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Influence of two convection schemes on the radiative energy budget

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The authous use the Grid-point Atmospheric Model of IAP LASG version 1.0 (GAMIL1.0) to investigate impacts of different convective schemes on the energy budget. The two convective schemes are Zhang and McFarlance (1995) /Hack (1994) (ZM) and Tiedtke (1989) / Nordeng (1994) (TN). Two simulations are performed: one with the ZM scheme (EX_ZM) and the other with the TN scheme (EX_TN). The results indicate that, duiring the convective process, more water vapor consumption and temperature increment are found in EX_ZM, especially in lower model layer, its environment is therefore very dry. In contrast, there is a moister atmosphere in EX_TN, which favors low cloud formation and large-scale condensation, and hence more low cloud fraction, cloud water mixing ratio and deeper cloud extinction optical depth are simulated, reflecting more solar radiation flux in EX_TN. This explains why the TN scheme underestimates the net shortwave radiation flux at the top of the atmosphere and at surface. In addition, convection influences longwave radiative, surface sensible and latent heat fluxes through changes in cloud emissivity and precipitation.