Atmos. Chem. Phys. Discuss., 13, C6131–C6135, 2013
www.atmos-chem-phys-discuss.net/13/C6131/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric boundary layer top height in South Africa: measurements with lidar and radiosonde compared to three atmospheric models" *by* K. Korhonen et al.

Anonymous Referee #1

Received and published: 26 August 2013

This manuscript presents analysis of the atmospheric boundary layer height over the South African site Elandsfontein using lidar and radiosonde measurements and comparisons to model data. In particular the lidar data are valuable as extensive measurements are rare in this part of the earth. However, the recommendation is major revisions of the manuscript before publication in ACP.

General comments:

The intention of the paper is not clear. Is the main component of the manuscript the analysis of the PBL height or the comparisons between lidar, model and radiosonde

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data? The authors should focus on one topic and work it out in more accurateness.

The manuscript is not well structured. A better arrangement of the different topics would lead to a better comprehensibility. This point might be correlated to the missing focus of the paper.

The interpretation of the data is often subjective (e.g. time shifting for comparisons between ECMWF and lidar data; statements like 'detected reliably').

Conclusions are drawn out of the manuscript without justification or links to former studies (e.g. Summary and Conclusion).

Some specific comments:

Page 17410, line3-4: 'only a few ....' This sentence is repeated several times in the manuscript. In my opinion the value of the lidar measurements would not be less if the authors would omit this sentence; especially as the statement is not completely stable considering the number of boundary layer studies over the northern hemisphere.

Introduction: The introduction is in large parts not introductive for a PBL study (e.g. Page 17411, line 25-Page 17412, line 18 dealing with general aerosol lidar studies). References of former studies are missing.

Page 17410, line 18-19: Which are the many methods for measuring the vertically resolved atmospheric properties of the PBL?

Page 17412, line 4: Is the reference to Ansmann et al., 2009 the right one at this time? Perhaps it would be better to give the reference in connection to SAMUM and give a second reference for the vertically profiling (with lidar).

Page 17412, line 8: Give a reference and explanation for SAFARI 2000.

Page 17412, line 13-15: What is the intension of presenting this information? Why do the authors present the analysis of lidar ratios from an instrument (CALIPSO) not able to measure the lidar ratio independently? What is the value of this information

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while talking of the limitations of the elastic backscatter measurement technique in the following sentence?

Page 17412, line 28-29: repetition

Page 17413, line 23: '... and the lowest and the lowest . . .'

Page 17413, line 25: Which are the four major synoptic circulation types? Why are they important? They are not used anymore in the manuscript.

Page 17414, line 18: Give a reference for the long-term climate statistics.

Page 17415, line 25: '. . . typically . . .'; are there others? – Be consistence with radiosonde or radio sounding

Section 3.2: Whow is the PBL height derived? Does the wind direction matter for the comparisons of lidar and radiosonde measurements?

Section 3.3: Give more information and references for the ECMWF model

Section 3.4: Give references for the SAWS model

Section 3.5: What does LAPS and GASP mean?

Section 3.6: Do the authors use level 1 or level 2 data?

Page 17418, line 23-24: This sentence is not clear.

Section 3.7.2: Not understandable. What does major period mean; more than 2 per day? What is for the other periods? What is the intension of this section?

Section 3.7.3: Give references!

Section 4.1: Why can the CALIOP data be used for interpreting the POLLYxt data? In the introduction the authors stated that CALIOP data are not so valuable for boundary layer studies.

Section 4.2: What about daily/monthly/seasonal comparisons? What about the vari-

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ability? What is the value of an annual comparison above 120 km without considering the external conditions (e.g. wind direction)? Why shifting the lidar? What is the value of shifting the lidar data if it does not give a realistic view? What about the deviation due to temporal resolution?

Section 4.3: The conclusions presented in this section are not clear and comprehensible. E.g. results from TAPM and SAWS model data are in the same order and no systematic deviation can be seen for the ECMWF data.

Section 4.4: Mainly repetitions! Line 4-6: Can this conclusion really be drawn from this data set? Line 8-10: This conclusion is not clear! What about January and December? Line 20-23: What is the height of the stacks? Give references for this statement!

Section 4.6: line 14: What does 'detected reliably' mean? This is a subjective conclusion. Line 14-15: What is meant by 'variability'? What is the 'strong anomaly in October'? From Figure 8 only the ECMWF shows a large difference. Line 17: Where does the information about the cloudiness come from? Give references! Line 17: Seasonal or monthly differences?

Subsection 4.6.1: Mainly repetitions! What is meant by 'uncertainties'? Uncertainties or errors are not discussed before. It is crucial to discuss errors and uncertainties of the measurements and the used method. This is missing in this manuscript.

Subsection 4.6.6: Is not the good correlation between POLLYxt and the CALIOP lidar contradictory to the statement earlier in this manuscript, that the CALIOP lidar is not suitable for PBL studies? Which CALIOP data have been used?

Section 5: Line 3-4: Repetition!

Section 6: Page 17432, line 2-3: This was not discussed in the paper! Page 17433, line 19-23: This was not discussed in the paper! Page 17434, line 1-5: How can this conclusion be derived from this manuscript?

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