Review of manuscript wes-2026-50 titled “Improving offshore wind data from reanalyses using ship-based lidar measurements” by H. Rubio, V. Vakkari, M. Kuhn and J. Gotschall

General comment: This study proposes an observation-based method to improve the accuracy of ERA5 reanalysis wind speed for offshore environments. Specifically, the post-simulation ERA5 wind speed is calibrated against ship-based lidar measurements via space-time weighted difference. The bias-reducing effect between ERA5 and observations before and after calibration is then assessed utilizing data collected at a nearby island featuring long-term wind speed measurements by Doppler Lidar. As a result, the ERA5 wind speed is overestimated close to shores and underestimated in offshore environments, consistently with previous literature results. When assessed against the island site, the bias reduction is partially hindered by the persistent dependency on the distance between ship-based and stationary lidar, indicating that larger ERA5 bias reduction requires a closer instrument for calibration.

Overall, the manuscript is well written, the problem is clearly stated and addressed rigorously. I only have few minor comments before recommending this article for publication.

Specific comments

- **Line 90**: Please provide further details on the choice of calibration time window (length, consistency throughout the campaign, possible sensitivity of the results on this parameter, etc.).
- **Line 129**: The chosen values of elevation angles seem significantly shallow and may induce inaccurate wind speed estimates if the flow is inhomogeneous within the scanning cone. Please provide more details on the terrain surrounding the stationary site.
- **Figure 2**: I suggest improving this figure by adding mean wind speed and data availability from the ship-based lidar to have a direct comparison of wind resources at the stationary and offshore sites.
- **Line 162**: Are the error metrics defined between ERA5 and ship-based measurements? If so, please state it.
- **Figure 3**: I suggest modifying the color map to have different colors at the edges of the measured interval. Right now, the curve referring to 270 m is indistinguishable from the one referring to 60 m.
- **Line 211-212**: I am not sure about this explanation. In analogy to the temporal coordinate, including more de-correlated information in the optimal selection of R_{xy}

should increase the RMSE. On the other hand, 90 km might be the length scale of the dominant meso-scale pattern driving the wind resources at the offshore site (in analogy to 0.5 h in time), thus providing the lowest RMSE.

- **Figure 5**: Please add a color bar to quantify the occurrence of each event.
- **Lines 249-251**: The low ERA5 resolution close to the shoreline is a reasonable explanation. However, it could also be due to different meso-scale wind patterns occurring at the shores as opposed to the offshore area. Maybe examining the wind roses (or wind direction time series) at the shores vs. offshore could clarify this point.
- **Line 280**: In addition to the distance from the shore, I wonder if the RMSE also depends on reproducing different wind patterns occurring at hourly or monthly time scale. Given the remarkable length of the observational campaign, this is something that should be verified.

Technical comments

- **Line 36**: Please add a space between the full stop and "Since".
- **Line 80**: I guess you refer to Q_{raw} and Q_{cal} instead of only Q_{raw}.
- **Figure 8**: Please revise the equation defining the percentage improvement of MAE.
- **Lines 303-304**: Please remove these lines as they are a repetition of the previous ones.