Geophysical Research Abstracts
Vol. 14, EGU2012-4193, 2012
EGU General Assembly 2012

Probabilistic Quantification of Heavy Future Rainfall Events via Statistical Downscaling for the Poyang Catchment in China

T. Simon, Ch. Ohlwein, A. Hense, and C. Simmer
Meteorological Institute, University of Bonn, Germany (tsimon@uni-bonn.de)

The climate in the Poyang catchment is dominated by the East Asian Summer Monsoon (EASM). Between mid June and mid July prevailing Southwesterlies support the moisture transport from the tropics to the Poyang region. Along the extension of this windfield the Meiyu rain belt can be found. It causes heavy rainfall events not only in Poyang but over the entire Yangtze valley and even up to the Southern parts of Korea and Japan.

In order to quantify the probability for a heavy rainfall event a logistic regression model is set up. Therefore the local daily precipitation observations are transferred to a binary variable indicating the exceedance of a high threshold. This binary information represents the response variable of the statistical model. Patterns derived by a multivariate principal component analysis (PCA) of the ERA-40 dataset are used as predictors. For our model the combination of relative vorticity at 850hPa (RV850) and vertical velocity at 500hPa (W500) works best. A forward selection procedure and a subsequent cross validation experiment give insights about the importance of the different PCA modes. The first and the third mode were found to be highly related to the described EASM dynamics above. This analysis enhances the knowledge about the geostrophic and ageostrophic processes leading to heavy rainfall events in the Poyang catchment.

Due to GCM specific properties (Grid, discretization, parametrization, ...) the statistical model cannot be applied to the A1B runs of the ECHAM5-MPIOM directly. Therefore an adaption to the different model dynamics is carried out using 20C3M runs first. To learn more about the monsoon dynamics in the GCMs the mean state and the variability (PCA, box-correlations) of RV850 and W500 fields in both the ERA-40 dataset and the 20C3M runs of ECHAM5-MPIOM are examined. This analysis shows similar patterns of variability for the two models but a strong difference in the mean state. These outcomes support the approach to substract the mean fields of the 20C3M from the ECHAM5-MPIOM data before the PCA-predictor fields of the ERA40 data are projected. Finally the uncertainty of the estimated future exceedance rate is assessed by a Monte Carlo simulation. Samples are drawn from the daily exceedance rates and averaged over 40 years. This procedure is repeated 1000 times to obtain a distribution of the uncertainty.

Our analysis concludes higher exceedance rates in the A1B runs for the period 2010-2049 than in the 20C runs for the period 1960-1999.