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The role of aerosol particles on precipitation and ice phase processes: observations versus 3D simulation with bin microphysics for convective cloud systems over southern France

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A three-dimensional model with detailed (bin) microphysics is used to reproduce observed radar reflectivities and surface disdrometer measurements, and to investigate the role of the aerosol particles spectrum on precipitating events in mixed phase clouds over the Cévennes' foothills. The Cévennes' region is during fall often subject to high precipitation events causing flash-flood and thus important damages, especially in urban areas. The 27/28 October 2004 event is a medium convective case with a total rain accumulation over 24h larger than 100 mm in Alès (Chapon, 2006). This case is of interest because surface rain drop number and spectra from a disdrometer in Alès are available to be compared with the model results. Vertical profiles of reflectivitiy from the volumetric radar at Bollène complete the data set.

The detailed microphysical model (*DESCAM*, Flossmann and Pruppacher, 1987) including the ice phase module of Leroy et al. (2007) is coupled with the dynamics of the NCAR *Clark-Hall cloud scale model* (Clark et al., 1996). The microphysics follows the evolution of aerosol particles, drop and ice crystals spectra each with 39 bins. Aerosol mass in drops and ice crystals is predicted by two distribution functions each with 39 bins in order to close the aerosol budget. Using a 3D grid resolution of 1km in horizontal and 250m in vertical, this model, called *DESCAM-3D*, is able to simulate

a realistic cloud field of medium convection with a rain accumulation up to 20mm during 3 hours of integration. Surface rain drop diameters are around 1mm which is in agreement with the measurements from the disdrometer. Vertical profiles of observed and simulated reflectivities also compare quite well in terms of vertical extension and the location of the Z_R maxima.

The impact of pollution in terms of the initial aerosol particle number has also been investigated. An increase in the initial number of aerosol particles can modify intensity and location of rain and to a certain extent also the rain drop spectra. The presentation will also focus on the role of the aerosols for the ice phase processes which are a significant factor in the precipitation formation in mixed phase clouds in medium convection situations.