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Atmospheric Measurement Techniques Discussions

Interactive comment on "Automated Wind Turbine Wake Characterization in Complex Terrain" *by* Rebecca J. Barthelmie and Sara C. Pryor

Rebecca J. Barthelmie and Sara C. Pryor

rb737@cornell.edu

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Responses begin with » See also tracked changes version of the manuscript (attached)

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-461, 2019 Interactive comment on "Automated Wind Turbine Wake Characterization in Complex Terrain" by Rebecca J. Barthelmie and Sara C. Pryor Anonymous Referee #2 Received and published: 12 March 2019 The study mainly focuses on detecting the height of the wake center through a research measurement campaign in a complex site, Perdigao, Portugal. The results are novel and interesting, I recommend for publication. My major and minor comments are listed below.

Major Comments: âĂŤâĂŤâĂŤâĂŤâĂŤâĂŤâĂŤâĂŤâĂŤ - In your sentences ": : :the remain-

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ing 33% could not be categorized either by the algorithm or subjectively, mainly due to the complexity of the background flow." Don't you think this percentage is a bit high? I think the information about such situations should be put into a clearer definition. In which cases the categorization is failed? Is it possible to enlarge the comments on the issue? »P22.L15. Yes. We improved the wording on this. The new wording reads: 'There are several types of D case. The most common is that it not possible to distinguish a centre of velocity deficit from the complexity of the background flow (Type D, Figure 12d), sometimes because what could potentially be the wake is split. However, in most of these cases there are other areas of much lower velocity present in the scan. The example of a case D type shown in Figure 12d is very typical of the flow complexity with weak upslope/downslope flow to the right/left of the centreline to the wind turbine (shown as lateral distance =0). This flow pattern persisted for many consecutive time periods and thus appears to represent micro-scale topographic forcing of the flow (see slope variability in Figure 1). Naturally, not all case D wake types are reflective of flow complexity. There are also a few cases where the velocity deficit is not present, use of SCADA data might remove some of these cases as it is possible that the wind turbine was not operating during all 10-minute periods.' - It is also not clear to me why the initial free-stream in the code sometimes cannot be assigned. I am guessing, these cases are within the mentioned 33%. How do you assume that the free-stream value derived from the radial velocity of the measured line of sight direction is sometimes valid and sometimes not?

»We've added some wording on this to explain it more clearly. In essence, there are some cases where there is not a strong enough signal to return a wind speed at distances > 1 km. »p11. l28. ' However, for some periods with low clouds/rain there are insufficient returned wind speeds at this distance (∼1 km) to proceed.'

- Do you find any similarities or differences between your results/measurements and the two experimental works done within the Larsen et al., 2008 study (Dynamic wake meandering modeling, Risoe-R, No. 1607(EN)? » There is not much similarity because

we’re focusing on the location of the wake center in the vertical plane whereas Larsen et el in this study focus more on the lateral movement. Our plan is next to analysis the horizontal/lateral movement so thanks for the reference. It would be really interesting to test out the wake meandering model on this dataset.

Minor comments: âĂŤâĂŤâĂŤâĂŤâĂŤâĂŤâĂŤâĂŤ - Although figure 1 is a good work of combining many information together I would prefer the line of sight lines "joined". Current view does not give any information due to the color mixed anyway. Furthermore, maybe a zoomed-in 2D plot of a line of sight vector plot might be helpful. »We’ve added a scan view plot of the 15ïĆř elevation scan to show the scan pattern more clearly but the points are important because they show the location of each range gate.

- Equation 4: k sign should be as it was defined in page 3 line 11 (_), because “k” will be used for the rate of expansion later at Page 5 Line 14. »Thanks for pointing that out it has been changed in Equation 4.

- In figure 2 and 14, your turbine sketches are downwind turbines, but 2 MW Enercon E-82 is an upwind turbine. One can misunderstand the setup. »Thanks for pointing that out it has been changed on Figure 2 and 14. We’ve also changed it on Figure 16.

Please also note the supplement to this comment:
https://www.atmos-meas-tech-discuss.net/amt-2018-461/amt-2018-461-AC2-supplement.pdf

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