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On the role of subtropical Indian Ocean dipole in triggering the tropical Indian Ocean dipole

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The role of the subtropical Indian Ocean dipole (SIOD) in triggering the tropical Indian Ocean dipole (IOD) is investigated in the present study. It is revealed that the SIOD is the dominant mode of the interior Indian Ocean sea surface temperature variability on the basin-scale, from empirical orthogonal function (EOF) analysis. A composite analysis with respect to boreal winter positive (negative) SIOD shows that warm (cold) southwestern Indian Ocean sea surface temperature (SST) anomalies southeast of Madagascar are highly persistent and affect the monsoon wind over the western Indian Ocean from boreal spring to early summer, inducing warm (cold) SST anomalies in the western tropical Indian Ocean via reduction of latent heat flux and suppressed upwelling along the Somali coast. Consequently, the zonal SST gradient in the tropical Indian Ocean generates the equatorial anomalous easterly (westerly), which is essential to IOD evolution. Under the air-sea coupled processes initiated by this equatorial easterly (westerly), a positive (negative) IOD event will develop in the early boreal summer and peaks during autumn. Lead-lag correlation analysis supports the above result further that positive (negative) IOD events are preceded by positive (negative) SIOD events, in which the southwestern Indian Ocean SST anomaly plays an important role.