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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Climate information based streamflow and rainfall forecasts for Huai River Basin using Hierarchical Bayesian Modeling" *by* X. Chen et al.

Anonymous Referee #1

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This research article develops a multi-site seasonal rainfall and streamflow forecast for the Huai River Basin in China. It is refreshing to see Bayesian statistics, as opposed to frequentist statistics, used to explore teleconnections between sea surface temperatures and rainfall and streamflow. The approach appears to tick all boxes required of Bayesian statistics, such as estimating prior and posterior distributions using well-established software and methods. The plot of the posteriors (coefficients) shows nicely the spatial variation between stations and the model covariates and give a sense of parameter uncertainty in the model making this a transparent forecasting method. The m-fold cross validation also builds confidence in the forecast skill to a

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degree. While the paper is nice and compact a more in-depth discussion of the results is important. The following thoughts may provide a starting point: As is usual with all forecasting approaches, the extremes are not captured well by this forecast approach. This is particularly evident for streamflow at Bengbu for 1997, 1999, 2003 and 2009 (Figure 5). This warrants more discussion considering that this station is a "best performer" looking at the skill scores (Figure 7). Importantly, it is these outliers that are most important to forecast. Why is this method missing these events? Here are some thoughts on what this discussion may contain; 1) is a log transform of the original data appropriate and/or does the back transformation need to be (bias) corrected, 2) could a hierarchical generalized linear model assuming gamma distributed error structure be more appropriate considering the original data is skewed, 3) is this approach confirming a limit of the predictability of rainfall and streamflow using SSTs (see for example Westra and Sharma 2010), 4) is this shortfall a major hurdle for incorporating forecasts in dam management? Further discussion is also warranted on why there is an inconsistency in the skill scores (station 14 is pointed out). Though, this confirms the need for multiple skill scores, why not dig out why there is variation in the skill scores. Could this reveal more on forecast performance? Two final questions: 1) is there persistence (particularly for streamflow) from one wet season to the next and was this considered and 2) is the streamflow unregulated and if not how was this accounted for? To summarise, while the approach seems solid, a more in depth discussion would give further insight into the model results, limitations and future directions for this research area. Without this discussion, this research paper offers much the same as Kwon et al. (2009). I look forward to further discussion.

Kwon, H., Brown, C., Xu, K. Lall, U. 2009. Seasonal and maximum streamflow forecasting using climate information: application to the Three Gorges Dam in the Yangtze River Basin, China. Hydrological Sciences–Journal–des Sciences Hydrologiques, 54(3), 582-594.

Westra, S., Sharma, A., 2010. An Upper Limit to Seasonal Rainfall Predictability?

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Journal of Climate 23, 3332-3351.

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