Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2016-660-AC2, 2017
© Author(s) 2017. CC-BY 3.0 License.

Hydrology and Earth System Sciences
Discussions
Open Access

Interactive comment on "Deduction of Reservoir Operating Rules for Application in Global Hydrological Models" *by* Hubertus M. Coerver et al.

Hubertus M. Coerver et al.

b.coerver@mailbox.org

Received and published: 25 April 2017

Dear referee,

Thank you for your comments and suggestions.

In case the current approach is implemented in a GHM, the ANN will be trained using inflow data derived from the model itself. Assuming that the variance in the errors in inflow values is not very large, the ANN will be trained with inflows containing the bias (opposed to actual observed inflows). By combining this inflow with remote sensing measurements of the storage in the respective reservoir, the release can then also be

Printer-friendly version

Discussion paper

determined.

The mentioned cascading effect can indeed cause problems. In case the reservoirs are close to each other and the operations are done in an integrated way, one could consider to lump all the reservoirs together and apply the ANN using the inflow in the most upstream reservoir and the combined storage of all the reservoirs.

Regarding the non-stationarity of the rule curves, it is possible to update the ANN online, giving a greater weight to more recent samples than older ones. This way the fuzzy rules will steadily adapt over time to new situations.

Table 1 shows the MSE and Nash-Sutcliffe (NS) coefficients for the selected dams of which the functions does not include irrigation modeled with Hanasaki et al. (2006), together with the indicators already presented in the manuscript. Comparing the indicators, it becomes clear that the proposed methodology performs better for five of the seven dams. While the remaining two perform similarly, with NS-coefficients of 0.70 compared to 0.54 for Charvak and 0.83 compared to 0.75. Therefor it would indeed be a good idea to implement the fuzzy approach over as many reservoirs as possible, data permitting, while completed with generic rules.

Considering your comment on the carry over storage, perhaps this is not clear enough from the manuscript, but the ANN can indeed simulate carry over storage. For the case in which the ToY parameter is applied, it is possible that the rules describing the release around the end of the year incorporate the behavior of the dam operator with regards to the carry over storage target. In case the storage is below the target during the last months, the release described by the rules for these specific months should reflect that.

Regards, Bert Coerver

CC BY

Table 1. The test MSEs (10^{-3}) [-] and the NS coefficients [-] for all dams for different time-ranges and with different prediction horizons together with the indicators using the Hanasaki et al. (2006) method.

			Dam										
Range	Lag		AJ	BL	CF	CD	CV	KR	NR	SN	TT	TQ	TM
1	0	MSE	23.9	41.1	5.80	71.2	5.68	23.6	15.2	16.0	21.1	12.3	19.8
		NS	0.69	0.46	0.80	-0.49	0.92	0.45	0.78	0.40	0.33	0.50	0.95
2	0	MSE	5.10	15.8	1.85	4.13	32.3	6.27	3.31	11.6	9.60	6.18	0.981
		NS	0.93	0.79	0.94	0.91	0.54	0.85	0.95	0.57	0.70	0.75	0.98
2	1	MSE	41.0	31.9	5.78	23.6	13.0	32.6	23.0	12.0	28.0	24.1	21.5
		NS	0.46	0.58	0.80	0.51	0.81	0.23	0.66	0.55	0.12	0.01	0.5
2	2	MSE	46.6	41.5	21.5	48.3	30.7	115	40.2	21.9	39.1	50.8	34.6
		NS	0.42	0.45	0.24	-0.02	0.55	-1.67	0.39	0.18	-0.19	-0.91	0.21
Hanasaki et al. (2006)		MSE	21.9	48.9	6.34	-	13.2	15.2	-	-	28.6	7.57	-
		NS	0.51	0.11	0.22	-	0.70	0.52	-	-	0.02	0.83	-

1 References

Hanasaki, N., Kanae, S., and Oki, T. (2006). A reservoir operation scheme for global river routing models . Journal of Hydrology, 327(12):22 41.

Printer-friendly version

Discussion paper

CC BY