Geophysical Research Abstracts, Vol. 9, 09504, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09504

Stochastic rainfall simulation for the rainy season of the Volta basin in West Africa

P. Laux (1), H. Kunstmann (1), A. Bárdossy (2)

(1) Institute for Meteorology and Climate Research (IMK-IFU), Forschungszentrum Karlsruhe, Germany, (2) Institute for Hydraulic Engineering, University Stuttgart, Germany, (patrick.laux@imk.fzk.de / Fax: +49 8821-183243 / Phone: +49 8821-183259)

Rainfall modelling is an important task with a lot of potential applications for hydrology, agriculture and construction trade. Most of the applications require local or regional scale rainfall information on daily time scale. For agriculture, e.g. the question after the optimum planting and cropping time requires very detailed (spatially and temporally) rainfall forecast.

Statistical downscaling of coarse resolved global circulation models (GCMs) in companion with stochastic rainfall simulation is exhibiting one possibility to answer these questions. However, the generation of daily precipitation series on site-scale is a difficult task due to the chaotic and non-linear behaviour of precipitation, its spatial and temporal intermittency and the high variability of daily precipitation.

The presented methodology is separated into a classification and a simulation part. First, NCEP/NCAR reanalysis fields are classified into objective circulation patterns using fuzzy rules. Several reanalysis fields, e.g. the moisture flux in 500 hPa level, were analysed towards the existence of abnormally wet and dry circulation patterns. Reanalysis fields owning most differentiated wetness pattern may serve as predictors for the stochastic rainfall simulation. The rainfall is simulated as stochastic process coupled to the corresponding circulation pattern of that day. The model was calibrated for the period 1961-1990 and validated for the period 1991-1999. The performance of the model for numerous observation sites and 5 regions within the Volta basin on daily as well as on monthly time scale has been investigated.