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The 10th of July 2006 over Niamey: A golden case of daytime moist convection in a semi-arid environment

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On late afternoon of July the 10th 2006, deep convection developed locally over Niamey in the vicinity of several instruments displayed there in the framework of the AMMA field campaign: lidar, radar and ceilometer from the ARM Mobile Facility, soundings, surface measurements, ATR flight... In particular, deep convective cells initiated right in the field of view of the MIT radar, which also provides observations of the boundary-layer evolution prior to deep-convection initiation. Observation analysis of that day reveals particular conditions specific of semi-arid regions:

- a weak latent heat flux,

- a weak lapse-rate in the mid-troposphere

- a deep boundary layer with cloud base reaching more than 2km,

- an increasing level of free convection and decreasing Convective Available Potential Energy through the day.

Those conditions contrast with the typical view that daytime convection over land is related to the daytime CAPE increase and are a-priori unfavorable to deep convection triggering. With that case, we investigate boundary-layer mechanisms in semi-arid conditions leading to a cloudy boundary layer and a locally forced convection. Those semi-arid conditions raise new challenges for parameterizations of boundary-layer growth and deep-convection triggering. Results of both 3D high resolution and 1D simulations are contrasted, focusing on boundary-layer transition regimes from dry to cloudy and shallow to deep moist convection.

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