

## **Impact of middle atmospheric humidity on boundary layer turbulence and clouds**

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We investigated the moisture present above the boundary layer and its association with the cloud development and boundary layer (BL) turbulence using Large Eddy Simulation (LES). The dry boundary layer with shallow clouds observed during Cloud-Aerosol Interaction and Precipitation Enhancement Experiment (CAIPEEX) over the arid Indian peninsula is studied here. LES derived fluxes and variances are compared with the constant altitude aircraft observations at different elevations. LES simulations with the drier conditions above the BL resulted in deeper, warmer and drier BL with an enhanced boundary layer turbulence. Drying has resulted in energetic BL eddies and a doubling of moisture exchange coefficients. LES sensitivity indicates that the middle atmospheric water vapor alone could influence the shallow to deep cumulus cloud transitions in the monsoon regime in a dramatic way. A 30% drying above the BL could drastically reduce the liquid water path and cloud albedo by 10-15%.