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Evaluation of simulated East African precipitation in climate simulations with different cloud-ice and convection schemes

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Climate simulations for East Africa have been performed with the regional climate model CLM which is derived from the local weather prediction model COSMO-LM of the German Weather Service (DWD). Different schemes for convection and cloud ice have been tested in order to determine which configuration results in the best representation of climatic patterns for the region. The simulations were driven by 6-hourly lateral boundary conditions from the forty year ERA40 reanalysis. They were performed in a spatial resolution of 0.5° for the period 1996-2001 on a domain extending from 37.5°S to 25°N and from 14.0°W to 67°E.

Here we evaluate the quality of simulated precipitation by comparing it with observed precipitation. In the comparison we considered the Tiedtke mass-flux convection scheme in combination with a one- and a two category cloud ice scheme as well as the Kain-Fritsch convection scheme. The simulated seasonal behaviour of precipitation is reasonable in all configurations, whereas absolute values are strongly influenced by the selected schemes. Best agreement with observations (GPCC full data reanalysis product, version 3 in a spatial resolution of 0.5°) is achieved with the Tiedtke mass-flux convection scheme in combination with a two-category cloud ice scheme, that considers cloud ice as an additional solid form of water. This setting is used for operational numerical weather prediction since September 2003. With a one-category ice scheme precipitation is generally underestimated. The configuration with Kain-Fritsch convection scheme leads to a distinct overestimation. Seasonal and spatial structures of precipitation are discussed.