Partial wavelet coherence analysis for understanding the standalone relationship between Indian Precipitation and Teleconnection patterns

Rathinasamy Maheswaran, Ankit Agarwal, and Juergen Kurths

PIK, Germany (maheswar@pik-potsdam.edu)

Hydro-meteorological variables, like precipitation, streamflow are significantly influenced by various climatic factors and large-scale atmospheric circulation patterns. Efficient water resources management requires an understanding of the effects of climate indices on the accurate predictability of precipitation. This study aims at understanding the standalone teleconnection between precipitation across India and the four climate indices, namely, Niño 3.4, PDO, SOI, and IOD using partial wavelet analysis. The analysis considers the cross correlation between the climate indices while estimating the relationship with precipitation. Previous studies have overlooked the interdependence between these climate indices while analysing their effect on precipitation. The results of the study reveal that precipitation is only affected by Niño 3.4 and IOD and a non-stationary relationship exists between precipitation and these two climate indices. Further, partial wavelet analysis revealed that SOI and PDO do not significantly affect precipitation, but seems the other way because of their interdependence on Niño 3.4. It was observed that partial wavelet analysis strongly revealed the standalone relationship of climatic factors with precipitation after eliminating other potential factors.

Keywords: Indian Precipitation, wavelet coherency, partial wavelet coherence, teleconnections patterns.