## Responses to B. Schaefli (Editor)

We wish to thank you for the invaluable comments and constructive suggestions used to improve the quality of the manuscript.

**Major points:**

1. First of all, J. Seibert asked whether effective parameter values for 30 km 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.

We agree with you. (1) The three baseflow parameters estimated by the soil properties was based on the physical meanings of the parameters in the model structure. The used soil data was distributed, i.e., the resolution was 5 minute (about 10 km x 10 km). Therefore, the estimated three baseflow parameters could be regarded as quasi physically-based. (2) Based on the revised formula, the topography slop would not be used anymore. The $D_m$ parameter would be estimated only by the $K_s$. Thereby, the resolution of DEM data would not impact the estimated model parameters

2. 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.

We agree with you. Based on the suggestions from J. Seibert, the three baseflow parameters were also set as the average values of the 24 catchments. The comparison among the average methodology, 6-parameter methodology, and the 3-parameter methodology was illustrated in Fig. R1. Generally, for streamflow simulation, the 6-parameter methodology was the best one, followed by 3-parameter methodology, and then average methodology. The 50$^{th}$ value were 0.805, 0.809, and 0.814 of *Nsc*; 1.016, 0.836, and 0.568 of absolute *Re*; and 0.879, 0.902, and 0.895 of *Mnc*, based on the average methodology, 6-parameter methodology, and 3-parameter methodology, respectively.

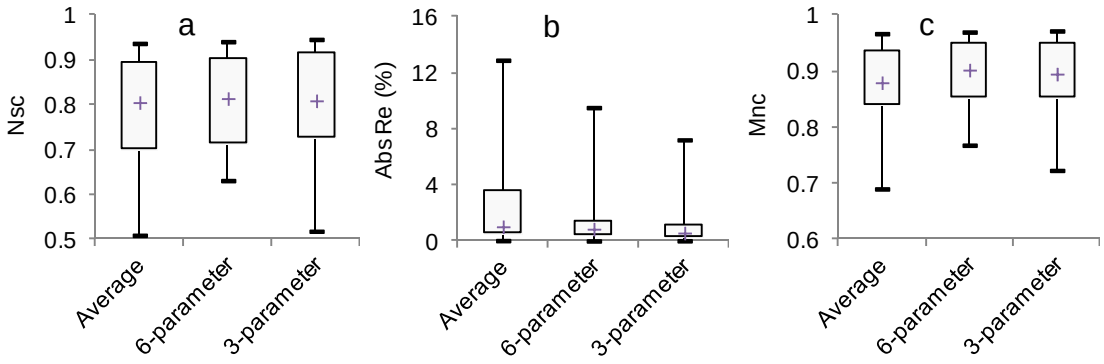


**Fig. R1.** The comparison of model performance among the three parameter setting methodologies. (Average methodology, 6-parameter methodology, and 3-parameter methodology; a: *Nsc*, b: absolute *Re*, c: *Mnc*)

As an example in Gaoqitou catchment, the streamflow uncertainty, i.e., confidence interval using the 3-parameter methodology was lower than that using the 6-parameter methodology, especially for low streamflow (Fig. R2).

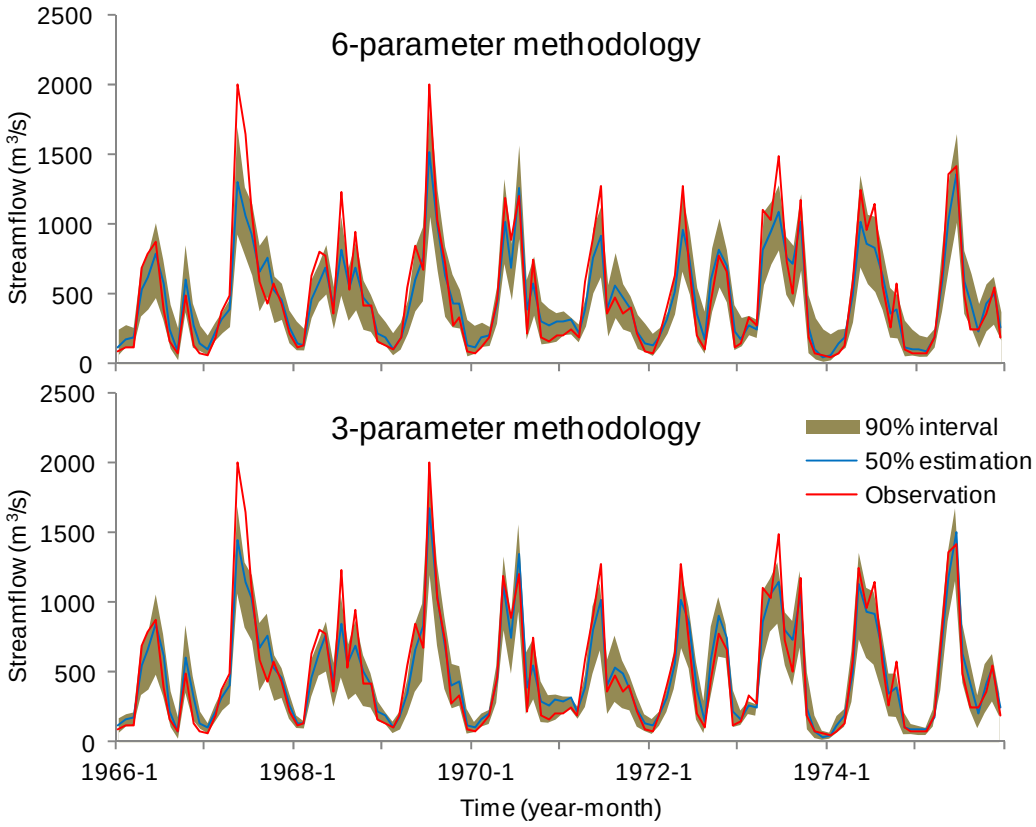


**Fig. R2.** The 90% confidence interval and 50% estimation for simulated streamflow in Gaoqitou catchment by two kinds of parameters setting methodologies.

**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.

The reviewer pointed that "*The reason Dm has the unit length per time, as the right side of the equation has, is that the water flow is seen over the area of the grid cell in xy directions.*" Therefore the $D_m$ corresponds to the vertical flux with the reference area being the horizontal xy-plane.

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.

Although the GLUE could be used by several objective functions, the weight for each parameter set was only one. In order to considering the *Nsc* and *Re*, the *Mnc* criterion was used in this study.

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).

I agree with you that there is a relationship between the variability of a sample and its length. In this study, it was compared that the variability of model parameters based on the 6-parameter methodology and 3-parameter methodology. But, the comparison of the variability of model parameters in different catchments was not focused in this study. The length of sample was almost same with the two parameters setting methodology. So, the variability of model parameters was compared by the box plot.