Authors Response to Review (reviewer 2)

Ivanell et al.

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The authors thank the reviewer for the time taken reviewing the paper and the helpful comments. This document specifies the modifications made according to the comments received by the reviewer. All changes are highlighted in a separate pdf for simplicity in parallel to the new (clean) version of the manuscript. In this document, we also comment on and discuss each review point made by the reviewer.

The input of the reviewer has improved the quality of the paper, we thank the reviewer for all contributions.

In addition, the results from DTU have been updated due to the identification of a bug.

Sincerely,

Authors

Reviewer 2

In this work, the authors investigated the impacts of atmospheric boundary layer (ABL) height and capping inversion layer thickness on wind plant performance. It is an important topic considering the continuing growth of wind plant sizes. One strong point of the work lies on the inclusions of results from different models and different codes. Specific comments are as follows:

1. The work focus on the power output and mean streamwise velocity. As the momentum entrainment in the vertical direction plays an important role on the wake flow recovery, and therefore the wind farm performance. It is necessary to examine turbulence statistics around the top tip of the rotor for different ABL heights and capping inversion layer thicknesses.

#Response#: The authors thank the reviewer for identifying the importance of the topic. We do agree with the reviewer that the entrainment is a very important aspect of wind farm flows. However, that has not been the focus of this paper, where the primary focus is to investigate how the farm efficiency depends on the boundary layer height. This is of course dependent of lateral and vertical entrainment. In this case, with the different level of boundary layer height, the vertical is of most interest. We refer, e.g., to Lanzilao Meyers (2024), where this type of analysis has already been thoroughly made. In the current study, we focus on model inter comparison rather and try to avoid repeating too much of this earlier work, so that the manuscript do not become overly long.

2. There are several concerns regrading the conclusion, i.e., "the sensitivity of using different levels of modeling fidelity and numerical approaches overall is limited since the result generally show good agreement.", drawn in section 5: (1) the overall good agreement among the several codes employed in this work may not be enough to conclude that the sensitivity is limited;

(2) moreover, works in the literature have shown that recovery rates of wake flows depend on turbulence models and wind turbine models employed; and (3) it needs to be clear about for which quantities, the sensitivity is limited.

#Response#: We agree with the reviewer that the statement was too strong. This has been modified and moved to the discussion part instead of the conclusion.

3. Differences among different codes are larger for the H150 case and the H500 case in comparison with the H500-dh500 case (figures 6, 13-15). It is suggested to discuss the underlying reasons.

#Response#: Thank you for pointing this out. This is because DTU and UU did not simulate the H500-dh500 case, so there are fewer results to compare for this case. Consequently, the results in Figure 6 and 15 are less different compared to those in Figures 4, 5, 13 and 14. The additional comment has been added in the manuscript as follows: "Since DTU and UU did not simulate the H500-dh500 case, fewer results are available for comparison, which makes the results in Figure 15 appear less different than those in Figures 13 and 14.".

4. It is necessary to use the same naming convention for legends of different codes. For instance, "DNV-RANS, DTU-LES, ..."are employed in figure 12, while "NDV, DTU, ..." are employed in figure 13. It is suggested to use those in figure 12.

#Response#: The legends have been corrected as suggested by the reviewer.

5. For the caption of each figure, make it self-explained. For instance, it is suggested to add the descriptions for each subfigure in figure 2.

#Response#: Labels in each subfigure in Figure 2 have been added.

6. A typo on line 258: "caes"

#Response#: This has been corrected to "cases".