

## ***Interactive comment on “Methodology for deriving the telescope focus function and its uncertainty for a heterodyne pulsed Doppler lidar” by Pyry Pentikäinen et al.***

### **Anonymous Referee #1**

Received and published: 30 January 2020

The manuscript deals with a methodology that can be used to derive the telescopic functions of a pulsed Doppler lidar. The idea is to use the information on the lidars telescopic functions to derive the attenuated backscatter profile from the SNR signal from the wind- lidar. The telescopic functions are estimated by comparing (by iteration) with the attenuated backscatter profile measured by a ceilometer.

After having read the paper several times I am still in doubt whether the methodology is intended for applied use or if is a purely academic exercise. I would like the authors to put more emphasis on the use of wind-lidars in practical applications for the measurements of attenuated backscatter profiles and what can achieved by such

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measurements from wind-lidars.

1) It needs to be clarified why the data filtering is so strong, why are there so few good profiles out of so many available profiles in table 3. Are some of these data simply considered outliers - it is always dangerous to neglect outliers.

2) How much does the improved telescopic functions improve the attenuated backscatter profile as compared to the information from the factory setting of the telescopic functions?

3) How well does the attenuated backscatter profiles determined from the wind lidar SNR profile compare to the profiles observed by ceilometer. Only a few examples are shown in the paper, and a real quantification based on many (all) profiles from these rich data sets would be an considerable improvement to the paper. The main question is if the wind lidar is able on a routine basis to produce reliable profiles of attenuated backscatter profiles. A ceilometer is a very cheap instrument compared to a wind lidar, is it still recommendable to have a ceilometer next to a wind lidar or can the ceilometer be omitted and the backscatter profile determined with sufficient accuracy from the SNR?

Minor remarks

1) Line 28 – page 5. Why is the threshold chosen to be 22.2 dB, the number sounds arbitrary. Why not simply set a very high threshold value for this exercise – e. g. -15 dB, to secure high quality data?

2) Line 28 page 5, If observations below -22.2 dB are discarded, the averaged SNR will be biased – is this accounted for?

3) Line 29 page 5. Explain what is meant by “using interpolation where necessary”.

4) Line 9 page 6. How is the cloud base detected? Do you use a threshold method (if yes what is the threshold) or a more sophisticated method?

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5) Line 17, Page 8: Explain why you expect f-2 to be superior.

6) Why do you mix two parameters for the flagging in Eq. (8), It seems more natural to flag the individual parameter.

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Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-491, 2020.

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