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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Analyzing the turbulence in the Planetary Boundary Layer by the synergic use of remote sensing systems: Doppler wind lidar and aerosol elastic lidar" *by* Gregori de Arruda Moreira et al.

Anonymous Referee #2

Received and published: 25 May 2018

The paper presents different techniques for boundary layer detection with lidar and microwave radiometer. A method for error reduction in Doppler lidar and elastic lidar data is given. The paper is, however, not yet ready for publication. Several major issues must be met before publication:

Major issues:

1.) Different techniques for boundary layer detection are presented. This is however not new. An an actual comparison is not even presented: In all figures, the actual

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Discussion paper

boundary layer height is only shown for the microwave retrieval (stars). I would lilke to see at least one case study, in which all three techniques are shown together. Please put in symbols that indicate the boundary layer development for the Doppler lidar and the elastic lidar methods as well. So far, this information is only given in single profiles, which is not enough. The Doppler lidar also yields measurements of attenuated backscatter, so you actually can compare all three techniques in one case study.

2.) Three different definitions of boundary layer are used in the context of the paper: Thermodynamic (Temperature detected by the Microwave radiometer) Turbulence (Mixing Layer height detected by Doppler lidar) Aerosol load (Aerosol boundary layer and residual layers detected by elastic lidar) What use is it to compare measurements based on these three definitions? What does it mean, if the measurements are in agreement/disagreement?

3.) The message of the paper is not clear. Only the very last sentence refers to the larger meaning of the paper and indicates that something could be done in the context of the EARLINET network. Please elaborate more on why and how these techniques should be used together within EARLINET. What is the overarching goal? Which gaps are filled by the technique?

4.) The paper is of pure technical nature. This is usually not the scope of ACP, more of AMT or an ACP technical note. I leave it up to the associate editor to decide whether the paper may be suitable anyway for the EARLINET special issue.

Minor issues:

- Please update the flowcharts in Figs. 2 and 3 and give them a better layout: What does the blue circle mean? The symbols seem unnecessary. Boxes with text should be used instead. And please try to make the flowcharts in a way that there is a flow of information into one direction. Currently, the pathways are quite convoluted.

- L.281: "do not have significant differences": An actual time-height comparison of

PBLH is not given (see major point 1), so it is hard to assess what "significant" means in this context. There will be deviations, which should be quantified (height difference).

- L.286: "The skewness values obtaiend from RCS give us information about aerosol motion.": There is no way to detect aerosol motion directly with an elastic lidar. If there should be any statistical correlation between aerosol motion and skewness, please give references or discuss in the introduction. Moreira et al. (2018) is cited, but does not appear in the reference list. Please be more thorough, here. This topic is much too complicated to be handled with a single comment. Even if there should be any statistical relationship between backscatter skewness and turbulence it will depend on a lot of assumptions. And the discussion of those would make the paper even more blurry.

Technical corrections:

L. 19: aircrafts -> aircraft L. 25: compare -> compared L. 36: process -> processes L. 61: due to its -> due to their L. 62: "Several kind of tracers" -> I think this refers to the boundary layer height. Please think again about the term "tracers". In the context of this paper it could be misleading. E.g. for a Doppler lidar, aerosol particles are tracers for wind velocity. L. 89: Responsible of -> responsible for L. 94: "MULHACEN": Please describe the abbreviation L.103: Streamline -> If you want to name the instrument it would be nice to also name the sub-type (PRO, SR, XR, ...). The technical differences between the systems can be significant. L.130: PBLH is introduced without description L.189: LALINET: please describe this abbreviation L.229: Errors bars -> Error bars

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