

Wind Energ. Sci. Discuss., referee comment RC1
<https://doi.org/10.5194/wes-2021-150-RC1>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on wes-2021-150

Anonymous Referee #1

Referee comment on "Offshore wind energy forecasting sensitivity to sea surface temperature input in the Mid-Atlantic" by Stephanie Redfern et al., Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2021-150-RC1>, 2022

In this study, Redfern et al. compare the performance of WRF simulations forced by two SST products with different temporal, spatial and assimilation characteristics. They use lidar measurements as well as buoy measurements to compare the performance of the simulations. The evaluation is made through different error measures. They conclude that both SST products give comparable results on monthly time-scale, while during more challenging events GOES-16 outperforms OSTIA for simulating winds at 100 m height.

General comments

The study is interesting and certainly relevant for wind energy, since good wind forecast during challenging situations is critical. However, I think the analysis could be improved in terms of evaluating different heights. Most of the analysis focuses on hub height wind, which is defined as 100 m. However, the appendix shows, how much the error measures vary with height. Discussing other heights in more detail would create a more complete picture both with the prospect that hub heights of turbines are expected to increase as well as with respect to obtain a more complete picture for the entire rotor area.

I was confused about the third SST product, MUR. It is not very well introduced and only turns up as a surprise for approximately 13 lines in the paper. It is neither mentioned in the abstract, discussion and conclusion. The role of MUR should be more clear and a proper introduction is necessary or it should be left out entirely. See my specific comment in that regard below.

Specific comments

* Line 39: You could add the following paper to your discussion, which addresses the LLJ frequency in the area that you are investigating:

Aird, Jeanie A., Rebecca J. Barthelmie, Tristan J. Shepherd, and Sara C. Pryor. 2022. "Occurrence of Low-Level Jets over the Eastern U.S. Coastal Zone at Heights Relevant to Wind Energy" Energies 15, no. 2: 445. <https://doi.org/10.3390/en15020445>

* Line 81: Please add some more statistics about the availability of the buoys and lidars
* Line 90: In line 69 you write about two model simulations "We run two model simulations with identical setups, aside from the input SST data, off the Mid-Atlantic coast for June and 70 July of 2020.", while here you write about three simulations. "We compare how well three different SST datasets validate against buoy observations and subsequently select the two best- performing data sets to force our simulations (Table 3). Aside from these different SST product inputs, the rest of the model parameters in the simulations remain identical." I understand that you discard one SST product early on during your evaluation, but it is confusing as a reader to get this mixed information on how many simulations are performed. Also in table 3 there are only 2 products shown, which make it even more confusing. I see the first introduction to the third product, MUR, only during the analysis in section 3.1. I would suggest that you either always talk about three products or leave out the 3rd product. The least MUR should already be introduced in section 2.3.
* Line 154-156: Personally I don't like this style of summarizing the findings at the beginning of each section. It takes away the motivation to read the entire section. This is the same as in line 205-206.
* Line 161: Linked to my point in line 90: Why introduce the 3rd data set with a "significant coarser" resolution here? It seems a bit unnecessary, especially in line 172 it is already disregarded from further analysis.
* Line 171: According to Table 5 for Atlantic Shores, BIAS and EMD are rather comparable for MUR and the other products. You don't show the evaluation for the other stations for MUR. Based on Table 5, I find it a bit difficult to follow your assessment
* Line 179 - 181: I cannot follow your argument here: For instance, both for buoy 44017 and 44065 EMD, RMSE and Bias show worse performance for GEOS-16 than for OSTIA as well as compared to the average over all sites. Please clarify
* Line 187/188: It would be nice to see the boxplots to comprehend where your conclusions come from. If you don't feel there is enough space to show all plots, it would be nice if you could add "(not shown)" to the text, so the reader does not continue searching for the plot related to that statement. This statement is also valid for line 171.
* Beginning of each section 3.3.1 - 3.3.3: To better understand the event, it would be good to have a description of the event at the beginning. This description could be what you have in line 225ff. This gives a good introduction to the event.
* Line 215-220: As you motivate yourself 100 m is only one height. In figure 8 you could easily also add the matrices for e.g. 150 m height next to the matrices for 100 m.
* Line 239: An improvement for GOES-16 compared to OSTIA of 0.02 is indeed a very small. I would remove that statement.
* Line 275: You show figures for wind direction in the above analysis, but you do not evaluate the performance of the different products in terms of wind direction or wind veer. Are they similar for those quantities?

Technical corrections

- * Line 50: Please add citations for ERA5 and MERRA2
- * Line 62: Please add a citation for WRF
- * Figure 1: According to the WES guidelines: "A legend should clarify all symbols used and should appear in the figure itself, rather than verbal explanations in the captions (e.g. "dashed line" or "open green circles")". Please add a corresponding legend to the figure. Why are the leasing areas in different colours?
- * Table 2: Please consider to upload the wps and wrf namelists to a repository (e.g. zenodo) so the study becomes better reproducible
- * Line 93: Please add a citation for OSTIA
- * Line 98: Please add a citation for GOES-16
- * Line 113: Please add a citation for DINEOF
- * Figure 3: Are the buoys in a particular order? If not I would suggest to order them in an ascending order
- * Figure 4: It seems like you are not using the same bins for all of the three PDFs. This makes it difficult to compare the PDFs.
- * Figure 5: Why is 80 m highlighted although you mention in the text (line 191) that you consider 100 m as hub-height?
- * Figure 8: In contrast to figure 3 you did not reverse the colormap for correlation. So for figure 8 yellower colours are better for correlation, but worse for RMSE and EMD. I suggest to have better performance in the same colour for all matrices (this also goes for figure 11 and 14). Please show two significant digits for the bias for GOES-16, even if it is 0
- * Line 240: "although both present values very close to 0 m s-1" <- "are" is missing
- * Figure A1 - A3: hub height line is at 80 m instead of 100 m as stated in the description