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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Assessment of methods for seasonal streamflow forecasting in the Upper Indus Basin of Pakistan" *by* Stephen P. Charles et al.

Anonymous Referee #2

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The authors have assessed three different methods - Bayesian Joint Probability (BJP), the Snowmelt Runoff Model (SRM) and a hybrid approach (SRM - Ensemble Streamflow Prediction inflow means as additional predictor in BJP approach) for forecasting seasonal streamflow to the two largest dams in the Upper Indus Basin, Pakistan. The authors concluded that BJP approach is simple and it worked well to provide probabilistic seasonal streamflow forecasts.

The topic is relevant for publication in HESS. Overall, the paper is well written. I recommend a moderate revision to the manuscript and the following concerns need to be addressed:

Major Concerns: 1. Under the BJP approach, was the conditional multivariate normal distributions fit over the entire season or on monthly basis? How many samples were generated through Monte Carlo Simulations under the BJP approach? Provide details. 2. Page 7, lines 24-27, the skill of using March flow and/or one climate predictor looks very similar to each other. The authors are recommended to use statistical significance test to compare if the skills are significantly different from each other. 3. Given that most of the streamflow at Indus River at Tarbela is snowmelt driven, use of a direct or indirect indicator of snow as one of the predictors, along with the projected summer air temperature can improve the forecasting skill. The authors are encouraged to consider global precipitation (for winter) and air temperature forecasts as predictors, which can represent snow as one of the inputs to the model. 4. It is not clear why MEI for May and Jun from previous year enhanced the skill score for Indus at Tarbela? Explain. 5. Page 7, line 1, how good or better the skill enhancement is if SSCRSP (or SSRMSE) changes from 21 to 24.3 (within moderate skill range in Table 1)? Does it reduce uncertainty? Clarify. 6. In Table 3, it will be good to know the correlations that are statistically significant (e.g. at 95% confidence interval) based on the sample size. 7. Page 10, lines 2-7, the hypotheses listed are not clear. As mentioned by the authors earlier, it is already known the snowmelt plays an important role for Indus River at Tarbela. So it not a hypothesis. Also, the results indicated that adding NAO, when used as a predictor, did not improve forecasting skill.

Minor Concerns: 8. Did the models use monthly (or daily) data for the model fitting? If so, it needs to be clearly stated. 9. Page 6, lines 27 – 30, RMSEP needs to be used instead of RMSE. Also RMSEP needs to be defined in the text. 10. In figures 3a, 4a, 5a and 6a, what are the bounding lines (is it 95% Confidence Interval)?

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