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Interactive comment on "A simple topography-driven and calibration-free runoff generation module" *by* Hongkai Gao et al.

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We thank Anonymous Referee 3 for all his/her constructive comments and useful suggestions. Here are our replies to the comments:

1. The overestimation of the saturated area is most likely caused by the different definition of saturated area in field measurement and in hydrological models. The discussion and interpretation of the overestimation of the saturated area fraction in the BB basin are described in Line 604-614.

2. It is worthwhile to test the impact of seasonal, geological, vegetation, climate and flow characteristics on model efficiency. Actually, we have conducted a study with the MOPEX data to test the impact of vegetation, climate, geology, topography, and other

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catchment characteristics on the shape of the beta function, and found that the topographic information has the most significant impact on the shape of beta function (Gao et al., 2018). In this study we also found the impact of other characteristics on model efficiency not as clear as topography. And the new concept module (HSC) has better performance in mildly sloping catchments, which means topography impacts on the efficiency of HSC module. Therefore, we merely discussed the impact of topography on model efficiency in the manuscript.

3. The discussion will be revised to be better linked with the results.

4. We compared the HBV model performance in MOPEX catchments with other studies (e.g. Ye et al., 2014). We will also refer to Kollat et al. (2012) in the revised manuscript.

Specific comments:

1. We will rephrase the abstract.

2. As has been discussed in Section 6.2, topography, with fractal characteristic, is often the dominant driver of runoff, as well as being a good integrated indicator for vegetation cover, rooting depth, root zone evaporation and transpiration deficits, soil properties, and even geology. But quantifying to what extent the HSC concept reflects different geomorphological and geological processes is still a challenge (Rempe and Dietrich, 2014; Gomes, 2016), which needs further investigation. This limitation will be further discussed in the revised manuscript.

3. I will redo the plotting of Figure 6, to make sure they have the same legend for all maps.

4. Yes, a list of the used catchments will be added as SI material.

References:

Gao, H., Duan, Z., Cai, H. (2018) Understand the impacts of landscape features on the shape of storage capacity curve and its influence on flood, Hydrology Research, 49(1):

90-106.

Ye A, Duan Q, Yuan X, Wood EF, Schaake J. 2014. Hydrologic post-processing of MOPEX streamflow simulations. Journal of Hydrology 508: 147–156 DOI: 10.1016/j.jhydrol.2013.10.055

Kollat, J. B., P. M. Reed, and T. Wagener. "When are multiobjective calibration tradeâĂŘoffs in hydrologic models meaningful?." Water Resources Research 48.3(2012):3520.

Rempe, D. M., and W. E. Dietrich (2014), A bottom-up control on fresh-bedrock topography under landscapes, Proc. Natl. Acad. Sci. U. S. A., 111(18), 6576–6581, doi:10.1073/pnas.1404763111.

Gomes GJC, Vrugt JA, Vargas EA. 2016. Toward improved prediction of the bedrock depth underneath hillslopes: Bayesian inference of the bottom-up control hypothesis using high-resolution topographic data. Water Resources Research 52 (4): 3085–3112

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