Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2020-60-RC1, 2020

Hydrology and Earth System Sciences
Discussions
Open Access

Interactive comment on "The benefit of using an ensemble of seasonal streamflow forecasts in water allocation decisions" *by* Alexander Kaune et al.

Anonymous Referee #1

Received and published: 19 March 2020

Streamflow forecasts can substantially contribute to the efficiency of water resources system. Yet, the efficiency improvements are influenced by multiple factors, such as the quality of forecasts, the characteristics of the system, and the optimization/simulation models for system operation. This paper has conducted an investigation of the use of ensemble seasonal streamflow forecasts in water allocation decision-making. The forecasts are generated by the FoGSS model; the water allocation is through a simulation model (Figure 3 on Page 23); and the case study is for the Murrumbidgee basin in Australia. In general, the paper is interesting with the results and methods clearly presented.

There are a few comments for further improvements of the paper.

First of all, is it possible to conduct the system operation using perfect forecasts? If so, the performance under perfect forecasts would serve a benchmark, i.e., upper bound, in the analysis. Specifically, it would illustrate the maximum benefit from the use of forecasts. In the analysis, the paper has analyzed the performance under climatology. Conceptually, it shows the lower bound of the system performance when no forecasts are available. The gap between the lower and upper bounds would highlight the potential benefit due to the use of streamflow forecasts.

Secondly, the system is operated by a simulation model. According to Figure 3 on Page 23, the model involves a number of thresholds that are quite empirical. How are the thresholds determined for the case study? How is the sensitivity of the system performance to the thresholds? Are the values of the thresholds optimal (or sub-optimal)? Details on the setting of the simulation model, in particular the empirical thresholds, ought to be provided.

Thirdly, according to Figure 4, the actual water storage tends to be higher than the simulated storage. On Page 9, the difference is related to that "a constant factor is used (78%) to simulate the carry-over between water years". This result highlights that the empirical thresholds can considerably influence the water allocation decisions and the performance of the water resources system. Is it possible to test the optimality (or rationale) of this critical threshold (and also other thresholds) of the simulation model?

Fourthly, stochastic optimization models are usually set up for reservoir operations using streamflow forecasts. For some examples, please refer to Labadie (2004, https://doi.org/10.1061/(ASCE)0733-9496(2004)130:2(93)), Celeste and Billib (2009, https://doi.org/10.1016/j.advwatres.2009.06.008), Zhao et al. (2012, https://doi.org/10.1029/2011WR010623), Turner et al. (2017, https://doi.org/10.5194/hess-21-4841-2017), and Anghileri et al. (2019, https://doi.org/10.1029/2019WR025280). One remarkable advantage of stochastic optimization models is the explicit handling of forecast uncertainty. Also, the system performance can be optimized, instead of being simulated. For the case study, is it possible to set up an optimization model?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2020-60, 2020.