

## ***Interactive comment on “Multiobjective calibration of the MESH hydrological model on the Reynolds Creek Experimental Watershed” by A. J. MacLean et al.***

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Thanks to the anonymous reviewer for the constructive comments. We agree that based on this reviewer's (and others) comments, substantial revisions are required to the manuscript. For the comments that are most significant, we provide a response below.

Our work was focused on applying the MESH model to Reynolds Creek in an attempt to test MESH model performance. As a result, we were not interested in conducting a 'calibration exercise' with a much simpler model. In essence, we wanted to present

C1452

a modelling study and corresponding calibration procedure for a complex hydrologic model/land surface scheme (MESH). Since MESH is part of the forecasting system being developed by Canada (Environment Canada) as described in Pietroniro et al. (2007), we wanted to demonstrate the calibrated performance of MESH in particular. Furthermore, when evaluating the impacts of climate change on the hydrologic system, we feel that the use of a physically-based model like MESH has great advantages over much simpler conceptual hydrologic models.

As per the comments of other reviewers, details of the model parameters calibrated (ranges, initial values, final values etc.) will be added to the revised manuscript. The results will be presented in a way so as to indicate relative sensitivities of model parameters. The way we defined the multi-objective function (SWE+Q) will also be further clarified in the manuscript (i.e. an explicit equation will be added).

In terms of using vegetation as a GRU delimiter, we certainly agree that there are more (and probably better) options like slope and aspect. However, as a starting point, we consider the use of vegetation as a GRU delimiter to be a traditional or common approach and as such utilized vegetation to define GRUs. Unfortunately, it is simply beyond the scope of our current manuscript (and current resources) to consider the impacts of alternative GRU definitions. We will more clearly indicate in the revised manuscript that the choice of vegetation as a GRU delimiter is not necessarily the most appropriate choice, that problems in the ability to simulate SWE and runoff could be attributed to this choice and that future work should compare calibrated model performance under alternative GRU definitions.

In general, we believe it is fairly straightforward to address the remaining comments made by the reviewer in the revised manuscript and final response.

Pietroniro, A., Fortin, V., Kouwen, N., Neal, C., Turcotte, R., Davison, B., Versegny, D., Soulis, E.D., Caldwell, R., Evora, N., Pellerin, P.: Development of the MESH modeling system for hydrological ensemble forecasting of the Laurentian Great Lakes at the

C1453

regional scale. *Hydrology and Earth System Sciences*, 11, 1279-1294, 2008.

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C1454