Geophysical Research Abstracts
Vol. 14, EGU2012-1147, 2012
EGU General Assembly 2012

Monitoring drought conditions and their uncertainties in areas with sparse precipitation data. Evaluation of different precipitation datasets in Africa.

G. Naumann, P. Barbosa, H. Carrao, A. Singleton, and J. Vogt
Joint Research Centre, Institute for Environment and Sustainability, Ispra, Italy (gustavo.naumann@jrc.ec.europa.eu)

Assessment of drought conditions requires understanding regional historical droughts as well as the impacts on human activities during their occurrences. Traditional methods for drought assessment are mainly based on water supply indices derived from precipitation time-series alone. Thus, the main limitation for developing effective real-time drought monitoring and early warning systems in Africa is the lack of reliable and up-to-date precipitation data in many regions of the continent. A sparse distribution of rain gauges and short or incomplete rainfall historical records pose further problems. This lack of information may lead to significant errors in the estimation of statistical parameters for deriving water supply indices from the precipitation time-series.
Procedures for drought detection and assessment have a particular level of uncertainty associated to the data and models used. In order to better understand the extent, severity and impact of a drought in a region, it is first necessary to improve the quality of these procedures by using the best available data, theoretical assumptions and model formulations.
The main objective of this study is to evaluate the uncertainties due to sample size associated with the estimation of the Standardized Precipitation Index (SPI) and their impact on the possible level of confidence in drought monitoring in Africa.
In order to do this, four different rainfall datasets, each available on a monthly basis, were analysed over four river basins in Africa (Oum-er-Rbia, Limpopo, Niger, and Eastern Nile) as well as at continental level. The four precipitation datasets used were the Tropical Rainfall Measuring Mission (TRMM) satellite monthly rainfall product 3B43 (0.25°x0.25°), the Global Precipitation Climatology Centre (GPCC) gridded precipitation dataset V.5 (0.5°x0.5°), the Global Precipitation Climatology Project (GPCP) Global Monthly Merged Precipitation Analyses (2.5°x2.5°), and the Climate Prediction Center Merged Analysis of Precipitation (CMAP, 2.5°x2.5°).
A non-parametric resampling bootstrap approach was used in order to assess the sampling uncertainties associated with SPI estimation in terms of confidence bands. Confidence bands are essential for making a qualified assessment of drought events.
The comparative analysis of the four different datasets suggests that is feasible to use short time series of precipitation data with high spatial resolution (0.25°x0.25°) such as the TRMM for reliable drought monitoring over Africa. Furthermore, the bootstrap technique gives an estimate of the SPI uncertainty by providing confidence intervals. The proposed approach for drought monitoring has the potential to be used in support of decision making at continental and sub-continental scales over Africa or other regions that have a sparse distribution of rainfall measurement instruments.