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Hydrology and Earth System Sciences
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Discussions

Interactive comment on "On inclusion of water resource management in Earth System models – Part 2: Representation of water supply and allocation and opportunities for improved modeling" *by* A. Nazemi and H. S. Wheater

Anonymous Referee #2

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Review of "On inclusion of water resource management in Earth System models – Part 2: Representation of water supply and allocation and opportunities for improved modeling" by Nazemi and Wheater

The manuscript is a review paper summarizing the research and modeling approaches in groundwater as source of supply, reservoir operations modeling and large scale applications. The discussion follows on the author's perspective of future research directions on water resources management, in particular online coupling and modeling

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development testing.

Overall Comments:

1/ This is an exhaustive review of the large scale modeling done so far. This will be a very nice reference paper for the current state of large scale management modeling.

2/ I would agree with reviewer #1 that there are a couple of erroneous statements which could be verified by the different modelers.

3/ the last section suggesting a modeling and testing framework (5.6) seems limited in comparison to the first sections (2,3,4) describing the existing processes. The framework is not put in perspective with respect to the modeling suggestions made in the section 5 subsections. A case study of the suggested framework with one of the example suggested in earlier 5.s section would validate that framework. The point is that if a framework is being suggested in a paper, readers will expect a case study in order to get convinced that this is sound and feasible, even though the paper is already pretty long.

4/There is a lot of information, which comes in text, and might seem unorganized and sometimes even in opposition to previous call for improvement (especially computational burden and mismatch in space and time scales between LSS, GHS, and management models for example). I would suggest a summary table which specifies for all the suggested improved modeling, the spatial and temporal scales at which this is meaningful, and the data required to make it possible in terms of parameterization and validation at least. I think that this process would make the manuscript easier to properly cite and useful for directions in research.

More specific comments:

Section 3.3.1: Voisin et al. (2013) actually combines release targets with storage targets, ∼rule curves.

Section3.3.2: Although there are advantages to using optimization-based algorythms,

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the computational burden and need of forecast demand and inflow makes it inappropriate for full online coupling. It is unclear in the paper how the authors see further research on how to integrate them in their vision of future research.

Section 4: GHMs are used for hydrological application because their hydrology processes are more complex and allow for some calibration. Reservoirs have fixed characteristics and the main driver of uncertainty for reservoir modeling is the bias in the inflow (Muller Schmied et al. 2014). This would need to be put in perspective in terms of direction of research, in the sense that there is a workflow in the modeling improvement; Some things need to be improved first before we can improve other concepts. The idea of workflow could be introduced in the summary table suggested above.

Section 5.4: Even in local see regional operational water resources management, different decision support systems are used for handling events at different time scales: i.e. hydropower with a 5 minute market, floods with subhourly to hourly time step, and monthly seasonal water supply. The suggestion to move large scale water management to a sub hourly time scale seems i) irrelevant and ii) in contrast with the need of data for calibration when operation are driven by the market for example, and in constrast with the need to balance computational needs.

Table 1:

The demand-supply dependency term of “upstream” is confusing. The dependence links the grid to places where water can be withdrawn, i.e. the grid and a couple of reservoir upstream. But those reservoirs are note defined at “ 5 grid upstream”. Rather, the dependent grid cells are downstream from a reservoir and within 5/10 grid / 200 km from the impounded river (downstream). Please clarify.

Entries for Voisin et al. are inaccurate: “Dynamic priority in operation” should be changed to irrigation, flood control, hydropowers and others.

Table 2:

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The source of data for Voisin et al. (2013a,b) include USGS, USBR and GRDC as in Haddeland et al. There should be another row for Voisin et al. (2013b) which actually used the Community Land Model (CLM) instead of VIC.

Sensitivity of simulated global-scale freshwater fluxes and storages to input data, hydrological model structure, human water use and calibration by H. Müller Schmied, S. Eisner, D. Franz, M. Wattenbach, F. T. Portmann, M. Flörke, and P. Döll http://www.hydrol-earth-syst-sci.net/18/3511/2014/

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 8299, 2014.