

Wind Energ. Sci. Discuss., referee comment RC1
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Review of “Experimental results of wake steering using fixed angles” by Fleming et al. (wes-2021-32)

Anonymous Referee #1

Referee comment on "Experimental results of wake steering using fixed angles" by Paul Fleming et al., Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2021-32-RC1>, 2021

General comments:

This research article investigates wake steering with fixed yaw offset in a commercial wind farm. The use of fixed yaw offsets allows for comparison with wake model predictions, which is valuable for further confidence in the models and future implementation in optimized wake steering algorithms.

In this article power ratios from a commercial wind farm are compared to model predictions from the newest version of the FLORIS model, which generally shows very good agreement with the SCADA results assessed from the turbines. Although there still seem to be some uncertainties related to offsets in wind direction, the reasoning for the implemented correction seems logical and the presented results show good agreement with model predictions. The influence of second-order effects in the wake model predictions, such as the asymmetry in wake steering, secondary steering and the yaw added wake recovery due to Gauss-curl is discussed. Furthermore, the results are comprehensively discussed with results from simulations and wind tunnel experiments.

Some important details about the wind turbines and farm setup are sparsely described, which might be due to restrictions from the farm operator. If this is the case, it gives some limitations to the repeatability of the work. However, the presented work is assessed to be an important contribution on the way to implementing optimized wind farm control in practice. Overall, I recommend this article for publication. I have only some minor comments, most of which are insignificant technical corrections.

Specific comments:

P3.L62. "Results show agreement between model predictions and measured results." This sentence sounds very conclusive to end the introduction. Maybe reformulate "This research article will investigate agreement between ..."?

P3.L64. Test site overview: very good description of the turbine setup, but I could not find any information about the type and size of the wind turbines itself. I guess this information might underlie confidentiality agreement with the farm owner, but – if possible – some basic info about the approximate rotor diameter, rated power and thrust coefficient would be very useful for comparison with future datasets.

P3.L68. "... two ground-based lidars". Where are these located in/next to the farm? Could the locations be included in Figure 1?

P3.L71. "While 10-minute average data is conventional (...), we believe it can be a challenge...". I do strongly agree to that statement. Can you link this to the statement on P10.L170?

P4."Figure 2" It took me some time to figure out the different offsets you measured. Would it be possible to include "compass direction" "vane direction" and "real wind direction" in the figure?

P5."Figure 3. FLORIS model..." Is it possible to include the turbine numbers also in this figure?

Technical corrections:

P1.L23. "... necessary that the models **are** computationally efficient."

P2.L24. "... (FLORIS) software framework (Laboratory (2019)) ...". Looks like the automatic referencing interpreted "laboratory" as an author's last name. Change to "NREL" or similar

P7.L111. "Table A1". I assume "Table 2" is the correct reference here.

P8.L148. "Table A1". As above I assume "Table 2" is the correct reference here.

P10.L171. "...energy ratio nadir". I am not sure if "nadir" is a typo or has a meaning here.

P11.L209. "...correlated (such as turbulence level?) Perhaps both?". This sentence is somewhat informal. Could you reformulate? I do however agree with the interpretation of these effects.

P13.L229. "...are critical.Boccolini et al. (2021)". Revise punctuation.

P18. "Table A1. Summary of selv- and reference measured offsets by target". I assume the capture text is not correct as it is the same as for "Table 2".