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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Statistical forecast of seasonal discharge in Central Asia for water resources management: development of a generic linear modelling tool for operational use" *by* Heiko Apel et al.

Anonymous Referee #2

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This paper proposes to use standard multiple linear regression (MLR) to predict season streamflow for 13 catchments in Central Asia. The predictors are antecedent precipitation, streamflow, temperature, and snow depth. The different combinations of predictors are tested using MLR under the framework of leave-one-out cross validation (LOOCV) and using the metric of predicted residual error sum of squares (PRESS). At the end, "the best 20 forecast models" are picked out for the prediction of future streamflow. In general, the paper is well-written and the results are clearly presented. In the meantime, there are comments for further improvements of the paper:

First of all, it is widely known that the predictability of seasonal streamflow is generally from two sources, i.e., catchment storage and future climate [Hamlet and Lettenmaier, 1999; Chiew and MacMahon, 2002; Wood et al., 2002; Schepen et al., 2012; Crochemore et al., 2017]. However, in this paper, the predictors of future climate, which can be atmospheric circulation indices and GCM/RCM outputs, are not considered at all. That is to say, this paper only accounts for the predictability from catchment storage. As a result, the forecasts as are presented in this paper are not deemed "best" and they can be further improved. The authors are encouraged to consider circulation indices in seasonal streamflow forecasting. It is noted that NOAA provides a collection of more than 30 climatic indices (https://www.esrl.noaa.gov/psd/data/climateindices/list/).

Second, the analysis of predictive uncertainty is too simple to be informative in this paper. It is pointed out that for ensemble and probabilistic forecasts, the attributes of reliability and skill are of key importance [Murphy, 1993, What Is a Good Forecast? An Essay on the Nature of Goodness in Weather Forecasting]. Reliability can be diagnosed using the PIT reliability diagram or PIT histogram [e.g., Wang et al., 2009; Crochemore et al., 2017]. Meanwhile, Skill can be measured using the continuous ranked probability score (CRPS), which is for both deterministic and ensemble forecasts and is equivalent to the mean absolute error (MAE) for deterministic forecasts [Hersbach, 2000]. In addition to the illustrative plots of predictive uncertainty, the authors are encouraged to perform a comprehensive examination of forecast reliability and skill.

There are also some minor comments: 1. As for LOOCV, it can lead to artificial overestimation of forecast skill if the streamflow series exhibit strong auto-correlation. It is worthwhile to check the serial autocorrelation of streamflow. Or, a more rigorous leave-five-years-out cross validation (L5OCV) ought to be applied. 2. In terms of predictors of catchment storage, the use of multi-monthly means as the predictor values is sensible. 3. The paper suggests to use the "the best 20 forecast models". This setting is empirical and it is rare in peer studies. Please clarify why.

References: http://ascelibrary.org/doi/abs/10.1061/%28ASCE%290733-9496%281999%29125%3A6%28333%29 http://www.tandfonline.com/doi/abs/10.1080/0262
http://onlinelibrary.wiley.com/doi/10.1029/2001JD000659/abstract
http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-11-00156.1
http://www.hydrol-earth-syst-sci.net/21/1573/2017/hess-21-1573-2017.pdf http://journals.ametsoc.org/doi/abs/10.1175/1520-0434%281993%29008%3C0281%3AWIAGFA%3E2.0.CO%3B2
http://onlinelibrary.wiley.com/doi/10.1029/2008WR007355/full
http://journals.ametsoc.org/doi/abs/10.1175/1520-0434(2000)015%3C0559:DOTCRP%3E2.

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