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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Determination and climatology of the planetary boundary layer height by in-situ and remote sensing methods as well as the COSMO model above the Swiss plateau" *by* M. Collaud Coen et al.

Anonymous Referee #1

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Review of acp-2014-314:

Determination and climatology of the planetary boundary layer height by in-situ and remote sensing methods as well as the COSMO model above the Swiss plateau. by M. Collaud Coen et al.

General comments: The study investigates different methods, applied to different instruments and the COSMO model, for the determination of the planetary boundary layer height. The study based on the analysis of measurements of a radar windpro-

filer, radio soundings, microwave radiometer, and a Raman lidar. The methods, Parcel method, bulk Richardson number method, and gradient methods are well explained and discussed, as well as the difficulties of definition of PBL height, depending on stability and clouds. The authors offer a solution for an operational system for PBL height detection, separately for each method and instrument. I'm missing a combined PBL time series, resulting of all methods, due to the authors knowledge of advantages and limits of the different methods. Additionally a two-year climatology of different PBL types is given. Therefore the paper provides an important contribution to the investigation of the PBL and should be published (just some minor revisions).

Specific comments: I think it's a pity that you have a ceilometer, but used is just for cloud detection. Instead of the temporally "bad" resolved ASR, you could use the pure backscatter signal of the ceilometer with very high temporal resolution for the detection of the CBL height (see Lammert and Boesenberg: Determination of the convective boundary-layer height with laser remote sensing. Boundary-Layer Meteorology 119, 159-170, 2006).

You have shown the limits of the bR method due to the sensitivity to the correct surface temperature. In COSMO this method is used for PBL height determination – so doesn't it make sense to chose an other method? Have you checked other quantities, like humidity or temperature profiles from the model in combination with one of the other methods?

The climatology of the CBL and cloudy CBL: in Fig. 9 and 10 you showed a very good agreement of Lidar and MWR for the cloudy CBL, but an underestimation for the CBL. That surprises me, due to the advantage of lidar in cases of cloud free, convective conditions. Where does this underestimation comes from?

Fig. 9 and 10: Why haven't you included the time series for MWR/bR? It would be helpful to better rate the results of COSMO.

Fig. 11 and 12: The spread between the lines is very high, so it is hard to know, which

lines should be compared together. What's the reason for the low number of cases for MWR compared to the other instruments? MWR PM in CBL cases and MWR/bR for stable ones are both plotted in red, which suggest a bit that both methods are complementary – was what your intention? In the conclusion your suggestion for a good combination is MWR/PM and MWR/SBLpT.

Technical corrections:

P9, L33: please compare with values in Table 3 (0.47 vs. 0.49 ...) P12, L6: Please explain APCADA. Fig. 4, 5, and 8: please exclude the legend of the lower plot and plot it to the right hand site. Fig. 5: What's the reason for "no data" below 400m in the background? Fig. 8: The background is SNR or lidar? Both would make sense, but please decide. ;-) Fig. 11 and 12: The additional lines in the lower plots are not explained. Why have you separated the number of days in these cases, but not for the CBL cases? Please notice a uniform notation of the methods (MWR PM or MWR/PM, COSMO vs. COSMO-2...)

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 15419, 2014.