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Non-stationary Modeling of Extreme Precipitation over Monsoon Asia – Role of Teleconnection Time Lags

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Extreme precipitation events are increasing due to climate change and leading to frequent flooding and severe droughts. These events vary in both space and time and are positively correlated with the climate teleconnections representing the oscillations of the ocean-atmospheric system. However, large numbers of climate signals and the precipitation response may vary at certain time lags with each climate indices. This study identifies time lags for climate indices using cross-correlation analysis between extreme precipitation and climate indices. These time-lagged climate indices are used as a covariate to fit a non-stationary generalized extreme value (NS-GEV) model over Monsoon Asia. The best NS-GEV model among non-stationary models is selected based on Akaike information criteria (AICc). Results show that the correlation between precipitation and different climate indices is spatially non-uniform. Incorporating time lag climate indices as covariate improves the performance of the non-stationary models. This study helps in understanding the teleconnections influencing the variation of extreme precipitation in a non-stationary framework and to revise the infrastructure designs and flood risk assessment.