Hydrology and Earth System Sciences Discussions

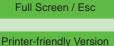## *Interactive comment on* "Soft combination of local models in a multi-objective framework" *by* F. Fenicia et al.

Anonymous Referee #1

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The paper deals with the development of a modular approach to rainfall-runoff transformation using a conceptual rainfall-runoff model known as HBV. The model was calibrated using two distinct objective functions aimed at better reproduction of high and low flows. In this way two local model are developed having the same structure but with different parameter sets. A fuzzy weighing scheme is used to integrate the simulated discharges of the two local models to the produce the composite/combined discharge of the global model. In general the paper is well written. However, there is a lack of detailed description of the HBV model which would enable the reader to better understand the results (e.g. Fig 4). For example, a schematic diagram of the model and a discussion about the parameters which control the low and the high flow dynamics would be useful. The authors need to provide the parameter sets of the two local model

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used in providing the composite discharge to strengthen their discussion. In page 93, the authors argue that simple conceptual model often display a lack of flexibility in capturing the dynamic and time varying nature of hydrological responses. In my view this is the main driver for the paper. However, the authors fail to address this point in a concise and a simple manner. For a more appreciation of this paper by the reader the authors need to show when the HBV model is calibrated using a non-weighted objective function (i.e. WHF=WLF=1) the model will fail the capture the low and high flow dynamics. It is also plausible that the model may succeed in capturing either of the low or the high flow dynamics. This would have a major impact on the development of the local models. The authors have demonstrated the composite global model has better results than the two models used in producing the global model. This is not surprising as these two models are local developed to provide better simulation in particular flow zones. Thus, it is paramount that the authors should demonstrate that the composite model will also has better results that the HBV model calibrated using the non-weighted objective function. As pointed out the authors in the introduction section of the paper, there a number of methods which can be used to produce the composite/combined discharge. To test the efficacy of the fuzzy weighting method used in the paper to produce the composite discharge there is a need to benchmark its results against other methods. At least its results should be compared to those obtained using the simple and the weighted average method.

References

Xiong, L., Shamseldin, A.Y. and O'Connor, K.M. (2001). A non-linear combination of the forecasts of rainfall-runoff models by the first-order Takagi-Sugeno fuzzy system. Journal of Hydrology, 245: 196-217.

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