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Hydrology and Earth System Sciences Discussions

Interactive comment on "Prediction of runoff and discharge in the Simiyu River (tributary of Lake Victoria, Tanzania) using the WetSpa model" *by* J. Rwetabula et al.

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Please address the following issues and submit a revised paper if you wish to continue with publication of this paper.

This paper deals with an application of an exiting hydrological model, WetSpa, to a catchment draining to Lake Victoria in Tanzania. The catchment is of importance because of high pollutant loads from agricultural sources delivered to the lake. This paper uses WetSpa to investigate water balance characteristics of the catchment as a precursor to water quality modelling.

General comments

The Simiyu basin, as for many in Africa, has sparse data. This applies to both spatial information on land use and soil and temporal data relating to precipitation, evaporation and river flow. Given such data consideration of whether WetSpa is an appropriate modelling technique would be helpful.

The paper is really about estimating river discharge and the title should reflect this.

In the section on model input more detail is needed about how soil parameters are derived from the soil map, and indeed what parameters were available for each soil type.

In the section on model calibration please add a table showing ranges of parameter values and final calibrated values.

For those data from lookup tables which are not calibrated please state their relevance to African conditions.

I am concerned that the calibration and verification periods used for the model overlap substantially. Data exist for the period 1999-2004 and yet calibration has been carried out from 2001-2004 and then verification from 1999-2004. This is not normal practice and the two periods should not overlap. I suggest splitting the time period in two and carrying out an independent calibration and validation exercise.

There is confusion about groundwater in the paper. Table 1 says there is no groundwater input to the river and yet there is quite a high percentage of percolation. In the paper there is discussion about a groundwater threshold level which has not been reached, but perhaps this percolation is just a factor which allows the model to be calibrated reasonably well? This is often the case in other distributed hydrological models.

I am concerned about some of the model evaluation criteria, especially as Figure 8 seems to show rather more bias in results. The overall efficiency of 57.4 percent is not good compared with other applications of WetSpa and we have no detail on the

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formulation of the final two evaluation criteria which focus on low flows and high flows respectively. Why are these used when Nash-Sutcliffe already gives more weight to evaluation of high flows?

Table 1 is extremely confusing and needs clarification. In particular the column headed percentage - this is percentage of what? I could not reconstruct a water balance easily from this table which is surely what it is supposed to facilitate. Footnote (a) should I think read excluding missing data. The numbers in the table do not seem to agree with those in the text: for example in the table percolation is given as 38.8 percent whilst in the text is given as 42.2 percent - in either case this is a lot of water to be lost to some hypothetical groundwater store which does not reappear.

In view of the comments about calibration, validation and evaluation, the model performance needs more careful assessment and the discussion and conclusions should reflect this.

Figure 8 is difficult to read and interpret because the rainfall and flow bars overlap - please expand one of the scales so that bars do not overlap.

Please add scales and N arrows to all maps

I would ask that the authors also address ALL the comments of the anonymous referee 3 in the review published 14 January 2008.

Required grammatical corrections

Introduction

Paragraph 1, line 5 .is mainly from fertilizers and pesticides Paragraph 3 line 1 The main contributions to the pollution load of Lake Victoria from Tanzania are from the Mara, Kagera and Simiyu basins . Paragraph 3 line 4 .generating high yields of sediment Paragraph 3 line 7 indicating that the majority of contaminant is Paragraph 3 line 10 Hence, proper water quality

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WetSpa model (theory)

Paragraph 1 line 8 .running the model and parameter selection is.. Paragraph 3 line 1 .depends on storm intensity and vegetation. Paragraph 3 line 9.is regulated by the evaporative demand. Paragraph 4 line 9 .Thornthwaite and Mather Paragraph 4 line 12.evapotranspiration as a function of. Paragraph 5 line 2.higher than field capacity, as a function of. Paragraph 6 line 1 .routed Paragraph 6 (between equations 6 and 7) by integration along the topographically determined Paragraph 7 line 1 .interflow along its topographically.

The Simiyu catchment and field data collection

Paragraph 1 line 1.in the southeast of Lake Victoria, Tanzania Paragraph 1 line 5 maps at scale 1:50,000 Paragraph 1 line 8 training sites for a supervised classification Paragraph 1 line 9 Figures 2, 3 and 4 Paragraph 2 line 2 ..Five and a half years Paragraph 2 line 7 ..and 20 percent during other months.

Model input parameters

Paragraph 1 line 2..hydrological features such as surface slope Paragraph 1 line 4 is considered to be drained. Paragraph 2 line 8 ..for a relatively flat area

Model calibration

Paragraph 2 line 5 simulation period is very low, which is likely to be due. Paragraph 2 line 7 .rather large, which can be related Paragraph 2 line 13 .with a relatively high permeability.

Model results and discussion

Paragraph 1 line 1..is verified for a longer period. Paragraph 2 line 6 ..that do not capture Paragraph 2 line 8 short term flash flows. Paragraph 3 line 1 The required number of precipitation .....gauge density) for good evaluation of precipitation input is discussed Paragraph 3 line 4.for a large catchment such as the Simiyu river Paragraph

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3 line 6 water level recordings Paragraph 3 line 7 A final source of error Paragraph 7 line 2.and 0 percent of the total discharge. Paragraph 8 line 9 .contributes about 9 percent...

Conclusion and recommendations

Paragraph 1 line 1 .A spatially distributed hydrological simulation. Paragraph 2 line 7 .cannot capture flash flows Paragraph 3 line 1 is about 2.4d with a maximum of 8d Paragraph 4 line 1 is 61.4 percent of the total discharge Paragraph 4 line 2 interflow may be caused by Paragraph 5 line 3-4 .which are transported to and deposited in Lake Victoria.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 881, 2007.