Equatorial oceanic waves and the evolution of 2007 positive Indian Ocean Dipole

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Abstract

In this paper, the role of equatorial oceanic waves on the evolution of the 2007 positive Indian Ocean Dipole (pIOD) event was evaluated using available observations and output from a quasi-analytical linear wave model. It is found that the 2007 pIOD event was a weak and short-lived event: developed in the mid-summer (July), matured in the early fall (September), and terminated in the mid-fall (October). The evolution of the 2007 pIOD event was linked to the equatorial wave dynamics. The development of the event was associated with the generation of upwelling equatorial Kelvin waves (westward current anomalies) generated by the easterly wind anomalies. On the other hand, the termination of the event was associated with the occurrence of eastward zonal current anomalies resulted from a complex interplay between the wind-forced downwelling Kelvin waves and the eastern-boundary-reflected Rossby waves. A quasi-analytical linear wave model was used to assess the causes of the westward and eastward zonal current anomalies along the equatorial Indian Ocean during the evolution of the 2007 pIOD event. The results show that during the development and maturation of the event, the wind-forced Kelvin waves played a dominant role in generating zonal current anomalies along the equatorial Indian Ocean, while the eastern-boundary-reflected Rossby waves tended to weaken the wind-forced Kelvin waves signals. On the other hand, during the termination of the event our model shows that the initiation of anomalous eastward current was resulted from the reflected Rossby waves at the eastern boundary. The wind-forced Kelvin waves associated with the seasonal reversal of the monsoon further strengthened the eastward zonal currents generated by the boundary-generated Rossby waves in the late-October/early-November. This highlights the importance of the eastern-boundary-reflected Rossby waves on the termination of the IOD event.

Key words: *Indian Ocean Dipole, Kelvin waves, RAMA buoys, Rossby waves*