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Atmospheric Measurement Techniques Discussions

Interactive comment on "Inter-comparison of lidar and ceilometer retrievals for aerosol and Planetary Boundary Layer profiling over Athens, Greece" *by* G. Tsaknakis et al.

Anonymous Referee #2

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General comments:

Ceilometers are a useful tool for automatic monitoring of the atmosphere and the verification of the quality of the retrieved aerosol products like the backscatter coefficient is necessary. A comparison to lidar backscatter coefficient profiles is an appropriate method for this. However, several important points in the manuscript remain unclear, see specific comments. They should be clarified before publication. Furthermore, the authors do not discuss the difficulties in retrieving the backscatter profile from the noisy ceilometer data. Some comments on this topic should be included in the manuscript as well.

Specific comments:

page 76: line 19: what is the line width of the Vailsala ceilometer? This sentence implies that all ceilometers have the same wavelength width. I thought that the Jenoptik CHM15k had a smaller laser line width (0.3 nm) than CL31.

line 25: 4 km was found during daytime. During nighttime aerosol was detected up to 8.5 km. See last sentences in the abstract of the cited paper.

page 77: line 14: "The full overlap height at 50 m". line 21: "The full overlap height at 10 m". Which one is right? Martucci et al., 2010 specified the CL31 full overlap to 70 m. Vaisala specifies the range from 0-7500m. What do you see in the profiles yourself?

page 78: line 10-11: "full overlap at 100 m". Are you sure about this? If so, why do you show profiles only above 500 m in Fig. 1, 2, and 4?

page 80: line 12: Why is the first derivative of the backscatter signal not available? Aren't the data in Fig. 1a and Fig. 2a not the received ceilometer signal?

line 13: backscatter coefficient of the ceilometer data? and line 16: According to the ceilometer data (Fig. 1a) ... On page 79, line 19 and 20: the authors wrote: "in Fig.1a we present the temporal evolution of the backscattered signal (in arbitrary units-A.U.)". I don't believe that this is the backscatter coefficient. Besides, it would be given in km-1 sr-1. I assume that Fig. 1a and 2a is the range corrected signal or the attenuated backscatter of the ceilometer! Compare especially Fig. 2 a and b, they look quite similar.

page 80 and 81: Why don't the authors use more objective criteria for the determination of the boundary layer top than detecting gradients and colors bye eye?

page 81: line 18-22: The most visible increase in pot. temperature and decrease in humidity is between 1500 and 2000 m! May be the detected PBL top in the plots could be indicated by a horizontal line.

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page 82: line 21-23: "Since the ceilometer's output energy is low we had to perform a 3-h average in order to sufficiently reduce the noise in the backscatter coefficient profiles obtained by the instrument." Exactly! Therefore Fig 1a and 2a cannot show the backscatter coefficient!"

How was the retrieval of the backscatter coefficient from the ceilometer data done? Finding a suitable reference height is difficult from the noisy data. At what altitude was it set? In the Figures no aerosol free height range is shown.

line 22-25: Why don't the authors also use a 3h-average of the lidar data to be more consistent? For example in the discussion of the discrepancies below 1000m on 26.11.2008. And the developing PBL is also not covered alike in both profiles by the different averaging times.

page 83: line 2: "...from 500m (above the full overlap height)." See overlap discussion above.

line 19-22: Please indicate the time steps of the backtrajectories in Fig 6.

page 84: line 1-11: Again, the same average time for both profiles should be used to avoid differences due to time averaging in the profiles. This is especially important in this case, because the dust layer is descending and thus produces a vertically broader layer over a longer averaging time.

line 16: The abbreviation NOA was not yet introduced, see page 74.

line 26-27: "...all averages were made around 12:00 UTC)." No, one was 11-13 the other 12-13! This is an additional hour of measurements included in the comparison. See time averaging comments above.

The retrieval of the backscatter coefficient profile (Fig 10.) seems doubtful. Negative values as at the heights 3250 - 3750 m are not realistic. See also discussion above.

page 85: line 24: Why not using the same LR for both profiles? If a LR of 30 sr was

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used by default for all ceilometer profiles, the comparison of the total values is useless. Why don't the authors use the AOD from the UV-MFR for calibration?

Technical comments:

page 75: line 20: earth -> Earth

page 83: line 16: 23 July or 24 July?

page 85: line 5: "... and were in generally in good agreement." -> ... were generally in good agreement.

Fig. 1: Headlines indicating the used instrument on top of each plot would made a fast visual comprehension easier (CL31, SA Lidar, SA Lidar 1. derivate). I also guess the ceilometer signal is the range corrected signal, see comments above!

Fig. 2: see comments to Fig.1

Fig. 3: indicate PBL heights by horizontal lines

Fig. 4: Units of the backscatter coefficient are different (a) m-1 and (b) km-1.

Fig. 5: The numbers on the axes are too small. You may indicate fewer heights and use a bigger font.

Fig. 6: Time axis for right hand side plot?

Fig. 7: backscater -> backscatter.

Fig. 8: See comments Fig. 5

Fig. 9: See comments Fig. 6

Fig. 10: backscater -> backscatter. Units 10-6 km-1sr-1 must be 10-6 m-1sr-1 ?

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 73, 2011.