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Hydrology and Earth System Sciences Discussions

Interactive comment on "Estimation of baseflow parameters of variable infiltration capacity model with soil and topography properties for predictions in ungauged basins" *by* Z. Bao et al.

B. Schaefli (Editor)

bettina.schaefli@epfl.ch

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As can be seen in the discussion, the two reviewers were rather critical regarding two major points:

1. estimation of pseudo-physical parameter values per grid cell from observed data
2. interest of the proposed approach

The answers to these two major points are not satisfactory and I would like to ask

the authors to further comment on them before I can recommend the preparation of a revised manuscript version.

First of all, J. Seibert asked whether effective parameter values for 30km x 30 km grid cells can really be considered as physically-based and estimated from soil maps. This point was not answered. Furthermore, there is no answer to the question of whether subgrid slope can be used as a hydraulic gradient and how the scale-dependence influences the results. The answer simply gives a list of data used but no comment on the above questions. In this context, the answer that "the relationships between soil characteristics (Ksat, etc.) values and each soil type were referenced to Rawls et al. (1998). Page 7025, line 16" is not satisfactory. There needs to be at least a comment about the context / purpose in which the followed method has been proposed.

Interest / value of the proposed approach

Both reviewers questioned the scientific value of the proposed approach. J. Seibert asked " whether fixing these parameter values in the way presented here is any better than fixing the values to other values" and E. Demaria noticed that " authors fail to convey the advantages, if any, of the 3-parameter methodology over the 6-parameter (conventional) procedure."

The authors answered this last point by arguing that " 1) The other three parameters became more sensitive when the 3-parameter method was used. 2) Parameters and stream flow uncertainty was reduced with the 3-parameter method compared to the original 6-parameter approach."

As it is visible from the results and pointed out by the reviewers, the sensitivity increase is marginal, which is a-priori surprising given that the degree-of-freedom has been reduced from 6 to 3, but easily understandable if we consider that in the 3-parameter method each grid cell has its own base flow parameter set. Thus argument 1) does not hold. Furthermore, as pointed out by J. Seibert, the decrease in uncertainty is a direct effect of reducing the degree-of-freedom but does not say anything about the value of

the proposed method.

A further performance analysis method, e.g. along the line suggested by J. Seibert would be required here to show that the suggested approach outperforms the naïve approach where the 3 base-flow parameters are simply set to arbitrary values sampled within the acceptable limits.

Further detail comment:

i) The answer regarding eq. 8 reveals that the authors and the reviewer (J. Seibert) interpret the base flow differently. The authors' equation suggests that Dm corresponds to the vertical flux with the reference area being the horizontal xy-plane; the reviewer suggested that it is a horizontal flux with reference area the xz-plane. The answer does not comment on this.

ii) The answer regarding the question why Nsc and Re were averaged is misleading; GLUE can indeed by applied to several objective functions (iterative reduction of acceptable parameter space). Furthermore, there is no general rule for the Nsc threshold, this a subjective decision to be made by the modeler.

iii) Finally, the question about the relationship between the variability of a sample and its length was also not satisfactorily answered. Indeed, any variance estimate (e.g. standard deviation) has to take into consideration the sample length. In the case here, the interquartile range is used as a proxy for the variance; this needs to be weighted by the sample length (the expected interquartile range of a short random sample is smaller than of a longer sample from the same distribution).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 7017, 2011.