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comment

# *Interactive comment on* "Lidar measurements of yawed wind turbine wakes: characterisation and validation of analytical models" *by* Peter Brugger et al.

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Received and published: 23 June 2020

This paper describes a useful set of measurements used to examine wake deflection. Overall it is interesting and has a good message. It could be improved to make it substantially easier to follow and compare the different cases and data sets and models. A data access statement is required by journal policy.

Please see comments below.

Introduction: Could this be quantitative? Rather than listing the papers, wouldn't it be helpful if the introduction gave a background in terms of answering: How big are

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Discussion paper

power losses due to wakes? What could be expected in terms of the gains from wake steering? What have other modeling studies and the few available field studies indicated are those magnitudes? You could then follow up in the conclusions to evaluate whether a consensus is being reached on the viability of wake steering for power gain for example.

Figure 1. The google map figure needs a scale.

Figure 2 needs an idea at least of how LONG a measurement period this represents. Is it the whole data period i.e. six months of data, from every direction?, every wind speed and turbulence condition ? is it a case study?

Section 2: How was the target yaw offset determined? How were the wind directions determined from the lidar data? What is the purpose of the analytical models? (beyond 'comparison with data'? what is the objective?) Please elaborate why and how you used the models. What are the errors in the wind speed direction comparison? How does that propagate into the uncertainty in the wake deflection analysis?

Section 3.2 How were these wake deflection cases selected? Are you saying it is an analysis of all of the data from January to April?

Please rewrite this section to help readers understand what you mean? What is a favorite in this context?

'First, the wake deflection is verified for non-yawed control cases, where no wake deflection is expected. The distribution of the normalized wake deflection using theWindIris has a RMSE of 0:08 (Fig. 9a) and using the wind direction of theWindCube with the nacelle position of T2 provides a RMSE of 0:07 (Fig. 9b). These errors agree with the RMSE of the yaw angle between 235 the two instruments (4sin(1:30_) = 0:09) and both distributions have mean value that is not significantly different from zero. The consistency between the yaw angle errors and wake deflection distribution shows that the wake scanning and its spatial positioning were working well, and the absence

of a bias shows that the alignment of the wake scanning lidar with the rotor axis is correct (the measured offset of 0:15_ during the installation was taken into account in the processing). Since we could not identify a clear favourite between the WindIris and the WindCube for the yaw angle, the average of both will be used for 240 the remainder of the article.'

Figure 7. Please add some quantitative comparison e.g. correlation coefficients, RMSE? How many measurements are included? Or excluded? How were they selected? It looks like about 30 measured points?

Figure 8. This figure is probably key but again its very difficult to understand. Describe how you chose this case, describe how and where the measurements are located, describe how and where the models were implanted including the derivation of the freestream and its errors. Is tis a totally random case? Was it selected for some specific purpose?

Can you start by laying out the various cases in a table ? Are there are examples, wake steering cases and the complete data set. Are there more? Like the wide case and the narrow case? It is difficult to follow and make comparisons. All of the comparisons should be in a table with the model results to allow a better evaluation? So for example, how does Table 2 compare with Table 1?

In the conclusions please evaluate this study in terms of: 1) Measurement errors vs model errors 2) Magnitude of wake steering vs errors 3) Comparison with other data sets – what is the overall assessment in terms of the viability of wake steering.

Please provide a data access statement.

Please check for typos.

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Interactive comment on Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2020-73, 2020.