

## ***Interactive comment on “Calibration and validation of SWAT model and estimation of water balance components of Shaya mountainous watershed, Southeastern Ethiopia” by A. A. Shawul et al.***

### **Anonymous Referee #1**

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#### General comments and recommendation

The manuscript by Shawul presents a study of applying the widely used SWAT hydrological model to a mountainous watershed in Ethiopia. The study presents the calibration and validation results of the application of the SWAT model at a monthly time-step.

A study of the application of a complex hydrological model to a medium sized watershed with only moderate observational data availability can be of interest if the study is

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able to provide further insights into the model strengths and limitations, the hydrological processes dominant in the catchment, or how observational data limitations affect model performance. I do not consider that this study addresses any of these issues in sufficient depth. The presentation of results of the calibration and validation of a highly parameterized model at a monthly time-step is not sufficient to justify publication in a high impact journal, such as HESS.

#### Specific comments

The paper lacks some basic information about the watershed and data availability. For instance, the area of the watershed is not given and very little information is given about the gauging station data. Presumably there is only a single gauging station at the outlet of the watershed but this is not specified. Some additional data about the rating curve of the gauging station would be useful. There are four meteorological stations in and around the watershed but no elevation data are provided about the stations. Given the very large elevation range in the catchment, it would be useful to know where the individual stations sit within this range and to what degree they are able to capture any orographic effects on rainfall totals. Figures 1 and 2 suggest that the rainfall stations are located in the lower half of the elevation range and so the rainfall totals could be substantially underestimated. This aspect has not been investigated at all in the modelling study. The evaluation of the effects of the quality of the major forcing and discharge data on the modelling is likely to be as important as considering the effects of land cover and land use.

Achieving reasonable calibration and validation results at a monthly time-step using a highly parameterized model is not particularly interesting. The model was calibrated using 13 parameters that were found to be most sensitive. However, the study does not describe the number of Hydrological Response Units (HRU) used in the model. Given that only one set of calibrated values are presented in Table 1, does that mean that only one HRU was used or are these average parameter values from a number of HRUs? In order to make the study more scientifically interesting, it would be useful to present

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how differing degrees of spatial complexity in the model affect the outcomes. Likewise, is a complex model like SWAT required to achieve the model efficiencies achieved at a monthly time-step? Could a simpler conceptual model achieve similar results?

The study does not present any detailed examination of how well the SWAT model captures the dominant hydrological processes occurring in the watershed. There is some description of how baseflow-filtered streamflow was used to determine the 'slow flow' component of the total yield and that the parameters determining subsurface flow were the most sensitive to the modelling results. That information was interesting but needs to be further developed and with more details presented. This would be facilitated by presenting modeled results at a daily time step. For instance, given that subsurface flow has been identified as an important process, is the model able to simulate the recession flow of events? The analysis of how well the model captures hydrological processes would be facilitated by providing the context of what aspects of the flow regime are most important in this watershed.

#### Technical comments

There were a number of technical points that would need to be addressed but given that I am recommending rejection or major revisions, there is no point in identifying technical changes required at this stage.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 13955, 2013.