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## ***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 #2**

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Recommendations: MAJOR revisions The subject of this paper deals with the observation/diagnosis of atmospheric boundary layer top heights in South Africa using lidar and radiosonde data and the comparison with the outcome of three atmospheric models. The lidar observations are very relevant, in particular for this part of the world. However, the comparison with radiosonde data and the models calculations is troublesome and inconsistent. The authors use inconsistent and subjective methods for the derivation of the pbl depth on data and from the models. The lidar method provides basically an aerosol boundary layer depth which is known to be a good estimate for the pbl depth only during daytime in convective conditions (see also discussion by Harvey

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et al in QJMS). It is not correct to use this as a basis for comparison with nighttime turbulent mixing depth since during nights over land the aerosol layer coincides more with the depth of the outer region (or the top of the previous daytime boundary layer depth). Also the methods utilised for estimation of the pbl on basis of radiosonde data and using the three models is not consistent. My suggestion is to use one general method for all the model and radiosonde cases using mean profiles (and perhaps surface fluxes), such as in Seidel et al on basis of the ECMWF method which itself is based on the original Troen and Mahrt method (1986) and used by many others afterwards (and was recommended by Seibert et al). Also the claim that lidar is suitable for continuous measurements for pbl depth cannot be true given the comments above, and this claim needs to be relaxed in the paper. The time shifting in section 4.2 between ECMWF and the lidar “to improve the correlation” (as the authors write), is another example of a subjective method not acceptable for a scientific paper. Finally, the authors also need to give a better account on papers which appeared in the literature on related subjects (like Summa et al and Cimini et al in recent volumes of Atmos. Meas. Tech Discuss, 2013) and should avoid the use of so many acronyms in their paper.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 17407, 2013.

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