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Hydrology and Earth System Sciences
Discussions



# *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 #5**

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The authors investigated different implementations of generic reservoir operation rules to be used in in earth system models. In particular, the combination of storage and releases targets for multi-purpose reservoirs was studied in terms of usage priorities, withdrawals versus consumption demand, and natural versus regulated mean flow for calibrating the operating rules. The different operating rules were tested for the Columbia River Regulation System. Overall, the paper is well written but in some areas lengthy, which is supported by very long and complex sentences. Some aspects are subject for revision before accepted for publication.

1. The authors should explicitly explain the hydrological modeling, i.e. VIC was used for



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simulating river discharges for the whole Columbia River Basin, MOSART was applied to the subbasin. Which one? 2. Were all 125 reservoirs taken into consideration? 3. I assume water withdrawals were not available in a gridded format and for that reason being estimated. Please explain. 4. Equation 4: regional water withdrawals and consumption. What is meant by regional? 5. The acronyms given in the text and also in the figures should be the same. 6. Sensitivity analysis: How sensitive are storage releases with regards to water withdrawals versus water consumption and natural flow versus regulated flow? I think this is finally not well elaborated. How big is the impact of cascaded river discharges released from multiple reservoirs? 7. Different existing operating rules are compared. What is the overall improvement?

In detail: P 3504, l 14 and P 3524, l 11: Reference Doell and Lehner (2009) is not existent. P 3505, l 27: Please correct Doel et al. by Doell et al. P 3508, l 14: Multiple locations: How many were considered? P 3510, l 5: Reference Selley et al. 1998. Please add to the reference list or check spelling (Solley et al. 1999?). P 3510, l 13: "Total monthly consumptive demand. . ." Although reservoirs are prioritized for irrigation, total consumptive demand was used. Why? P 3510, 17-20: Here is some more explanation needed as measured datasets for water withdrawals and water consumption are available. P 3512, l 17: "(i) it includes the demand that can be self-met with local water,. . ." Does this mean that the total demand in a subbasin was assigned to the reservoir? P 3514, l 2-3: please convert Mgal in cubic meters. P 3514, l 4: "As USGS observed demand. . ." I assume both water withdrawals and consumption have been observed beyond 1999. P 3514, l 10-11: Maintaining 10% of river discharge as environmental flow is often used. Any evidence or reference? P 3505, l 13-19: These sentences should be written more "realistically", as e.g. figure 4 shows a decline in performance. An "accurate" representation is important but probably not feasible at the large scale. P 3516, l 1-3: acronyms differ from those in Figure 3 P 3518, l 13-15: I think that's far too optimistic, in particular the timing is not well represented. The authors should try to explain the reasons for the decline in performance (from The Dalles to American Falls). P 3518, l 18-19: At the first glance, this statement is not correct.



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Simulated regulated flow mostly overestimates observed regulated flow. On average, underestimation is apparent between mid June and October. P 3519, l 23-25: How did you calculate the demand not met? Using water withdrawals? If so, then sectoral differentiation would be important (not total water withdrawals as calculated from water consumption with a fixed share). Demand curve did not change much between 1990 and 1997. Why could the demand peaks be met in 1990 or 1994 but not in other years (Figure 6)? Reduction in precipitation?

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 3501, 2013.