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Hydrology and Earth System Sciences Discussions

Interactive comment on "Assessing hydrological model behaviors by intercomparison of the simulated stream flow compositions: case study in a steep forest watershed in Taiwan" *by* J.-C. Huang et al.

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Referee #2 The paper is about comparison between fluxes of two models of TOPO-MODEL and HBV. In my point of view the research question is valid and interesting. The authors tried to evaluate the model fluxes with what they found by end member mixing analysis (EMMA). This is effort on the right direction in my point of view. Using of tracer data is a powerful hypothesis (model) testing method. Although the research question is interesting, in my point of view the publication for this paper is not possible.

The paper is not noble enough. Almost the entire paper (except 4.3) is a basic calibration practice which is cannot be published. Moreover comparison in section 4.3 is very basic and based on previous studies. There are many other objections to this paper, as an example, I think the authors are in a logical loop by presenting figures 6, 7 and 8. These figures are just presenting what the model formulations are doing. Although interesting, in my point of view, the paper cannot be published in its current form.

Reply: We are glad that the reviewer thinks the study is interesting and is on the right direction, though he/she gives negative comments. It may be due to the unclear sentences in the original version; therefore we revised the manuscript thoroughly. As the reviewer argued, we reply to the two critical comments raised by the reviewer, i.e., the calibration procedure in this study and the logical loop by presenting fig. 6-8. Basically, the calibration procedure consists of two components. One is the measure for the model performance and the other is the sorting or selection procedure. For the model performance measure, no "best measure" has been proposed yet. Any measure is more or less biased or imperfect. Even if the multiple measures in the calibration procedure are used, the calibration procedure itself compensates the measures. Using either single or multiple measures is to set the goal that we hope the simulation can achieve. Once the goal is determined, the so called best-performed parameters are also determined. There are many advanced sorting or selection procedures are proposed. Indeed, they can save the computation and search the parameters more efficiently. However, the global searching (e.g., Monte Carlo simulation) basically and eventually can select the same best-performed parameters as well. Therefore we only focus on the streamflow compositions and model behaviors. The reviewer may think that the streamflow composition derived from EMMA should be involved into calibration. In fact, some studies incorporated the chem-hydrograph and/or estimated mean residence times into calibration in order to search the more realistic parameters or test model structure. Undoubtedly, that approach can shed insight on the hydrology science. However, incorporating the geochemical data in calibration must complicate the compensation in calibration and reduce the practical applicability. The geochemical

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data is relatively limited. For the second comment, we admitted the figures present what the model formulations did, which is what we attempt to address. Model, a simple representation of reality, usually combines numerous formulas. We may clearly understand the response of each formula, but we rarely know what the model respond. For example, the opposite patterns in the two simulated inter flows were unexpected. Even the similar patterns with different proportions (e.g. surface flow and base flow) should be addressed, because the proportion of the three flows affects the sediment and nutrient transport significantly. The reviewer may further criticize that such pattern can be determined as long as the numerous generated rainstorms are inputted. However, the representativeness of generated rainstorm is questionable. Nevertheless, understanding the role of parameters in flows and their interactions within the wide spectrum of rainstorms is important for modeling. The figure 6-8 clearly showed the model responses of the three flows to the change of rainfall intensity and storm duration. Moreover, as reviewer recognized, the comparison between model- and EMMA-derived streamflow compositions revealed the significant time lag in base-flow which should be improved further. We think that the data and modeling work we provided in the subtropical mountainous region are evident and valuable. The merit of this study is clear.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 855, 2013.