Dear Dr. Iungo,

Thank you very much for the critical and in-depth review of our manuscript. It has an overall positive tone, but convincingly addresses some shortcomings of the paper that can be improved to prepare it for publication in the Wind Energy Science journal. Below we will address each of your comments separately.

1. P1 L21: I agree that a wind tunnel provides the great advantage of fixing different flow parameters, such as speed and turbulence intensity. However, I would mention that we should be able to reproduce the wind field variability consequent to the daily cycle of the atmospheric static stability, or mimic a realistic wind rose.

   It is indeed good to mention this drawback of measuring in a wind tunnel. Therefore we added the sentence ,*Please note that one of the shortcomings of measuring in a wind tunnel as opposed to free-field measurements is the ability of simulating the variability of atmospheric stability and a representative wind rose.'*.

2. Sect. 1: I would suggest to expand this introduction to an overview of the most relevant works focused on characterization of wind turbine wakes both for utility scale wind turbines and wind turbine models, which have been performed with different measurement techniques.

   We will add some references that give an overview of the state-of-the-art research being done on wind turbine wake characterisation in both the free-field and in wind tunnel experiments. However, we would like to stress that the objective of this paper is not to do an extensive wake analysis, but it uses wake measurement to provide an interesting and relevant example. This objective will be highlighted more clearly (see your **comment #3**).

3. Sect 1: Add a paragraph to state clearly the aims of this project and the scientific questions you are attempting to address. I guess the main focus will be assessing the capabilities of continuous lidar to measure wind speed and turbulence in a wind tunnel environment.

   You are right. At the end of the introduction, we now added the objective as the sentence ,*The objective is to assess the capabilities of continuous-wave short-range lidar to map wind flows and measure turbulence in a wind tunnel.'*.

4. Sect 1: Add at the end of the section a description of the structure of the paper.

   The structure of the paper will be included at the end of the introduction.

5. P2 L15: Add some references for the wind turbine models and wind energy projects performed at the wind tunnel of PoliMi.

   We believe that there are sufficient references included that are related to both the wind tunnel as well as the model wind turbines. However, they were scattered over the paper and are now repeated in the section you mentioned to have a better consistency for reading.

6. P3 L4: In my opinion, it is a bit too simplistic affirming that we can reproduce an ABL flow in a wind tunnel with spires and turbolators. We would need also to reproduce the temperature profile and typical length scales of the coherent structures. I would say that we can reproduce similar vertical profiles of wind speed and turbulence.

   This is true, the sentence might have exaggerated what the turbulence generators are capable of. We changed it to ,*Typical vertical profiles of wind speed and turbulence can be imitated by the use*

of bricks on the floor that act as roughness and turbulence generators, i.e. spires, placed at the chamber inlet at the left boundary.'.

7. P3 L4: Please add a figure reporting the vertical profile of wind speed and turbulence intensity at the beginning of the turntable.

   Unfortunately we did not execute measurements of the vertical profile during this measurement campaign. However, vertical wind profiles for both wind speed and turbulence were measured during a previous campaign, under identical conditions. These plots are added to the manuscript.

8. P4 L9: I would remove "averaged". Each measurement is a sample corresponding to a given sampling frequency.

   The word ‚*averaged*' was replaced by ‚*Doppler spectrum averaged*' to indicate that it is an average over the whole time interval and not just a snap-shot, i.e. the raw signal is actually sampled at 100 MHz, Fourier transformed, and then averaged.

9. P4 L11: Does this lidar have any blind region close to its location?

   There is no blind region close to the lidar, but the optical configuration of the device implies a minimum and maximum possible focus distance. To improve the clarity, the sentence was changed to ‚*The measurement range is defined by the optical configuration of the device, which enables motor controlled focus distance between about 9 m and 150 m.*'.

10. P4 L19: I think the setup and installation of the lidars in the wind tunnel is not described in detail. It would be interesting for the reader learning about the procedure you applied for the positioning and pointing of the two lidars.

    The procedure for installation and calibration of the lidar has now been extended significantly, in order to have a more complete explanation.

11. P4 L27-28: In my opinion the elevation angle of 3° rather than a contamination from the w velocity, implies an under-estimation of the u- and v-velocities. It will be interesting to quantify error introduced on the horizontal velocities through the uncertainty analysis discussed later in Sect. 3.4.

    Indeed this would be very interesting and other reviewers also mentioned the possible bias in the horizontal wind speed components caused by neglecting the vertical wind component. This will be investigated further by means of uncertainty analysis.

12. P5 L9-13. Did you use the Dantec software for the calibration or do you have your own calibration procedure? In the second case, please provide a description and references.

    The Dantec hot-wire probes were calibrated according to their factory software and manual. The procedure is now explained in detail and a reference is provided.

13. P6 L5-11: It would have been interesting to estimate effects of the probe length on the turbulence statistics by varying the distance between the lidar and the measurement point. Do you have any available data to address this point?

    This would be very interesting indeed. We admit that there is a high dependency on the capability of measuring small-scale turbulence and the probe length, the latter of which increases quadratically with the focus distance. However at this point there is no such data set with which we can assess this issue.

14. P7 L1-3: The characteristics of the incoming velocity field should be reported in Sect. 2.1. Please provide a figure with the vertical profile of velocity, turbulence intensity and integral length scale of the wind tunnel flow.

    We now shifted the information about the wind tunnel inflow velocity and turbulence intensity to section 2.1. Also, as we answered to your **comment #7**, we included vertical profiles of wind speed and turbulence from a previous campaign executed under identical conditions and wind tunnel settings.

15. P7 L6-10. It would be more effective to show a chunk of velocity signals for both anemometer and lidar showing the different filtering steps starting from the raw data. Something like Fig. 10, but starting from the initial sampling frequency of the two instruments.

    We now included the time series for the 390 Hz u- and v-components as well, before averaging them to 1 Hz time series.

16. Table 1: I would add to the statistics skewness and kurtosis in order to learn more from the statistical behavior of the two signals. Furthermore I would provide statistics for the raw signals (with their sampling frequency), and after 1-s averaging.

    The statistical parameters skewness and kurtosis have been added to the table. Also an additional table with the statistics of the 1 Hz averaged time series has been included in addition.

17. Fig. 16. I am not sure if you clarify a significant energy damping for frequencies lower than 28 Hz. I guess you should emphasize that the size of the virtual measurement volume might be much larger than 0.1 m and it's a function of the relative angle between the two-laser beams. A more detailed discussion in this direction may help to better clarify this disagreement with the theoretical expectations.

    We clarified the observed behaviour with the text ,*The drop in the slope of the spectrum does not exactly coincide with the 28 Hz frequency mark, because the intrinsic Lorentzian spatial weighting function of a continuous-wave lidar extends beyond the defined bounds of the probe length, therefore also acting as a filter on lower frequencies. The effect of spatial weighting is explained in detail by Sjöholm et al. (2009). Also combining measurements from two lidars that each have a different probe volume causes an even larger effect of averaging out small turbulence scales over a more complex x-shaped volume (see Fig. 4).'.* We believe that this should be sufficient to understand that frequencies lower than 28 Hz are already affected by the volume averaging effect.