Geophysical Research Abstracts
Vol. 13, EGU2011-850, 2011
EGU General Assembly 2011

The impact of soil moisture on the regional climate of the Olifants basin in South Africa

Rachel White and Ralf Toumi
Department of Physics, Imperial College London, London, United Kingdom (rw408@ic.ac.uk)

The Olifants Basin in South Africa is under severe water stress [1]. The Olifants river is used for agricultural use, supports mining and is also one of the largest rivers to support the Kruger National Park. Water demand in the Olifants area is predicted to increase in the future due to planned additional mining activity in the area and increasing population. It is thus highly important to have accurate quantitative estimates of the available water in the future. The Weather Research and Forecasting (WRF) model is used as a regional climate model to study rainfall and runoff, and hence water availability, in the Olifants basin in South Africa. The WRF model is run at 4km horizontal resolution across the basin for 1979-1989 forced by ERA-40 re-analysis data. The model has a good degree of skill at simulating wet season precipitation when compared to direct rain gauge measurements and the CRU TS 3.0 observation-based gridded dataset. However the monthly runoff results are approximately twice the naturalised flow values calculated by the DWA. Changing several parameters does not produce more realistic results and so a new concept is introduced to the NOAH land surface scheme used within the WRF model. Based on the experimental results of Brooks et al. [2] a tightly bound water reservoir is implemented within the soil. This water does not move within the soil by diffusion or hydraulic conduction, and can only be extracted by evapotranspiration. This is the equivalent to suggesting a bimodal pore distribution for the soil – small pores from which water can only be abstracted back into the atmosphere, and large pores through which water can flow to reach the groundwater. This concept has some significant impact on the projected regional water availability.

[1] DWAF, National Water Resource Planning, 2006: Water available for allocation per water management area, http://www.dwaf.gov.za/WAR/documents/WMAWaterAvailibility23Feb06.pdf

[2] Brooks, J., Barnard, H., Coulombe, R., and McDonnell,.J., 2009: Ecohydrologic separation of water between trees and streams in a Mediterranean climate, Nature Geoscience 3:100-104