

Response to Reviewer #2.

Interactive comment on “On an improved sub-regional water resources management representation for integration into earth system models” by N. Voisin et al.

Anonymous Referee #2

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The paper is well written with specific questions raised about integration of water resources management within the earth systems model. The case study region selected is appropriate for evaluating the methodology.

We wish to thank the reviewer 2 for his/her comments and constructive criticism which have led to an improved manuscript. Below are answers in line with the comments.

1. The conclusions discuss more of the validation of the models developed and several associated difficulties and errors. The conclusions section should reflect on how improvements are achieved in the ESM models. What changes led to the improvements in the validation of the model with respect to system representation and similarity of the model response to the existing physical system response.

We added a comment in the discussion section. Please note that the system is not linked to an ESM yet and we clarified this point in the discussion section. With an improved representation of the storage and flow releases, we showed that we improved also on the representation of the monthly flow. Model evaluation of storage and supply had not been performed previously but is necessary for assessing the future impact when coupled into an ESM.

2. It is not clear from the manuscript if some of the operating rules in place in the river basin are optimized or not. If optimized, are they considered in place of generic operating rules used in the model?

A schematic of the system was added for clarity. Generic rules are calibrated/set up using long term mean monthly flow and demand. The optimized set up corresponds to the set up using the combination of natural/regulated monthly flow and withdrawals/consumptive water demand leading to the best performance. Schematics have been added to clarify along with the terminology throughout the text.

3. The subscripts used for the variables in the equations can be simplified so should be the notation so that readers can appreciate the constraints/equations.

Subscripts have been simplified.

4. It is not explicitly evident from the manuscript, what improvements achieved in system response based on improved representation of the water management components in the ESM. Can this improvement be quantified ?

In the schematic the improvement from previous work has been highlighted. Performance metrics are now quantifying the improvement in terms of monthly regulated flow. Sections describing the improvement and storage simulations are also clarified.

5. What are the issues if optimization is used considering the complexity of improved representation? Is the system tractable if optimization is used considering curse of dimensionality issues (with dynamic programming) and computational tractability due to solver issue imposed by nonlinear constraints and solution methods.

The use of the terms “optimization” and “calibration” has been revised throughout the text. Calibration refers to the set up of the operating rules and optimization refers to the set of operating rules leading to the best reservoir operation performance. We did not explicitly optimize the operating rules so there is no solver per se or associated programming issues.