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Characterization of convection-related parameters by Raman lidar: Analysis of selected case studies from the Convective and Orographically-induced Precipitation Study

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Abstract

This paper illustrates an approach to determine the convective available potential energy (CAPE) and the convective inhibition (CIN) based on the use of data from a Raman lidar system. The use of Raman lidar data allows to provide high temporal resolution (5 min) measurements of CAPE and CIN and follow their evolution over extended time period covering the full cycle of convective activity. Lidar-based measurements of CAPE and CIN are obtained from Raman lidar measurements of the temperature profile and the surface measurements of temperature, pressure and dew point temperature provided from a surface weather station.
The approach is tested and applied to the data collected by the Raman lidar system BASIL, which was operational in Achern (Black Forest, Lat: 48.64 ° N, Long: 8.06 ° E, Elev.: 140 m) in the period 01 June - 31 August 2007 in the frame of the Convective and Orographically-induced Precipitation Study (COPS), held in Southern Germany and Eastern France.
Reported measurements are found to be in good agreement with simultaneous measurements obtained from the radiosondes launched in Achern and with estimates from different mesoscale models.
An estimate of the different random error sources affecting the measurements of CAPE and CIN has also been performed, together with a detail sensitivity study to quantify the different systematic error sources. Preliminary results from this study will be illustrated and discussed at the Conference.