Hydrology and Earth System Sciences Discussions

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Comment

Interactive comment on "Parameter sensitivity to climate and landscape variability of a simple, lumped salt and water balance model" *by* M. A. Bari and K. R. J. Smettem

Anonymous Referee #1

Received and published: 28 September 2005

General comment

The authors appear to have done a considerable work, out of which they could potentially publish a good paper. However, what is reported in this paper fails to properly address what is indicated in the title of the paper and the objectives stated in the introduction part. Besides, the organization of the different sections of the paper lacks the quality that makes the paper palatable to the readers. I suggest that the authors rework on the paper so that they could remedy the limitations inherent in the paper in its present state.

Specific comments and suggestions

- While according to the title the paper was meant to go into the study of sensitivity

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of the model parameters to landscape and climate variability, the sensitivity study presented in the paper only shows how the model prediction is sensitive to disturbances of some of the parameters around their calibrated values and no attempt is made to relate these changes to changes in the landscape characteristics and/or climate variables. The sensitivity analysis should be done in such a way that it shows how changes in the landscape attributes and/or climate attributes are reflected in the model parameters and subsequently in the model prediction.

- The importance of section 2 at this stage of the paper is not apparent. Instead, it is better to start with section 3 with a modified title ('The study area', for instance). The first paragraph of section 2 could be incorporated here. The second paragraph, however, is better presented at a later stage in connection with discussion of the results of the model prediction.

- In section 4, the model structure is only briefly described in a qualitative way. In order to enable the readers properly interpret the results of the sensitivity study of the model parameters, the model structure should be presented in detail so that one can clearly see how the parameters are incorporated in the model and what they mean. Reference to other works is made, but this is not enough if the paper has to stand by itself.

- Section 4.2 needs clarification.

- Reference is made to Figure 7 in section 5. What is described in the text is inconsistent with the figure. The figure needs to be reworked.

- Sections 6.1 - 6.4 should precede section 5.

- In section 6, the implemented model calibration strategy is not clearly discussed. How were the parameters adjusted? Was automatic optimisation implemented? What objective function(s) was(were) used to calibrate the model? A set of objective functions are presented in section 6.3. But how were they integrated in the model calibration process?

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- It is stated that many of the model parameters were estimated for one or two catchments and were later adapted to the other catchments. How was the parameter transfer from one catchment to another done? Were the lumped values of the parameters estimated in one catchment directly used in the others or was there a means of relating the model parameters with the distribution of landscape/climate attributes of the catchments? This needs to be discussed.

- In section 6.4, regional variability of the model performance is discussed. What possible explanation can be given to the variability of the model performance across regions (different catchments)? It is also stated that the model has a tendency to overestimate the total flow volume. What could be the possible reason for this?

- Section 7 is mainly devoted to describing the components of the model. This could have been done in section 4, where the model is discussed and it is not necessary to repeat it here.

- In section 8, it is stated that a number of parameters that were adapted from the literature remained identical in all catchments and this is indicated as a 'key finding'. What makes it a key finding? Why do they remain similar throughout? Do all the catchments have the same attributes? If not, does it mean that these parameters are independent of the catchment attributes? Was it found out that changing these parameters doesn't change the model performance? Even then, what about their interaction with the other model parameters?

- What are the opportunities for further improvement of the work presented here based on what has been found out from this work?

Interactive comment on Hydrology and Earth System Sciences Discussions, 2, 1405, 2005.

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