

## ***Interactive comment on “Diagnostic calibration of a hydrological model in an alpine area by hydrograph partitioning” by Z. H. He et al.***

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This paper is a re-submission of a paper previously discussed in HESSD. The authors made a considerable effort to revise the text and the model to meet the reviewers' concerns. The model now has a separated degree-day factor for snow and ice and the description of the model is clearer (but still not entirely clear).

The proposed step-wise calibration method is tested to show how robust it is if applied to different periods and with different hydrograph separation criteria. The method is certainly transferable to other catchments and interesting for the readership of HESS and I recommend publication in HESS after minor revisions. .

Before giving some detailed comments hereafter, I would like to point out here that I do  
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not agree with the authors' view that an observed time series can be manipulated such as to "expand the measurement dimension". *Information can be extracted from data but the information content of data cannot be increased by any manipulation.* Could you please comment on this?

### **Detailed comments:**

#### **Abstract**

- In the abstract, the hydrograph is partitioned according to water sources but then "the hydrological model parameters are grouped by the associated \*runoff generation mechanism\*"; please use coherent wording according to the very first review of the 1st submission to HESSD. Same holds for section 3, and for the conclusion.
- The abstract does not mention any results, conclusions or outlooks, simply summarizes the method

#### **Introduction:**

- Good literature summary;
- I do not agree with wording "hydrograph partitioning is another possible way to expand RM". The measurement dimension cannot be expanded otherwise than by adding data; hydrograph partitioning might help to extract the meaningful information pieces and to match them with the corresponding parameter groups. This helps in parameter search since the parameters are not trying to match a piece of information which they are not supposed to simulated. But this does not "add measurements" and the measurement dimension is thus not expanded.

#### **Case study**

- I re-iterate my comment: why is the case study qualified as "alpine"? For botany, "alpine" might be a general term referring to any high elevation mountain range, for hydrology, "alpine" refers to my understanding to a hydro-climatic regime with a winter

season with snow accumulation and a summer season with melt occurring due to high temperatures; is this the case here? Or do we have a regime where accumulation and melt occur both during the summer as in the Himalaya? On web of science, I could find a single paper mentioning the words "alpine hydrology and Tianshan". Could you not just say why the area has alpine hydrology? Or simply replace alpine area by mountainous area? Namely also on p. 13398 and 13399 where the more general "mountainous area" should be used instead of alpine.

#### Method

- I still do not understand how you connect the accumulation and melt of snow with the modis image. The paper says that snow accumulation and potential melt are simulated per subcatchment, I conclude that SWE is also computed per subcatchment. How do you connect this to the area that experiences melt as obtained from the MODIS image? Do you multiply the potential melt (mm/day) with the area that experiences melt? But then, how do you update the SWE? What do you do if your computed SWE is non-zero but the MODIS image does not show any snow pixels? And what if SWE is zero but MODIS shows snow?

- The use multi-letter parameter names is banned by HESS.

#### Results

- I recommend explicitly commenting on the fact that clearly, the automatic calibration cannot find the solution to the optimization problem, otherwise it \*HAS\* to find a solution that is better than the step-wise solution. If the automatic solution found by optimizing NSE has a lower NSE or higher RMSE than the manual calibration, this means that the algorithm could not find the optimum.

- Again, I do not agree with the wording "Benefitting from the partitioning curves, however, the stepwise calibration method increases the dimension of measurement information to four. The measurement dimension is now equal to the number of parameter

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groups," The information content of data cannot be expanded by data manipulation. It can only be extracted. Otherwise you would create information.

- What means "to extracting index information"?

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