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Interactive comment on "Comparison of aerosol LIDAR retrieval methods for boundary layer height detection using ceilometer backscatter data" *by* Vanessa Caicedo et al.

Anonymous Referee #2

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General comments:

The subject of this paper is the comparison of three algorithms used for estimation boundary layer height (BLH) from a ceilometer CL31 produced by Vaisala. The comparison is performed with an independent dataset of BLH estimates obtained from co-located radiosonde profiles. The algorithms applied to the ceilometer signals are: the Vaisala Corp. BL Matlab v1.3, a cluster methodology as proposed by Toledo et al. 2014, and a Haar Wavelet method.

The methodology for retrieving BLHs from the ceilometer are described enough, as well as the methodology used for estimating the BLHs from the radiosondes. The results show a good agreement for all the methods considered. However, as also referee 1

suggests this is an obvious result when considering BLHs during daytime in cloud free conditions. The results obtained are a confirmation of those obtained by Haman et al. (2012). Unlike similar works Milroy et al. 2012, Haeffelin et al. 2012, Schäfer 2011, the comparison is performed using only one optical instrument. In their conclusions the authors suggest further studies involving more instruments. However, the authors should include a discussion on how their results can be considered if comparing with other instruments: the CL31 was used in several campaigns together with other ceilometers and lidars.

On my opinion, the most relevant aspect of this paper is the use of the cluster method, which unfortunately seems to be the one performing less well than the other two. The Haar Wavelet method used is the one that performs better. Also this conclusions is perfectly in line with the literature on this topic. In particular the issue of having multiple candidates and the selection methods are explored is a known issue since Endlich 1979 for the gradient method and Davis 2000 for the Haar Wavelet. However, the authors do not face this issue directly, as they use a reference sample, which presents conditions of fully developed boundary layer (13:00 CST).

On Fig. 5 the authors present all the results obtained. However, few things are missing: A cross-method comparison showing the 3 methods agreement with each other. A time series of BLHs estimates, which would be very useful for characterising the site.

It would be useful to know in which season-month there is the highest number of reference BLHs. And more in general, as also referee 1 suggest, a climatology information in this work is missing.

Another aspect stressed in the discussion needs to be considered. The Comparison is performed after filtering the data that exceeds a threshold in in the t-test. However, the way the uncertainties for the retrieved BLHs are estimated. Instead of the standard deviation of a sample of retrieved BLHs, the authors should use a more signal related error, like the one proposed in Biavati et al. 2015. This method could be used also for estimating the errors on the BLHs retrieved from the skew-T log-P method.

I consider that this work should go through a major revision in order to include: more works where the CL31 was used, a BLH climatology at the site, and a more robust way to assess the uncertainties. On the other hand I agree with the referee 1 and I am not going to repeat the details he already underlined.

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