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Indian Ocean Dipole Interpreted in Terms of Recharge Oscillator Theory

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In this paper we use sea surface height (SSH) derived from satellite altimetry and an analytical linear equatorial wave model to interpret the evolution of the Indian Ocean Dipole (IOD) in the framework of recharge oscillator theory. The specific question we address is whether heat content in the equatorial band, for which SSH is a proxy, is a predictor of IOD development as it is for El Nino and the Southern Oscillation (ENSO) in the Pacific. We find that, as in the Pacific, there are zonally coherent changes in heat content along the equator prior to the onset of IOD events. These changes in heat content are modulated by wind-forced westward propagating Rossby waves in the latitude band 5-10S, which at the western boundary reflect into Kelvin waves trapped to the equator. The biennial character of the IOD is affected by this cycling of wave energy between the equator and 5-10S. Heat content changes are a weaker leading indicator of IOD sea surface temperature anomaly development than is the case for ENSO in the Pacific though because other factors are at work in generating IOD variability, one of which is ENSO forcing itself through changes in the Walker Circulation.

Keywords: Indian Ocean Dipole, Ocean-Atmosphere Interactions, Climate Variability, Equatorial Waves, ENSO