Manuscript WES-2021-159

File: wes-2021-159-RC2-supplement.pdf

We thank the reviewer RC2 for reading the manuscript and for the constructive comments and suggestions for improvements. The original reviewer's comments are in black bold, and our response is in black italic font.
Beside the current file for the answers to the reviewer, an additional pdf file is attached which refers to the new pdf version of the paper after considering the reviewer's comments. Our changes to the manuscript are additionally presented in blue.

General comment

I commend the great work done by the authors, especially for the collection of lidar and airborne data. In my opinion, the title of this manuscript is misleading, indeed the reader is going to expect a detailed analysis of state-of-the-art lidar scans to investigate the wind field between wind turbine arrays, while the main focus of the work is an intercomparison between lidar and WRF wind speed at hub height for different wind directions and atmospheric stability regimes, which of course has a more limited scientific interest. Therefore, I am a bit confused about the main insight that this manuscript would convey. At this stage, this manuscript reads more as a technical report rather than a scientific paper. The novelty of this work, if any, should be better emphasized in the manuscript, and discussed in detail.

We agree that the focus can be expressed more clearly and could give the reader a wrong idea. Now, we changed the title to: "Offshore wind farm cluster wakes as observed by a long-range scanning wind lidar measurements and mesoscale modeling"
We adjusted the abstract to make clear that the focus of the paper. We still think that the manuscript is very useful for the deployment of this relative novel technique in offshore wind energy. Now we included a discussion section where we discuss the novelty of this study.

1. **L 110-115 - How the various atmospheric stability classes are defined based on the lapse rate? Please provide references as well.**

There is no clear agreement in the literature on the limit of lapse rate values around neutrality, and for the offshore environment it is even more difficult. We decided to use ±0.04 as a possible limit to filter the data into different stability classes. We have included a reference that gives an overview of this issue and uses a similar limit to ours.

2. **Fig. 8a - I am not sure it makes sense to generate a color map from the linear interpolation of the data collected over the transects. I think it would more informative to show the map with the transect locations and overlap the wind data with linear plots.**

Yes, you are right. We were aware of that, and we use this method as a qualitative inspection of the spatial distribution of the wake. However, now we plot again the flight legs data without any interpolation (see Figure 8a).

In Figure 8b we use just the data as measured by the flight using a leg that was passing by the scanning lidar position. The leg position is now clearly shown in Figure 8a to avoid any confusion.

3. **Fig. 10 b - I would plot the experimental probability density functions of the wind data, then overlap the respective Weibull distribution and/or the Weibull factors, as reported in the legend.**

Thank you for your suggestion. Now a plot with the data and their fit can be found in the appendix B to avoid a large number of graphs in the main text.

4. **L 318 – "The strong fluctuations in the wind speed of the lidar data in region R1 are due to the very small amount of data in neutral stratification" Can you try to quantify the accuracy of the data through any statistical approach, e.g. error on the mean or percentiles obtained through bootstrapping?**

Here we are not saying that the lidar data is in error, but rather that we do not have enough data. For a quantification of uncertainties in the lidar data, please see the appendix A.