Hydrology and Earth System Sciences Discussions

Interactive comment on "Uncertainty in water resources availability in the Okavango River Basin as a result of climate change" *by* D. A. Hughes et al.

Anonymous Referee #1

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1. Authors base the analyses on GCM data for "prescribed warming scenarios". These scenarios are not a standard CMIP3 output. How exactly were these scenarios generated? Where are data available from?

2. ClimGen procedure is mentioned as a way of integrating GCM data with hydrological models. It would be good if it was briefly explained. What exactly has been done to GCM data? Have they been regridded? downscaled? unbiased?

3. The authors state repeatedly that a median is not a good way of representing change signal in a situation of differences between models. The median would not be an ap-

propriate measure of change signal if distribution of signal was bi-modal, or if some models were less valid than others. If an ensemble is used under an assumption of equiprobability of its members, then the spread of change signal is an expression of differences between models in terms of represented processes, formulation of relationships between variables, space and time discretization etc, or in other words of model errors. In such a situation median is actually the only viable way of determination of "representative" change signal. Could authors please justify their statement?

4.Comparison of model runs using transformed GCM temperature data with these using PET calculated with Hargreaves method reveals systematic differences. This is surprising because Hargreaves PET is essentially linearly related to mean temperature. The method used to translate GCM temperature into hydrological model's evapotranspiration seem to involve unbiasing – PF factor is calculated from deviations around baseline mean. However, it is not clear from the text whether Hargreaves PET used as input into hydrological model was unbiased. If it was not, any bias in GCM temperatures for the reference period (20th century) would propagate into GCM scenario and might be responsible for the systematic bias in river flows. If the temperature data were unbiased (with reference to data used in reference model runs), what in the opinion of authors, is the source of the bias in river flows?

5. Authors stress the need to recalibrate the model: "it was therefore necessary to re-calibrate the Pitman model using the same gridded rainfall data that was used in the generation of the future climate scenarios." Re-calibration was done with respect to UDEL dataset. Btw. it is not explained how exactly was UDEL used in "the generation of the future scenarios". Argument that one needs to recalibrate a model to be used with a different dataset is difficult to uphold in a situation when data from GCMs is used. This is because reference run GCM data cannot in principle be used to recalibrate the hydrological model. Thus, there will always be a difference between calibration and scenario dataset. Moreover, there is a qualitative difference between GCM datasets and gridded datasets that are based on ground raingauge data, such as UDEL or the

dataset originally used in the calibration of the Pitman model. In fact, the UDEL dataset is conceptually closer to the original Pitman model rainfall dataset than it is to the GCM rainfall dataset. This is because both UDEL and Pitman model datasets were both obtained from interpolation between rainfall gauges, and subsequently regridded to desired aerial units, while GCM rainfall is an outcome from a model, and it is a function of a large unit scale synoptic variables. For GCM rainfall to be compatible with UDEL the former would have to be downscaled to point rainfall, and the point rainfall would have to be interpolated and regridedd. Can the authors please clarify this issue?

6. What dictated selection of parameters used in the uncertainty analyses? What dictated determination of ranges of these parameters? The ranges of modelled responses corresponding to the simulations with 1000 randomly selected parameter sets are rather narrow. Does it mean that the model is very well determined? Or maybe parameters were selected that the model was very little sensitive to?

6. The Okavango is not the world largest Ramsar site. Also, it is not the world second-largest inland wetland region. To name a few well-known larger ones: Sudd, Inner Niger Delta and Pantanal.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 5737, 2010.

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