Atmos. Meas. Tech. Discuss., 7, C549–C550, 2014
www.atmos-meas-tech-discuss.net/7/C549/2014/

Atmospheric Measurement Techniques Discussions

Interactive comment on "What is the benefit of ceilometers for aerosol remote sensing? An answer from EARLINET" *by* M. Wiegner et al.

Anonymous Referee #5

Received and published: 15 April 2014

This paper discusses fundamental retrieval issues of single-wavelength backscatter lidar, with an attempt to answer a question about to what extent ceilometers can be used for aerosol research. Because of the large number density of observation stations, less operation cost, and capability of continues observation, the ceilometer networks can be a very useful supplementary to the lidar networks. The paper would be useful to the science communities and potential users of the ceilometer measurements. The paper provides a detailed discussion on the retrieval issues such as lidar calibration, selection of lidar ratio, correction for geometrical overlap and water vapor absorption and their impact on the retrieval accuracy. However, the current writing of the paper has not well answered the question about to what extent a ceilometer can provide quantitative measurement of aerosols. The authors summarize in the abstract that "the

retrieval of ïĄćp with a relative error in the order of 10% seems feasible…", this is a useful conclusion but needs to explain more about in what condition it is feasible (spatial and temporal averaging and at what altitudes). Although, as stated in the paper, only ïĄćp might be derived quantitatively from ceilometer measurements, with the ceilometer ïĄćp measurement, useful information of the vertical distribution of aerosols in the lower troposphere can be extracted. In this context, Figure 13 provides a useful quantitative assessment of the capability of ceilometers to detect aerosol layers, which should be summarized in the abstract. And, it would be useful to quantify the difference of the base (and/or top) heights of elevated layers detected by MUSA and the ceilometer, and provide a similar plot of mean/median base (or top) height difference as a function of altitude. Minor comments: 1. While Fernald et al are probably the ones who in their 1972 paper first introduced the two-component form of solution of the lidar equation to the lidar community, Klett is the one who demonstrated in his 1981 paper that a backward inversion of the lidar signal is more stable than a forward inversion. As I noticed, some lidar researchers may refer to a backward solution as "Klett solution". The authors use both terms of "forward" and "backward" Klett solution throughout the paper. I would suggest simply using "forward" or "backward" solution. 2. Equations (8), (13) and (14): missing term of Sp in these equations. 3. Equation (19): more explanation is needed for Wi; how these weights are determined in practice?

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 2491, 2014.