Geophysical Research Abstracts
Vol. 16, EGU2014-1392, 2014
EGU General Assembly 2014
© Author(s) 2014. CC Attribution 3.0 License.

# Analysis of confidence in continental-scale groundwater recharge estimates for Africa using a distributed water balance model

Jonathan Mackay (1), Majdi Mansour (1), Helen Bonsor (2), Magdalena Pachocka (1), Lei Wang (1), Alan MacDonald (2), David Macdonald (3), and John Bloomfield (3)

(1) British Geological Survey, Environmental Science Centre, Nottingham, United Kingdom (joncka@bgs.ac.uk), (2) British Geological Survey, Murchison House, Edinburgh, United Kingdom, (3) British Geological Survey, Maclean Building, Wallingford, United Kingdom

There is a growing need for improved access to reliable water in Africa as population and food production increases. Currently approximately 300 million people do not have access to a secure source of safe drinking water. To meet these current and future demands, groundwater will need to be increasingly abstracted; groundwater is more reliable than surface water sources due to its relatively long response time to meteorological stresses and therefore is likely to be a more secure water resource in a more variable climate. Recent studies also quantified the volumes of groundwater potentially available which suggest that, if exploited, groundwater could help to meet the demand for fresh water. However, there is still considerable uncertainty as to how these resources may respond in the future due to changes in groundwater recharge and abstraction. Understanding and quantifying groundwater recharge is vital as it forms a primary indicator of the sustainability of underlying groundwater resources. Computational hydrological models provide a means to do this, but the complexity of recharge processes in Africa mean that these simulations are often highly uncertain. This study aims to evaluate our confidence in simulating groundwater recharge over Africa based on a sensitivity analysis using a distributed hydrological model developed by the British Geological Survey, ZOODRM. The model includes land surface, canopy, river, soil and groundwater components. Each component is able to exchange water and as such, forms a distributed water balance of Africa. The components have been parameterised using available spatial datasets of African vegetation, land-use, soil and hydrogeology while the remaining parameters have been estimated by calibrating the model to available river flow data. Continental-scale gridded precipitation and potential evapotranspiration datasets, based on remotely sensed and ground observations, have been used to force the model. Following calibration, the sensitivity analysis has been undertaken in two stages. For the first stage, individual parameters are perturbed from each component of the model. For the second stage, different methods for calculating groundwater recharge are introduced. Both stages aim to investigate which aspects of the model most impact on groundwater recharge and consequently how confidently we can simulate the complex recharge processes that occur in Africa using large scale hydrological models. Preliminary results from the analysis indicate the parameters that control runoff generation from the land surface and the choice of groundwater recharge calculation method both have a significant impact on groundwater recharge simulations.