Geophysical Research Abstracts,
Vol. 11, EGU2009-400, 2009
EGU General Assembly 2009

Use of Generalised Linear Models to quantify rainfall input uncertainty to hydrological modelling in the Upper Nile

M. Kigobe, N. McIntyre, and H. Wheater

Department of Civil & Environmental Engineering, Skempton Building, Imperial College London, SW7 2AZ, UK (email: max.kigobe05@imperial.ac.uk, Fax: + 44 (0) 20 7594 1511)

Interest in the application of climate and hydrological models in the Nile basin has risen in the recent past; however, the first drawback for most efforts has been the estimation of historic precipitation patterns. In this study we have applied stochastic models to infill and extend observed data sets to generate inputs for hydrological modelling. Several stochastic climate models within the Generalised Linear Modelling (GLM) framework have been applied to reproduce spatial and temporal patterns of precipitation in the Kyoga basin. A logistic regression model (describing rainfall occurrence) and a gamma distribution (describing rainfall amounts) are used to model rainfall patterns. The parameters of the models are functions of spatial and temporal covariates, and are fitted to the observed rainfall data using log-likelihood methods. Using the fitted model, multi-site rainfall sequences over the Kyoga basin are generated stochastically as a function of the dominant seasonal, climatic and geographic controls. The rainfall sequences generated are then used to drive a semi distributed hydrological model using the Soil Water and Assessment Tool (SWAT). The sensitivity of runoff to uncertainty associated with missing precipitation records is thus tested. In an application to the Lake Kyoga catchment, the performance of the hydrological model highly depends on the spatial representation of the input precipitation patterns, model parameterisation and the performance of the GLM stochastic models used to generate the input rainfall. The results obtained so far disclose that stochastic models can be developed for several climatic regions within the Kyoga basin; and, given identification of a stochastic rainfall model; input uncertainty due to precipitation can be usefully quantified. The ways forward for rainfall modelling and hydrological simulation in Uganda and the Upper Nile are discussed.

Key Words: Precipitation, Generalised Linear Models, Input Uncertainty, Soil Water and Assessment Tool (SWAT).