

## ***Interactive comment on “Projected impacts of climate change on groundwater and stormflow in a humid, tropical catchment in the Ugandan Upper Nile Basin” by D. G. Kingston and R. G. Taylor***

### **Anonymous Referee #1**

Received and published: 12 April 2010

**General comments** The paper addresses climate change impact on water resources in the Upper Nile Basin. SWAT model is used for hydrological response simulations, while 7 climate models are considered for climate projection. Climate sensitivity is tested investigated using UKMO HadCM3 for different temperature increase scenarios, showing significant flow anomaly for global temperature increase above 2C . Also, it is shown that projected flow regime changes are highly dependent on projected differences in precipitation between GCMs, and are less sensitive to hydrological model parameter uncertainty.

**Specific comments** In chapter 3 there is reference to Todd et al., 2010 for temporal

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rainfall disaggregation and ClimGen pattern scaling technique – this paper is in preparation, and therefore it would be better to include references to a published material.

Not being an expert in climate modelling, I would question why those 7 GCMs were picked from the pool of existing models – some additional motivation would be helpful.

SWAT model used is stated to be a semi-distributed model, but there is no description of its units, their size, and connections.

The SWAT predictions appear to be of very poor quality (NS is a little higher than 0) – is it a problem of precipitation disaggregation technique, spatial rainfall variability, or just SWAT model being unsuitable for the catchment?

When disaggregated CRU precipitation was used for calibration, the hydrological model efficiency was very low. But it appears that there is data from 5 daily rain gauges available for the 1965-1980 period. Would it be reasonable to use this data for calibration purposes instead of CRU data?

How many parameter samples for SWAT were used to investigate parameter sensitivity?

In Chapter 5.3 the authors say that ‘model parameterisation generally imparts little additional uncertainty to climate change projections’. First of all, it is very unlikely that the combined uncertainty would be additive; and secondly, the parameter uncertainty might be important for individual climate change scenarios with low annual flow anomaly, i.e. for scenarios given by HadCM3, IPSL, MPI, and HadGEM – the anomaly here seems to be below 10%.

In discussion, the authors say that ‘confidence can be placed in the assertion that irrespective of precipitation magnitude or direction of future changes in precipitation, the proportion that contributes to Mitano river discharge via groundwater flow will decrease as a result of increasing temperature’. This is based on one climate model (HadCM3) inputs for hydrological predictions. But HadCM3 predicts very moderate

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rainfall changes, and predicts one of the most extreme temperature changes (Fig.7)  
– because of that the conclusions could be not valid for other GCMs.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 1913, 2010.

**HESSD**

7, C476–C478, 2010

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