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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Coordination and Control: Limits in Standard Representations of Multi-Reservoir Operations in Hydrological Modeling" *by* Charles Rougé et al.

Anonymous Referee #2

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This article provides an evaluation of the consequences of the lack of a representation of reservoir coordination within a multi-reservoir system when simulating flood and drought events in large-scale hydrological models. The model Water Balance Model simulates a multi-reservoir system in USA. The model includes the representation of each reservoir operation policy (using predefined parameters according to each reservoir purpose) but it does not represent the coordination between reservoirs. The global sensitivity analysis Method of Morris is used to assess the effect of the parameterization to the model outputs. Authors conclude that the representation of reservoir policies independently is not enough and that, in addition, we need to capture reservoir coordination in large-scale models to properly simulate flood and drought effects

in multi-reservoir systems.

The article is well written and structured. The Introduction makes a good review of the hydrological impacts of multi-reservoir systems and previous attempts in representing reservoir systems in hydrological models. The methodology is well defined with the exception a few aspects that need further explanation. The article does not explicitly say where the parameters of the reservoir rules (Table 1) come from. Moreover, the authors do not specify the parameter ranges. If the values in Table 1 were obtained by calibration in a previous work, the authors could show the ranges applied in that calibration or just reference that work. If there is no previous calibration, how the predefined values of the parameters produce a good agreement between observed and simulated storages and releases (e.g. Figure 5) in normal climate conditions? The results and discussion are also clear and well structured but there is a lack of discussion of how the methodology applied here can be used by others. I was wondering if this could be done using a different model where the parameters of the reservoir rules are unknown and need to be obtained by calibration. Lastly, I think that the paper needs further and clearer discussion on why the lack of representation of reservoir coordination is most likely to be the main reason of this failure to simulate flood and drought events.

In conclusion, this paper makes a relevant contribution to the growing discussion around the representation of reservoir systems in hydrological models and it has clear practical implications. The authors provide practical recommendations and possible solutions. While the representation of reservoir coordination is still very difficult to implement in models, this study highlights its importance and the need to, at least, consider this limitation when modelling catchments containing reservoir systems under extreme conditions.

Other comments:

- While the authors provide a justification for the 10% range used for the sensitivity analysis, in my opinion, it would be interesting to also show what range of variation

around base values should be applied to properly simulate any of the drought and flood events.

- Page 15, Lines 17-19: What if the releases were represented as cumulative releases, the sensitivity would be as consistent as for the storage?

- Page 21, Lines 2-4: Could you please provide with a possible explanation to this unexpected result?

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