Author's Response to Interactive comment from V. Kumer

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The authors thank Dr. Kumer for her enthusiasm for this contribution as well as her thoughtful and productive comments.

General comments: The paper is presented clearly and is of great scientific value for on-going research, as it improves the understanding and interpretations of DBS measurements in wind turbine wake environments.

We are pleased that this work is considered useful.

Specific comments: In section 2.1 on page 9325 the wind speed deficit is increasing from 60% at 3D to 75% at 7D. These calculations are a bit unclear to me, as figure 2 and figure 3 show an increase of stream-wise velocity as the normalised values increase from uA/uH=0.5 to uA/uH=0.7, so the deficit should become smaller.

Thank you for pointing out this incongruity. The text should state that the wind speed is 60% of the upwind wind speed at 3D, and has recovered to 75% of the upwind speed by 7D.

Corrections to the revised text have been made.

In the presentation of the simulations in section 2, additional contour plots of horizontal

slices would be interesting to see. The plots could include one or two selected sets of four DBS measurements (N, E, S, W) so that it complements the gradients at the wake edge and rotation effects at the central line discussed in section 3.

Thank you for this interesting suggestion. Considering that we have already included ten multi-panel figures, we are reluctant to include more figures without a clear goal for including them. Additionally, our revisions include consideration of the lidar weighting function, which integrates measurements over depths of approximately 20 metres, limiting the utility of horizontal slices.

It would also be interesting to see in section 3 how the estimated error not only changes with averaging period but also with only taking 0.25Hz data. Sathe and Mann (2012) show that the 1Hz data may measure turbulent eddies twice, which could be avoided by reconstructing the wind vector only with 0.25Hz, after a full measurement circle is completed (Kumer et al., 2013)

Because the focus of this paper is on the error introduced by measuring inhomogeneous flow with the DBS method, we have expanded and extended section 3 to include a discussion of the effect of the lidar weighting function on the DBS measurements of wind speed. Although the reviewer's suggestion is an interesting one for the measurement of turbulence spectra in homogeneous flows, we do not find it applicable here because the largest errors are due not to twice-sampling turbulent eddies but rather because of the inhomogeneity in the flow. Sathe and Mann's 2012 work is focused on turbulent spectra in homogeneous flows (as specifically noted in their assumption (1) between equations (10) and (11)).

Technical corrections: There is a typo in equation 2. In the denominator a sinus is missing (2_ instead of 2sin_)

Thank you very much for catching this error, which was introduced in the publication stage.

References

Sathe, A., & Mann, J. (2012). Measurement of turbulence spectra using scanning pulsed wind lidars. Journal of Geophysical Research, 117(D1), D01201. doi:10.1029/2011JD016786

Kumer, V.-M., Grubisic, V., Dorninger, M., Serafin, S., Strauss, L., and Zauner, R.: Turbulence analysis of lidar wind measurements at a wind park in lower Austria, EWEA Proceedings, Vienna, Austria, 4–7 February, 2013, available at: http://proceedings.ewea.org/annual2013/proceedings/Posters/PO_256_EWEA2013presentation.pdf, 2013