for wind-wave (mis)alignment. Atmospheric Chemistry and Physics, 19(10), 6681–6700. https://doi.org/10.5194/acp-19-6681-2019

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.”

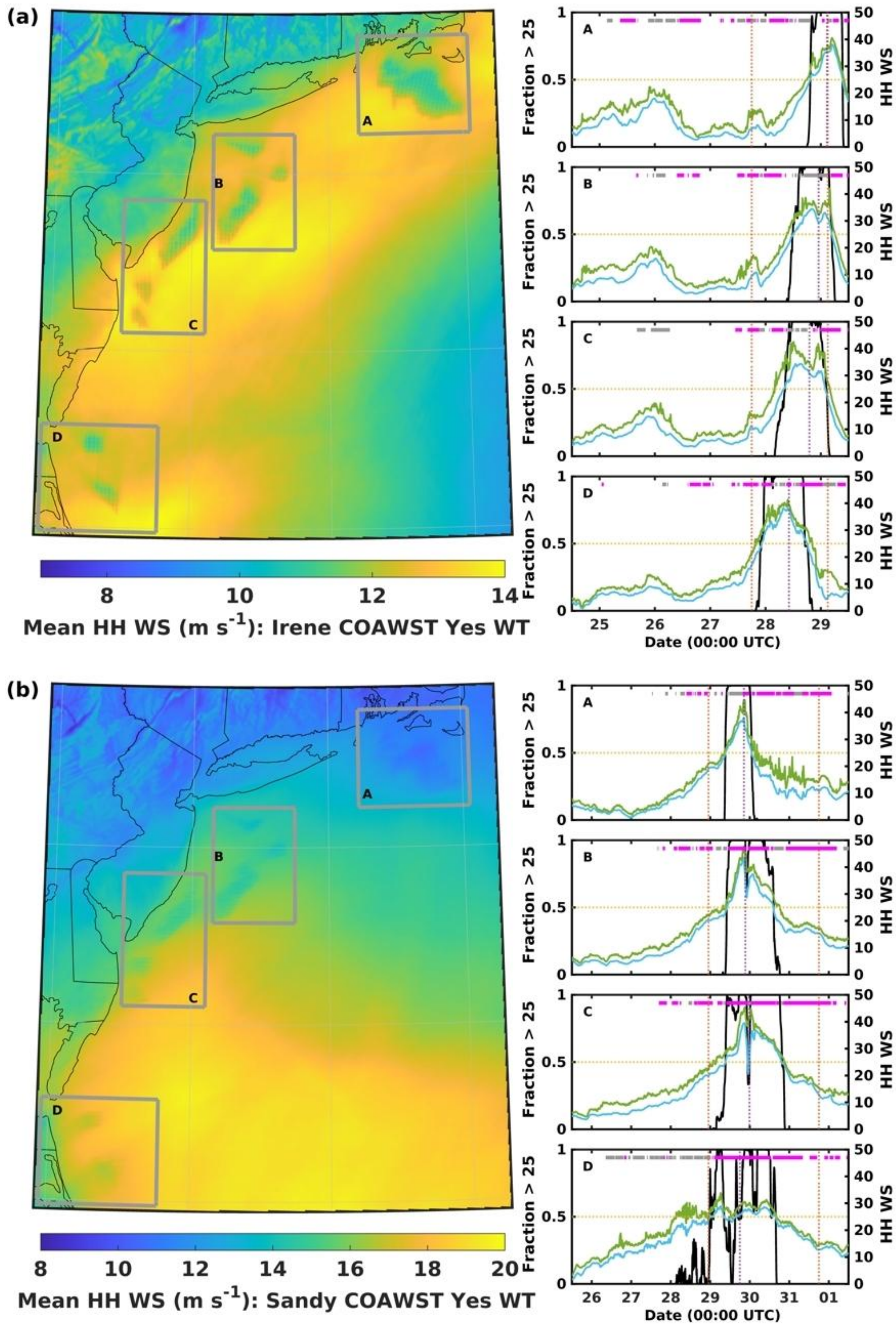
It may be helpful to separate the results and discussion sections, as the current layout makes it difficult to follow. I also recommend improving the structure within the results section. It currently includes comparisons between two hurricanes, multiple models (WRF (WFP), COAWST (WFP)), and different 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.