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Interactive comment on "A Large-Eddy Simulation Approach for Wind Turbine Wakes and its Verification with Wind Tunnel Measurements" *by* Jiangang Wang et al.

Anonymous Referee #2

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Summary The paper compares wind tunnel experiments of a wind turbine with large-eddy simulations using an actuator line model. The results are interesting, however, the reviewer suggests a major revision before publication in WES. There are various improvements that need to be made before the paper is ready for publication.

The paper is too long and there are many unnecessary details about the simulations that do not need to be there. Also, the authors missed many references in the introduction, although some of them were cited later during the discussion of the results. The authors should collapse many of the sections and instead of explaining all the details about linear solver, etc, they should just cite the appropriate references. Many of the

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Discussion paper

details are not relevant to the findings in the paper.

The authors conclude that the main differences in power and thrust between experiment and simulations come from the blade polars. However, it looks more like the differences are coming from turbine parametrization, such as epsilon, integral sampling, etc.

Specific comments:

In the introduction, when talking about ALM, the authors are missing some references. Please cite the original reference of the ALM (Sorensen and Shen 2002). There are good guidelines in the literature for choosing the appropriate tuning parameters for the ALM, but they require very fine grid resolutions (Jha et al JSEE 2014, Martinez et al WE 2017, etc). Also, the effect of nacelle and tower has been studied by many (Churchfield et al AIAA 2015, Santoni et al. WE 2017, Stevens et al, RE 2018, Yang and Sotiropoulos WE 2018, etc).

In the section Sub-grid scale model, there are no references to the work of others. The effect of SGS model and Smagorinsky coefficient on wind turbine wakes has been studied before (Sarlak et al RE 2015, Martinez et al. JRSE 2018, etc).

The section “Numerical discretization and solution of the resulting linear systems” seems to give too much information and not all of it is necessary. This section should be cleaned up.

In the section “Computational mesh” there is a complicated explanation about wall model and y plus. I believe this explanation is not needed and the authors can just mention that a wall model is used.

Figure 2: Why is the velocity not symmetric about y=0?

“Baseline simulation and parameter tuning” It is not clear how the optimal parameters were chosen. Do these values agree with the optimal values found in the literature? Please add this to the discussion.

Figure 5: Please move the legend outside of the figures. It would be best to just show the spanwise profiles in this figure (y/D). If it is needed, another figure showing the wall normal direction (z/D) can be added.

Figure 6: Can you make the plots wider, such that differences are shown better?

“Power derating” The authors conclude that the difference in polars is causing the differences in power. It seems unlikely that the polars would change much over the small Reynolds number variations seen by the blade. It seems that these differences are more due to the turbine parametrizations (epsilon, integral sampling, etc).

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