

***Interactive comment on* “Spectral correction of turbulent energy damping on wind LiDAR measurements due to range-gate averaging” by Matteo Puccioni and Giacomo Valerio Iungo**

Anonymous Referee #3

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General comments

This manuscript proposes a new method to correct turbulence measurements by Doppler lidar for low-pass filtering due to spatial averaging along the laser path. This is done by a combination of empirical transfer functions with classical Kaimal model spectra. The new approach is similar to commonly-used spectral correction methods for turbulence measurements by sonic anemometers (e.g. Moore, 1986), but at least to my knowledge, this has not been done before in this way for Doppler lidar measurements. The article is generally well written, perhaps a bit lengthy; the structure is clear and the figures are instructive, and the conclusions are drawn correctly. Nevertheless, I have

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two main comments, which are somewhat related:

1) Because Kaimal model spectra are based on surface-layer scaling, the proposed correction is only applicable in the surface layer (on the order of 100 m). This important restriction should be made very clear in the manuscript, because modern Doppler lidars often cover the entire boundary layer (on the order of 1000 m), and do not cover the first ca. 50 m. The authors need to clarify this when describing the scope of this study in the introduction section and also in the discussion and conclusion sections.

2) The literature review in the introduction section is incomplete. Particularly, one important reference is missing (Brugger et al., 2016), which has the same objective of proposing a spectral correction method for Doppler lidars to compensate for spatial averaging along the laser path. However, the underlying approach is very different (Frehlich and Cornman, 2002), which is based on a von Kármán turbulence model. This has the advantage that it is independent of stratification or the driving mechanism of turbulence. The authors need to explain what the differences between the two approaches are, theoretical and practical, disadvantages and advantages, and they also need to justify why they propose this new method. This affects the introduction and also the discussion and conclusion sections.

References

Brugger, P., Träumner, K. and Jung, C.: Evaluation of a procedure to correct spatial averaging in turbulence statistics from a doppler lidar by comparing time series with an ultrasonic anemometer, *J. Atmos. Ocean. Technol.*, 33(10), 2135–2144, doi:10.1175/JTECH-D-15-0136.1, 2016.

Frehlich, R. and Cornman, L.: Estimating spatial velocity statistics with coherent Doppler lidar, *J. Atmos. Ocean. Technol.*, 19(3), 355–366, doi:10.1175/1520-0426-19.3.355, 2002. Moore, C. J.: Frequency response corrections for eddy correlation systems, *Boundary-Layer Meteorol.*, 37(1–2), 17–35, doi:10.1007/BF00122754, 1986.

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