

Reply to the Associate Editor

*** "RMSE" should not be in italics; it is not a symbol, but an abbreviation. This also holds for TKE in equation 2, and C_{TKE} , etc. TKE is again an abbreviation that should not be in italics.**

The entire manuscript has been reviewed and the style of the abbreviations has been corrected.

*** It will be nice to see the area that was used to make the average in Figure 3; maybe you should overlay Figure 2.**

Figure 2 has been revised to illustrate the area used to compute the wind speed average presented in Figure 3. The following text has been added to the caption of Figure 2:

"The grey shaded region within the North Sea denotes the area employed for the statistical validation of the 10 m wind field described in Sect 4.2."

The note on near-coast region exclusion was moved from the Figure 3 caption to the main text at L276:

"Due to the coarse resolution of the ASCAT dataset, near-coast areas with mixed land–sea regions were masked in all datasets, leaving only the open-sea wind field for comparison, as indicated by the shaded area within the North Sea in Figure 2."

*** In Figure 2 and throughout the text. EMODnet shows the spatial distribution of wind farm areas. This does not mean the entire area will be used for a large wind farm; it means it is designated for wind farm construction. I suggest you clarify this point and confirm that you made that assumption. For inspiration, see <https://ens.dk/media/6393/download>, which outlines 4 scenarios.**

Indeed, wake effects can vary depending on the construction area location. We have added a full paragraph to Section 2.2 ('Wind farm metadata') detailing our assumptions regarding this aspect:

"EMODnet metadata provide wind farm areas relative to the planned areas, which does not necessarily correspond to the actual construction areas. Details on turbine distribution, density, and the precise location of the construction area were not available, at least at the time of EMODnet data acquisition. Wake and its effects may vary depending on turbine distribution and location. In this work, we assume that turbines are evenly distributed across their respective planned areas."

Additionally, in Section 3.3 ('Wind farm scenarios'), the strategy for determining the number of turbines used in the simulations is explained more clearly in L205:

"Except for the Control and Chronological simulations, all simulations assume a total installed capacity of 150 GW. To achieve this, the power density varies between simulations, with the number of turbines adjusted accordingly in each case."

*** Caption of Figure 8: It will be good to mention that these are "simulated" power curves. This might also apply to other figure captions.**

All figure captions were revised and reformulated to improve the description of the data sources. Accordingly, the captions of Figures 2, 3, 5, 8, and 9, as well as Tables 6 and 8, were amended.

*** L411: MW/km⁻². The slash should not be there.**

The units has been corrected. The text in L441 now reads:

“... with capacity densities from 3.5 to 10 MW km⁻².”

*** L487: "We thank the two..." At the end, there were three reviewers.**

The number of reviewers has been corrected.

*** L490: "Proceedings of the 5th Wind Energy Science Conference... ". Is that actually a reference?**

L38, where the conference is mentioned, has been revised to clarify its relevance, making the entry in the reference section unnecessary. L38 now reads:

“Numerous observational and numerical studies have examined the implications of wake effects, particularly within the energy sector, where power output losses play a significant role in economic planning. This remains a state-of-the-art topic, as highlighted by several contributions at the 5th Wind Energy Science Conference (WESC 2025).”