Geophysical Research Abstracts, Vol. 8, 03601, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03601

Analysis of the Monsoon onset in the Volta Basin of West Africa

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Particularly in regions, where precipitation is limited to only a few months per year, the reliable determination of the onset of the rainy season and the respective start of the sowing time is of crucial importance for sustainable food production. Planting too early may cause crop failure, whereas planting too late may reduce valuable vegetation time and crop yield. Since the middle 1980's, an increasing delay in onset dates in the Volta Basin of West Africa is suspected by local farmers. To investigate this speculation, the onset of the rainy season in the region was analysed by means of several statistical techniques.

First step was the development of fuzzy logic based definitions of the onset using daily precipitation data and accounting additionally for important plant physiological aspects. Linear trend analysis based on 40 year daily precipitation time series of 29 locations was performed. A delay of local onsets of up to 30 days within the last 30 years could be shown.

In a second step, methods for predicting the onset date were investigated. In this context, the detection of onset controlling variables plays a major role. Two distinctive strategies for the prediction of the monsoon's onset dates are investigated:

1.) A combination of upscaled station rainfall data to regional scale by means of principle component analysis and linear discriminant analysis.

2.) Statistical downscaling of large-scale NCEP reanalysis variables to regional scale via automated fuzzy based objective circulation pattern classification.

Results as well as the limits and potentials of the different approaches and their applicability for decision support systems are discussed.