Geophysical Research Abstracts
Vol. 12, EGU2010-11834, 2010
EGU General Assembly 2010

Observation of deep convection initiation from shallow convection environment

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In the afternoon of 10 July 2006, deep convective cells initiated right in the field of view of the Massachusetts Institute Technology (MIT) C-band Doppler radar. This radar, with its 3D exploration at 10 min temporal resolution and 250 m radial resolution, allows us to track the deep convective cells and also provides clear air observations of the boundary layer structure prior to deep convection initiation. Several other observational platforms were operating then which allow us to thoroughly analyse this case: Vertically pointing aerosol lidar, W-band radar and ceilometer from the ARM Mobile Facility, along with radiosoundings and surface measurements enable us to describe the environment, from before their initiation to after the propagation of of one propagating cell that generated a circular gust front very nicely caught by the MIT radar.

The systems considered here differ from the mesoscale convective systems which are often associated with African Easterly Waves, increasing CAPE and decreasing CIN. The former have smaller size, and initiate more locally, but there are numerous and still play a large role in the atmospheric circulation and scalar transport. Though, they remain a challenge to model. (See the presentation by Guichard et al. in the same session, for a model set up based on the same case, with joint single-column model and Large Eddy Simulation, which aims at better understanding and improving the parametrisation of deep convection initiation.)
Based on the analysis of the observations mentioned above, we consider here the possible sources of deep convection initiation that day, which showed a typical boundary-layer growth in semi-arid environment, with isolated deep convective events.