



One-year comparison of PBL structure derived by ceilometer, radiosonde, and weather prediction model in Sofia, Bulgaria

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Jenoptic CHM15k ceilometers are biaxial, eye-safe lidars contentiously operating in automated mode. They are mainly used to report vertical visibility and cloud base in aviation. But they also provide attenuated backscatter profiles, which can be used in determination of structure of the Planetary Boundary Layer (PBL) and hence mixing layer (ML) height. ML depth is a key parameter in air pollution numerical simulations.

In this study a free available algorithm Structure of the Atmosphere (STRAT) is used for retrieving the boundary layer structure and evolution. The ceilometer ML height is compared to the radiosonde derived height in different weather conditions in 2013. The comparison indicates that ceilometers are suitable for determining ML height, especially in clear sky conditions. In many cases, analysis of ceilometer profiles does not allow an unambiguous determination of ML depth so significant lack of concurrence with the radiosounding is observed. Discrepancy between both methods can be attributed to inconsistency between atmospheric parameters used in retrieving of ML height – virtual potential temperature profile and aerosols concentration profile. In addition, the retrieved PBL parameters are compared with the one from the numerical weather prediction Weather Research and Forecasting (WRF) model.