Reviewer comments on the paper

Assessing the Accuracy of a Three-Year High-Resolution Mesoscale Wind Farm Wake Simulation with Lidar and Satellite Radar Data

General comments

First of all, I commend the authors for conducting such a thorough revision of their work. I can see many changes in the revised manuscript in response to my comments and those of the other reviewers.

I am mostly satisfied with their excellent responses, but have a few minor comments for consideration. The most important point: please consider the simultaneous roles of momentum extraction (and its dependence on wind speed) and wake recovery in the wake length discussions. The wake recovery is well described in the paper, but momentum extraction is a missing piece in describing the new Figure 15. Please adjust the Conclusions accordingly with any new insights.

Minor comments

1) It would be good to specify what threshold you use to define the extent of the region affected by blockage (1%, 5%?). For instance, here: **"For NE wind directions (Figure 13), the blockage effect is also visible, though it is confined to a smaller region, approximately 2 to 3 km upstream of the Borssele wind farm."**

2) My understanding is that a more pronounced wake recovery leads to shorter wakes. Thus, it cannot be the reason for the longer wakes. Please consider the variability in thrust force with wind speed. Faster winds should produce stronger wakes (and wake recovery). This comment is based on the following statement: **"When the flow transitions to higher wind speeds (above 5 m s−1), the wake structures become more coherent, with more pronounced wake recovery areas, leading to overall longer wake lengths (see Table 6)."**

3) Similar to the comment above, you included the following in the revised paper: **"Greater wind speed magnitudes are associated with more pronounced downstream wind speed deficits (see Figures 12 and 13), as higher wind speeds in this region occur more frequently under neutral to stable conditions. Under these regimes, particularly during stable conditions, reduced turbulent mixing limits wake recovery, leading to enhanced and more persistent wakes [Rosencrans et al., 2024; Ali et al., 2023; Siedersleben et al., 2020]. The transition toward neutral and stable ABL conditions with increasing wind**

speed may contribute to the higher cRMSE values observed in Tables 4 and 5, as these regimes are associated with enhanced shear." Here, it is important to separate the extraction of momentum within the wind farm and its recovery downstream. Examining Figure 15 is the key. You can see that for wind speeds greater than 5 m/s, the intra-farm area has a much darker shade of blue. This reveals that the cases with less than 5 m/s extract less momentum. Following the rule that the thrust force increases with wind speed squared, the cases with wind speeds greater than 5 m/s will extract more momentum and thus create a stronger deficit. Now, the part you well stated comes into play: depending on the atmospheric stability (which has a correlation with the wind speed classes) the wakes recover differently. Thus, I find it necessary to include the momentum extraction aspect in the discussion and clearly establish that the wake length depends both on the momentum extraction within the wind farm and wake recovery.