

Dynamics of changing impacts of tropical Indo-Pacific variability on Indian and Australian rainfall

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A positive Indian Ocean Dipole (IOD) and a warm phase of the El Niño-Southern Oscillation (ENSO) reduce rainfall over the Indian subcontinent and southern Australia. However, since the 1980s, El Niño's influence has been decreasing, accompanied by a strengthening in the IOD's influence on southern Australia but a reversal in the IOD's influence on the Indian subcontinent. The dynamics are not fully understood. Here we show that a post-1980 weakening in the ENSO-IOD coherence plays a key role. During the pre-1980 high coherence, ENSO drives both the IOD and regional rainfall, and the IOD's influence cannot manifest itself. During the post-1980 weak coherence, a positive IOD leads to increased Indian rainfall, offsetting the impact from El Niño. Likewise, the post-1980 weak ENSO-IOD coherence means that El Niño's pathway for influencing southern Australia cannot fully operate, and as positive IOD becomes more independent and more frequent during this period, its influence on southern Australia rainfall strengthens. There is no evidence to support that greenhouse warming plays a part in these decadal fluctuations.

Keywords: Monsoon, ENSO, IOD