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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 #2

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The paper is on the determination of the height of the planetary boundary layer (BLH) by means of lidar measurements and application of the continuous wavelet transform method. The retrieved heights are compared to results from numerical models based on the parcel method. The latter allows to determine the entrainment zone; the required information concerning the surface heat flux and the temperature profile are provided from a microwave radiometer and sonic anemometer. The authors retrieve a set of BLHs for Lanzhou and Yuzhong.

The aim of the paper is to describe an improved variant of existing methodologies, and to apply this new approach to data from different seasons for the demonstration of the

potential and the drawbacks. From this point of view it is worthwhile to publish this paper.

However, there a several severe shortcomings that require major revisions.

- The description of the methodology is not as clear as required to understand the different steps ("... are some empirical parameters..."). Maybe a sketch will help: a realistic lidar signal with the different heights H1, H2, H3 as found by the wavelet algorithm, the illustration of the thresholds, the meaning of oldblh and so on. With this sketch it should also be possible to describe the different pitfalls and the corresponding solutions.

- The discussion of the results is poor and not convincing, i.e., several figures are not explained at all or not in a sufficient way (Fig. 2, right panel: no comments in the text; Fig. 5: no discussion at all; Fig. 6: the "lidar part" is not explained). Often, just statements are given, but the interpretation is missing (e.g. Sect. 4.4).

- The reason of the comparison with the model results is not obvious; one would expect sort of a consistency check or validation. It is however not clear how a lidar can measure the entrainment zone (EZ) in a quantitative way. If the thickness of the EZ is an independent information, available from further instruments (microwave radiometer) and with the lidar retrieved BLH, the influence of errors of the BLH on the retrieved thickness of the EZ must be quantified.

- Parts of the conclusions do not meet scientific standards ("...reveals that some consistence exists in them but the difference is also obvious".) This is not a quantitative description of a result!

- Some relevant parts are missing, e.g., details on the instruments (what is the difference between the lidars), the location of the sites (coordinates, distance from each other), or the introduction of Section 4 and 4.1.

- In Sect. 6 the authors state that there is a disagreement between the BLH derived

by the lidar and the microwave radiometer, respectively. What is the conclusion: which one is correct or are both incorrect? In Fig. 4 the authors show some examples of the agreement but do not explain why the differences occur and what could be learnt from them.

Further comments:

The English should be improved.

No information on errors or uncertainties is given; this should be added.

It is not possible to measure "vapor" by a micro-pulse lidar. What is meant?

What is meant by: "...larger than 0.15H1..." in line 15 of page 1240? I don't see H2 and H3 in Fig. 2 (line 23, page 1240).

What does "... represents the relative concentration profiles of atmospheric aerosols" mean (line 20, page 1234)? This is not a correct statement.

The reference list includes a lot of papers not included in the text! E.g., four papers of Emeis are listed but forgotten in the text. If Emeis et al. (2004) is referenced, Wiegner, Emeis et al. (J. Geophys. Res., 111, D13201, doi:10.1029/2005JD006593, 2006) should be added as well (or instead) as it includes a more comprehensive set of instruments and methodologies.

The authors should discuss the relevance of the residual layer for their study.

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