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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

Anonymous Referee #1

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In this manuscript, new analyses from the Perdigao experiment are presented. Specifically, the authors analyzed lidar measurements carried out for different wind conditions and atmospheric stability conditions. A procedure for automatic detection of wake centers from lidar measurements is proposed. This work in novel and of high interest for the wind energy community. Some results are in contrast with a previous study from the Perdigao experiment (Menke et al., 2018a), which may deserve a deeper discussion.

A very comprehensive introduction on flows over complex topography is provided in Sect. 1, followed by a description of the test site. An interesting discussion about optimal design of lidar scans is presented in Sect. 3.1. However, the selection of the used scanning parameters is not clearly justified (P8, LL 35-43). In Sect. 3, the use of the narrow PPI scans to define the background flow in not clear. I guess some details

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are missing in the description of the flow analysis.

This paper states that higher wake centers are observed under stable conditions and lower under convective conditions, which is the opposite of the previous results from Menke et al., 2018a. A more detailed comparison between these two works should be provided. One of the motivations for this disagreement is that the LiDAR scans performed for this work penetrate deeper into the valley and, indeed, the wake flow evolving within the inner layer should have been measured. However, the wake centers are still in the middle/outer layer, if I am not mistaken. I suggest to provide a clearer description of the results presented in these two works, their differences and motivations for this disagreement. More details are listed below.

Comments: 1. Table 1. I am not sure retrieval of all the parameters in Table 1 is described in the text. For instance, provide details how z0 is calculated.

2. P8, L 22, what is an arc scan? A PPI scan over an azimuthal range smaller than 360 degrees? Please specify.

3. IMPORTANT: The deviation in wind direction between met-tower and lidar data is a bit puzzling. Please provide more details why such big discrepancy between the two measurement techniques, which I am not sure is only a consequence of the complex topography.

4. P3, L11: equation "(X D $\pm$ 2)" might be incomplete.

5. Fig. 4. Cross-check this figure. There are few typos in this chart.

6. P24 – Figure 13: cross-check median z/L of Case A in the bottom plot (-0.22 instead if 0.22)

7. P25. These results on the height of the wake center are very interesting. In particular, it is interesting that these results are in contrast to those of Menke et al. 2018a, which are related to the same field campaign. I guess a more detailed discussion should be provided to understand possible justifications for these discrepancies.

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