

Wind Energ. Sci. Discuss., referee comment RC2
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Comment on wes-2021-109

Anonymous Referee #2

Referee comment on "Detecting and Characterizing Sea Breezes Over the U.S. Northeast Coast with Implication for Offshore Wind Energy" by Geng Xia et al., Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2021-109-RC2>, 2021

The paper is well written and easy to read. It considers an important topic for wind energy meteorology and better understanding of sea-breezes is a welcome addition to the field. However I have a few comments considering the methodology. I believe that there are some critical aspects of methodology that have not been properly described.

Major comments.

- P3L84-L85. The simulations are one month long. Was there any kind of nudging performed during the simulations? If not, please explain why there was no nudging performed because one month is quite a long time and the model can "run away" from the real atmospheric conditions.
- P6L129. Mean wind direction at 10 m is calculated. Wind direction is a circular variable and therefore I find it hard to interpret "mean wind direction". Please explain in more detail how you calculated mean wind direction in complicated meteorological situations and why such an approach is feasible, especially, taking into account the fact that the averaging is done over coastal quadrants, where sea breeze front can be present and therefore opposite wind directions can be next to each other. For instance, the average of W and E direction is S wind.
- Figure 3. I do not understand Figure 3. It is supposed to demonstrate the differences in prevailing wind between different types of sea-breeze. But the classification is based on the relationship between the prevailing wind and the shoreline. In these schematics the shoreline is not indicated. The brown and blue color is especially confusing here, because it is reminiscent of land/sea border in maps. I also have a problem that authors haven't defined how they interpret the direction of shoreline in the actual map. Is the north wind supposed to be purely offshore (coast-perpendicular) wind in this study? But the coastline is not oriented W-E, it has a complicated shape. Authors should clearly describe how they interpret the shoreline direction in this study and which prevailing wind directions correspond to "pure", "corkscrew" and "backdoor" directions and why.
- Figure 6. I am not sure if showing the composites here is the best way how to represent the findings. Authors admit it themselves: "Even though the composite 10 wind speed over the calm zone is between 2 and 4 m/s, it falls primarily between 0 and 1 m/s for each individual case". I am wondering if showing a representative single case

would not be better to illustrate the properties of sea breeze. I am wondering whether the problem is the fact that the evolution of sea-breeze depends less on the "absolute" timing and more on the hours elapsed after sunrise. Maybe if the composite was done by averaging timeframes relative to the time after sunrise, the composites would be better. I imagine that sunrise time changes quite a lot during the year at those latitudes.

- P9L200-202 " This could be partially associated with the increase in the land-sea thermal contrast. As the land-sea temperature difference becomes more strongly positive, there is greater potential for corkscrew sea breeze development over pure sea breeze development along the U.S. Northeast coast." I am confused about such an assertion. If the difference between pure and corkscrew sea breezes comes from the difference in prevailing wind direction (some authors use "geostrophic wind" here), how does the sea-land temperature difference influence prevailing wind direction?

Minor comments:

- Figure 2. It would be easier to understand Figure 2 if the explanations for the abbreviations, such as WR: "Wind regime" would be explained in the figure caption.
- Line 152. "SW-WR" – I assume that "CS-WR" is meant here.