

**JRBM vol 5 Issue 1**

**Hydrological parameterization through remote sensing in Volta Basin, West Africa**

*By MOHSIN HAFEEZ, MARC ANDREINI, JENS LIEBE, JAN FRIESEN, ANDREAS MARX and NICK VAN DE GIESEN*

Ground-based hydrological data collection tends to be difficult and costly, especially in developing countries such as Ghana and Burkina Faso where the infrastructure for scientific monitoring is limited. Remote sensing has the potential to fill the gaps in observation networks. The GLOWA Volta Project (GVP) seeks to maximize the information to be gained from satellite imagery by combining remotely sensed data with strategically chosen ground observations. However, there is very limited information about the coupling of remotely sensed data with ground based data over the mixed savanna terrain of West Africa. This paper provides an overview of innovative techniques to measure hydrological parameters as actual evapotranspiration, rainfall, and surface runoff over mixed savanna terrain in a semi-arid region in West Africa, and their potential use. Evapotranspiration - The Surface Energy Balance Algorithm for Land (SEBAL) was used to calculate sensible heat flux and evapotranspiration through the energy balance. The SEBAL parameterization is an iterative and feedback-based numerical procedure that deduces the radiation, heat and evaporation fluxes. Along a 1,000 km gradient in the Volta Basin, three scintillometers were installed to measure sensible heat flux over distances comparable to NOAA-AVHRR pixels, approximately two kilometers. The comparison of sensible heat flux measured from remotely sensed data and scintillometers provide accurate results. This will help to increase the reliability of SEBAL parameterization. Rainfall - Depending on the region within the Volta Basin, up to 90% of the precipitation in originates from squall-lines. The Tropical Rainfall Measuring Mission (TRMM) imagery provides a valuable tool to monitor such squall lines. However, the TRMM signal should be validated for squall line rainfall. To increase the reliability of space-based rainfall measurements, TRMM based rainfall rate estimates were calibrated with rainfall measurements from a dense network of rain gauges. Surface Runoff - Remote sensing has limited value in estimating surface runoff. The savanna of West Africa, however, is dotted with a large number of small reservoirs used to supply water for households, cattle, and small scale irrigation. Bathymetry of sixty reservoirs in Ghana's Upper-East Region produced a very regular correlation between surface area, as observable by satellites, and volumes. By using all-weather RADAR imagery and the measured surface/volume curves, surface runoff volumes can be monitored throughout the year. These indirect runoff measurements will help researchers to develop surface-runoff models for the Volta Basin.