

Contribution of oceanic wave propagation from the tropical Pacific to asymmetry of the Ningaloo Nino/Nina

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Ningaloo Nino (Nina) is a climate mode associated with anomalously warm (cool) sea surface temperature (SST) off the Western Australian coast. Considering its large impacts on the local marine ecosystem and precipitation, better understanding of its mechanism and predictability is desirable. Existing studies suggest that both local air-sea interaction and remote forcing contribute to generation and amplification of the Ningaloo Nino/Nina. The latter forcing includes the atmospheric teleconnection and oceanic wave propagation through the Indonesian archipelago, mainly associated with the El Nino/Southern Oscillation (ENSO). One of the important characteristics of Ningaloo Nino/Nina is its asymmetry; the Ningaloo Nino is stronger than the Ningaloo Nina. This suggests the presence of some asymmetry in these processes. However, no studies to date focused on this topic.

Using a regional ocean modeling system (ROMS), the contribution of oceanic wave propagation to the amplitude and asymmetry of SST anomalies associated with the Ningaloo Nino/Nina is investigated. For these purposes, a sensitivity experiment in which oceanic lateral boundary conditions are replaced by the monthly climatology is conducted. The results suggest that downwelling (upwelling) Kelvin waves from the western tropical Pacific associated with La Nina (El Nino) that often co-occur with Ningaloo Nino (Nina) are stronger (weaker) and contribute to the asymmetry.

Keywords: Ningaloo Nino, Regional ocean modeling system, El Nino/Southern Oscillation, coastal Kelvin wave