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Predicting extreme inflow in Xidayang Reservoir in North China using large-scale oceanic fields

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Climate is a primary driver for extreme rainfall and flood events. This study is focused on the temporal change of flood risk associated with the annual maximum daily inflow (AMDI) in the Xidayang Reservoir catchment, which is the largest catchment in Daqing River Basin in North China and is highly prone to floods related to the East Asian summer monsoon. We identified two climate factors, the average May-June-July sea surface temperature anomalies in areas of the northern Indian Ocean and western Pacific Ocean. There is one-month lag between the climate predictors and AMDI, which provides an opportunity to make pre-season prediction. Bayesian nonstationary models are then developed for the AMDI using the climate predictors identified as covariates. We compared three types of models of AMDI: (1) time-invariant, (2) linear temporal trend and (3) climate informed, and found that the climate-informed models exhibit the best performance according to Deviance Information Criterion (DIC) and 90th percentile Bayesian coverage rate for AMDI. A significant decreasing trend is identified in the AMDI, which is found to be associated with the climate predictors. Leave one out cross validation (LOOCV) is used to demonstrate that these models have decent skill in predicting year-to-year variability in flood risk. This can help to provide flood dynamic management measures for reservoirs in Daqing River Basin using information from before the beginning of monsoon season, thus facilitating adaptation to a changing climate.