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Understanding the association between global teleconnections and concurrent drought and heatwaves events over India

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The variability in the occurrence of concurrent extremes like droughts and heatwaves is often attributed to climate change and anthropogenic factors, neglecting its connection with large-scale global teleconnections. The current study investigates the temporal and spatial connections between concurrent droughts and heatwaves (CDHW) in India to large scale global teleconnections like El Nino Southern Oscillation, North Atlantic Oscillation, Pacific Decadal Oscillation, and Indian Ocean Dipole. Utilizing composite and wavelet coherence analyses, we conduct a univariate assessment of droughts and heatwaves, quantified with the standardized precipitation index and standardized heat index, respectively, in association with large-scale global teleconnections (referred as climate drivers). Further, a novel attribution table framework proposed to quantify the conditional probability of CDHW given the onset of climate drivers. We found that the probability of CDHW preceeding the onset of climate drivers is much higher compared to the probability of CDHW occuring without the onset of climate drivers. The insights from this study suggest the potential use of global teleconnections for issuing season-ahead forecasts of CDHW.