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Atmospheric Measurement Techniques Discussions

Interactive comment on "Lidar measurement of planetary boundary layer height and comparison with microwave profiling radiometer observation" *by* Z. Wang et al.

Anonymous Referee #3

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The paper describes measurement procedures to derive the planetary boundary layer height by combining data of aerosol backscatter lidar with data from microwave radiometer used for deriving temperature profiles. While each of the instrumental techniques is well established, the combined analysis to determine planetary boundary layer height is novel and worth publishing in AMT.

However, the current state of the paper needs considerable revision before publication.

General remarks: The main point of the paper shall be the combination of lidar and microwave data, as given in figures 3 - 5. Often there is good agreement, sometimes not. The paper needs to address better, when differences are small and when not, and

what is the reason for the later.

The selection of measurement dates presented in this paper is not described. Apparently all instruments run (almost) continuously, which shall provide for a much larger data base, than is presented here. Why only selected days are presented, why is there no statistical analysis?

There are 2 lidar instruments mentioned, CE370-2 and MPL-4, but their data is not compared. When is which data used here?

There is a spatial distance between SACOL-Main and SACOL-Lanzhou. How big is it and what's the influence on this analysis? While some BLH results are presented for both stations, the combined methods may be availbel for one only. This needs to be explained and discussed.

Mostly, the term boundary layer height (BHL) is exclusively used for the aerosol mixing layer height as determined by lidar. A definition (or explanation) of different boundary layer height values shall be provided:

- meteorological (wind profile, e.g. from meteorological data, or analyses)

- from temperature profile, as used for the microwave data

- from aerosol backscatter lidar

Each of these methods has drawbacks and they need to be evaluated, before a comparison can be made and additional information can be provided from the combination of these methods.

Please use different terms for BHL for each of these methods, to make clear, from which they have been determined.

There are too many general statements, where just individual data from selected days are shown, for example:

Fig 1 caption can be misleading, it should state: Temporal evolution of aerosol layer height on 2 days in Jan. 2007. It does not necessarily show typical examples during a winter

same for Fig. 2: It shows two examples of the diurnal evolution of BLH (or is it aerosol layer height as in Fig. 1 ?) during summer of 2008

Detailed remarks:

page 1235 line 13: work of Morille et al needs to be explained in a few sentences, before the difference of this method shall be explained.

page 1237 lines 3-4: how is thre1 defined / determined? This needs to be explained.

Examples of CWT1 and CWT2 should be shown, together with the corresponding range corrected backscatter profile.

same for thre2, thre3, thre4: how are they defined and determined? Please be precise here in order to avoid the impression that this calculation is not following an objective procedure.

page 1238: line 8: what does "seems reasonable" mean, who is making such judgement?

page 1239: line 2, 3:

BLH is calculated

1. from lidar data

2. from temperature profiles (from radiometer?)

This needs to be explained much further, here is one of the important aspects of this paper, by bringing together 2 completely independent methods to determine BLH (see general remark above)

Chapter 4 Results:

it needs to be explained, why only 4 days are selected for analysis here, what is special about these days, compared to all other days of measurements? The meteorological situation shall be explained in sentences, not bullets alone, or a table could be used instead.

Page 1240, line 23 What does “true BLH” refer to? Which BLH is true and which one is not? Please avoid such terms and write e.g. BLHaerosol

Page 1241, line 1-3 I cannot follow this statement. If there is no objective method to determine the “correct BLH” from this type of measurements, then they are not very useful at all. The goal of this paper shall be to use the different instruments to resolve just such cases.

Page 1241, chapter 4.3 Please be precise, which lidar data is used here, MPL or CE370? Which SACOL is meant, SACOL-Main or SACOL-Lanzhou?

Line 11, 14: “up limit height” means “upper limit height”?

Again, this chapter is at the centre of this paper, discussing the different methods to determine BLH. It needs to be expanded and clear rules need to be developed, under which conditions which methods appears to be best suited for determining the “correct BLH”.

Page 1241 Line 22: again, which lidar data is used here?

Page 1242 The entrainment zone thickness is a quantity given in meters. Please provide the different results derived from the different instruments not only as formulas, but also as quantities, to better appreciate their variability.

Results from fig. 6 need to be explained in more detail.

Fig. caption of fig. 6 needs to be more specific, what is shown in each sub-figure?

Conclusions:

Line 15:

“The comparison between measured quantity and that predicted by several theories reveals that some consistence exists in them but the difference is also obvious.” Such a sentence is without meaning. You need to detail when consistence exists, and when not and why.

Page 1243: Conclusions drawn here are very important, but they are not supported by results described in chapter 4. Therefore chapter 4 needs to be expanded accordingly.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 1233, 2012.