

Boundary layer height retrieval with ceilometer and doppler lidar: an intercomparison

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Ceilometers are low cost lidars designed for the detection of cloud base height. They also see aerosol but only close to their detection limit. It is widely assumed that this aerosol information can be used to derive the height of the boundary layer i.e. the height of the layer where vertical mixing leads to direct influence of the surface.

Basis for this assumption is that the main amount of aerosol is produced at the ground and can be found in the boundary layer. This assumption is mainly true for a fully developed convective boundary layer but fails e.g. during night time when the residual layer still holds a lot of aerosol. In this case vertical mixing might be strongly reduced and restricted to a shallow layer close to the ground within the night time inversion.

Since November 2011 we run a doppler wind lidar and a ceilometer in parallel at the Juelich Observatory for Cloud Evolution (JOYCE) in Germany. The doppler lidar measures vertical velocity and thus gives a direct measure for vertical mixing. We show some typical situations and how the methods compare to each other. A statistical analysis will show when the boundary layer height derived from the ceilometer is successful and when it is not possible to use it.