

Interactive comment on “Assessment of Mixed-Layer Height Estimation from Single-wavelength Ceilometer Profiles” by Travis N. Knepp et al.

Anonymous Referee #2

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The authors compared different (proprietary and open-source) data collection and assessment algorithms for mixing-layer height (MLH) from optical remote sensing with ceilometers. Partly, the results have been compared to radiosonde ascent data and systematic differences have been found. The main result is that a common algorithm should be used in a larger ceilometer network for assessing MLH.

The study is meaningful and will help to establish well-organised ceilometer networks. Thus, it deserves publication. But a few points should be addressed in more detail or depth before a final publication of this manuscript can be recommended.

The main point is that an indirect MLH assessment method (the one using aerosol

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backscatter data from ceilometers) is compared to a direct method (the evaluation of profile data from radiosonde ascents). Furthermore, ceilometers are remote sensing devices while radiosondes are in-situ probes. These two important differences must produce different results apart from the additional differences in the data collecting methods and the used evaluation algorithms. This must be discussed (along the three points mentioned below) and made transparent to the readers.

(1) Aerosols are used as a tracer for the vertical structure of the atmospheric boundary layer when evaluating MLH from aerosol backscatter intensities. It should be kept in mind that atmospheric particles need some time to adapt to a changing vertical structure of the atmospheric boundary layer (see, e.g., the lower right frame in Fig. 1 in Emeis and Schäfer 2006). Therefore, it might be advisable to compare radiosonde results to ceilometer results obtained in the hour after (or even in the two hours after) the radiosonde ascent.

(2) Horizontal advection of atmospheric particles can deteriorate the relation between the vertical structure of the boundary layer and the vertical profile of aerosol backscatter intensity.

(3) Radiosonde data usually have some sort of a hysteresis. The sensors need some time to adapt to the environmental conditions during the ascent. This could lead to a small bias towards higher MLH.

A minor point is that the Spanish word “mesa” should be explained to readers not acquainted to the topography of the surroundings of Boulder, Colorado.

Reference

Emeis, S. and K. Schäfer, 2006: Remote sensing methods to investigate boundary-layer structures relevant to air pollution in cities. *Bound-Lay. Meteorol.*, 121, 377-385.