Wind Energ. Sci. Discuss., referee comment RC2
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Comment on wes-2021-150

Anonymous Referee #2

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-RC2, 2022

General Comments:

The paper of Redfern et al. addresses the topic of the role of SST representation in modelling wind energy forecast at offshore in the Mid-Atlantic. They compare the model and the observation wind speeds for the selected shorter-lived events (e.g., sea breezes and low-level jets). They examine the impact of SST on wind forecasting by using the OSTIA (daily) and GOES-16 SST (hourly) products in the model configuration.

The topic is of high interest in the context of studying the relationship between SST and offshore wind energy, and the paper is well-written. However, some clarifications and improvements are needed before the manuscript is publishable in the Wind Energy Source journal. Although the revision is somewhere between major and minor, I would like the authors to address all of my comments and suggestions that are listed below:

Major Comments:

Clarity of the abstract: I found the abstract is easy to read and understand the methodology for a reader. However, I would give a little more details, such as the

horizontal resolution of the GOES-16 and OSTIA fields, the studying periods (June and July), and indicating that the wind speed deviations during flagged events are at 100 m hub-height. Concerning results, I would try to write some numerical results (e.g., better performance of xx% or so).

The SST Performance: My feeling is that the SST analysis in this paper is not fully conducted on the event scale. Although the SST difference maps (e.g., Figure 9) are beneficial, they are not sufficient enough to track the daily fluctuations in SST at the event periods. I strongly suggest the authors show the time series of the SST products for all three lidars (not just the Atlantic Shores) and highlight the event dates on the time axis of these graphs. Additionally, the validation metrics of SST can be calculated for each month, separately. I believe that these changes will help the reader to link the wind and SST event-scale changes.

Then, I have other concerns. Discussion (and conclusion): what is the main take-home message? This point should be much more evident and clearer. I suggest that the authors can give more detail about the physical explanation of their outcomes (e.g., What might be the possible reason for these events correlate with the wind ramps?, Why do GOES-16 generally outperform OSTIA at different hub heights?). I would also compare the final results with similar studies and argue the uncertainties from several error sources (i.e., overall uncertainty in initial and boundary conditions, structural model uncertainty, etc.), and try to write some numerical results. In the conclusion, there is no need to explain the methodology in detail. A bullet point list may be helpful to summarize the main outcomes of the paper.

Minor Comments:

1 Introduction:

a) P2L30: "The cold pool forms during the summer…" needs a reference.

b) P3L62: The authors can use the acronym 'NWP' instead of repeating the numerical weather prediction.

2 Methods:

a) Why is August not included in this study? Wasn't there any short-lived event during August 2020? The authors can explain the reason in the manuscript.

2.2 Model Setup:

a) P3L87: The resolution of the nested domain should be indicated in the text.

b) P4: 44008 station is not listed in Table 1.

c) P4: Please, indicate the horizontal resolution of the shown domain as well as the coordinates in Figure 1.

d) P4: The units of coordinates should be indicated in Table 1.

e) P5: The physics schemes references are missing in Table 2 (e.g., RRTMG, Kain-Fritsch etc).

f) Showing both domains (parent and nest) and their resolutions in one figure would be beneficial to explain the model setup.

2.3. Sea Surface Temperature Data:

a) P5L93: The OSTIA product needs a reference.

b) P6L113: The DINEOF needs a reference.

2.4 Event Selection:

a) Listing the event dates and simulation time in a table can help the reader to follow the methodology easily.

2.5 Validation Metrics:

a) Why was particularly 100m hub height used in the evaluation? The authors can explain the reason in the manuscript.

- Results:

3.1 Sea Surface Temperature Performance:

a) The focus of this study is the GOES-16 and OSTIA SST products and their performance on the Mid-Atlantic coast. The MUR SST data is limited to the Atlantic Shores and not much successful in terms of catching the in-situ measurements of SST compared to the other two data sets during June and July of 2020. Is this data set truly needed for the SST analysis? Why?

b) The correlation difference between the GOES-16 and OSTIA SST products in Figure 3 is not high. "Although GOES-16 follows the diurnal cycle rather than representing only the daily average SSTs, it still does not correlate with observations as well as the OSTIA" statement sounds like a strong judgment.

c) The EMD performances of the SST products (Figure 3) also should be argued in the text.

3.2 Monthly Wind Speeds:

a) "Additionally, in both simulations, whole domain winds in July tend to be significantly faster than June winds." (P10L189) conflicts with the line "June average wind speeds are faster than those in July for both simulations." (P22L283) in the discussion section.

b) Why are the modeled hub-height wind speed bias and correlation for simulations in Figure 5 only shown for June 2020, not also for July 2020? The authors should state the reason in the manuscript.

3.3. Event-Scale Wind Speeds:

a) P13L204: What are the criteria for the "little" in observational data?

3.3.1. June 21 – 22, 2020 Event:

a) P15L226: Grammer mistake? ("affect")

3.3.2. July 10 – 11, 2020 Event:

a) P16L235: "(Fig.10(a)))" one parenthesis is extra.

** I suggest this reference concerning the sensitivity study of the WRF model (including the OSTIA SST) in offshore wind modeling in the Baltic Sea: https://doi.org/10.1016/j.gsf.2021.101229.