A western-pole controlled Indian Ocean Dipole event in 2015 modulated by long-term variability

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The canonical Indian Ocean Dipole (IOD) event is usually associated with strong sea surface temperature (SST) cooling of eastern pole in the southeastern tropical Indian Ocean (SETIO) and warming of western pole in the western tropical Indian Ocean (WTIO). However, positive IOD in 2015 is western-pole controlled event, with little SST change off Sumatra-Java. The coastal upwelling in the SETIO was suppressed in 2015, causing the weakened SST cooling in the region. Empirical mode decompositions of SETIO and WTIO SST index show that the decadal variability and long-term trend modulate the strength of IOD. That implies the background state in the Indian Ocean is unfavorable for the eastern-pole controlled IOD in 2015. It also can be observed by the low-frequency oscillation of sea surface height, sea level pressure and surface wind, all of them following the Bjerknes feedback. In short, anomalous strong SST warming in the WTIO and unfavorable ocean state in the SETIO induced by long-term variability along the equator are the reasons for the western-pole controlled IOD in 2015.

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