Geophysical Research Abstracts,
Vol. 11, EGU2009-3016, 2009
EGU General Assembly 2009

Statistical postprocessing of precipitation generated with the mesoscale model FOOT3DK for the rainy season 2002 in Benin (West Africa)

P. Ludwig, A. Krüger, K. Born, and M. Kerschgens

Institute of Geophysics and Meteorology, University of Cologne, Cologne, Germany (pludwig@meteo.uni-koeln.de)

The presented study deals with various aspects of mesoscale modelling of precipitation in the Sudanian Region at the West African subcontinent and is imbedded into an interdisciplinary research project called IMPETUS. Environmental conditions of synoptic-scale features, being responsible regarding generation and propagation of several precipitation systems, are mostly influenced by the West African Monsoon system. For investigations of precipitation events during the rainy season of 2002, a total number of 40 precipitation episodes, with durations ranging from 54 to 72 hours for each episode, were simulated using the non-hydrostatic model FOOT3DK. While the spatial resolution is 3 km, the temporal resolution accounts for 1 hour. Input data for these simulations is provided using a model chain consisting GME-analysis, Lokal-Modell (0.25° resolution) and FOOT3DK (9 km resolution). The investigated area covers a region of 105 km x 105 km (35 x 35 grid points) and is situated in the upper river catchment of the Ouémé in Benin.

On basis of a total number of 50 rainfall recording stations comparisons between simulated and observed precipitation within this study has been carried out. The recording stations are irregularly spaced across the investigated area. The accomplished comparison of precipitation adverts to the necessity for an adjustment of simulated rainfall by FOOT3DK. Therefore, an adjustment technique has been developed and is presented within this study. Based on the 1225 grid points this method fits the hourly simulated towards the hourly observed rainfall rates using a mapping function. In a first step the station data has to be interpolated to the same underlying model grid. Afterwards, the desired relation between simulated and observed precipitation can be established by fitting a sigmoidal curve to the precipitation data using the Levenberg-Marquardt-Algorithm. For every single grid mesh a separate Gompertz function can be found and employed. The analysis of the corrected precipitation identifies several advancements with respect to the simulations of FOOT3DK. For example the domain average, the frequency distribution and the higher local variability fit better with the observations. Particularly the correction of weak precipitation rates (between 0.1 mm/h – 1 mm/h) as well as the generation of a distinct gradient of the spatial distribution of precipitation (going along with an increase of local extreme values of precipitation) are some encouraging highlight results within this study.