

## ***Interactive comment on “Diagnosis toward predicting mean annual runoff in ungauged basins” by Yuan Gao et al.***

**Anonymous Referee #2**

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This manuscript tried to parameterize the two parameters of the mean annual balance equation by relating their values with the controlling factors, in order to develop a model to estimate mean annual runoff in ungauged basins. It is an interesting topic and suitable for HESS. However, I have several comments as follow. 1. It isn't clear which equation is the water balance model that was developed for estimating mean annual runoff. 2. As shown in Figure 5(b), there is a large difference and low correlation between the estimated shape parameter and the calibrated one. At the same time, Figure 5(a) shows that the model has a fair estimation of mean annual runoff with the estimated shape parameter. I guess that the model has a low sensitivity to the shape parameter. I suggest a sensitivity analysis on the parameter. Also, it is necessary to evaluate the improvement due to the parameterization from soil characteristics as

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given in Section 2.2.2, since it is a relatively complicated process. In addition, I suggest that some statistical indicators should be given in Figure 5. 3. In Lines 142-148, the authors pointed out the effect of climate variability on water balance, but it isn't clear how to deal with the effect of climate variability in the developed model. In addition, previous studies reported that many factors, such as vegetation, catchment slope and etc., have an impact on water balance. I am not sure whether such factors have more lager impact on water balance than the spatial variability of storage capacity has. There is a possibility that their impacts can be attributed to the impact of the distribution of soil water storage capacity. More analysis and discussions are required.

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