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Raman lidar characterization of PBL structure during COPS

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ABSTRACT

The planetary boundary layer includes the portion of the atmosphere which is directly influenced by the presence of the Earth's surface. Aerosol particles trapped within the PBL can be used as tracers to study boundary-layer vertical structure and time variability. Aerosols can be dispersed out of the PBL during strong convection or temporary breaks of the capping temperature inversion. As a result of this, elastic backscatter signals collected by lidar systems can be used to determine the height and the internal structure of the PBL. Our analysis considers a method based on the first order derivative of the range-corrected elastic signal (RCS), which is a modified version of the method defined by Seibert et al. (2000) and Sicard et al. (2006).
The analysis is focused on selected case studies collected by the Raman lidar system BASIL during the Convective and Orographically-induced Precipitation Study (COPS), held in Southern Germany and Eastern France in the period 01 June - 31 August 2007. Measurements were performed by the Raman lidar system BASIL, which was operational in Achern (Black Forest, Lat: 48.64 ° N, Long: 8.06 ° E, Elev.: 140 m). During COPS, BASIL collected more than 500 hours of measurements, distributed over 58 measurement days and 34 intensive observation periods (IOPs), covering both night-time and daytime and the transitions between the two. Therefore BASIL data during COPS represent a unique source of information for the study of the boundary layer structure and evolution. Potential temperature profiles obtained from the radiosonde data were used to get an additional estimate of the boundary layer height. Estimates of the PBL height and structure for specific case studies obtained from the lidar data and their comparison with estimates obtained from the radiosonde data will be illustrated and discussed at the Conference.

References

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