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The scientific value of satellite altimetry data has grown dramatically over time in oceanographic studies, but has not been fully utilized in climate-related studies. The Madden-Julian Oscillation (MJO) impacts a wide range of weather and climate phenomena such as monsoon onset and break, El Niño – Southern Oscillation (ENSO), Indian Ocean Dipole (IOD) interactions, and tropical cyclone modulation. Despite the important role of the MJO in our climate and weather systems, current global circulation models (GCMs) exhibit considerable shortcomings in representing it. A lack of in situ observations in the tropical oceans, especially in the Indian Ocean, has impeded progress on the study of the MJO, specifically its initiation. This study shows that the MJO signal is observed in Sea Surface Height (SSH) data, indicating that satellite altimetry data can provide useful measurements of MJO activity, particularly in regions where there is a lack of observations.

In this study the role of air-sea interaction on Madden-Julian Oscillation (MJO) propagations across the tropical Indian Ocean is analyzed using integrated multi-mission satellite measurements of Sea Surface Height (SSH) and Outgoing Longwave Radiation (OLR). MJO-related activity is observed in both parameters in the eastern equatorial Indian Ocean indicates that in the eastern Indian Ocean, atmospheric conditions appear to aid the generation of equatorial Rossby waves while in the central and western Indian Ocean, different phases of oceanic Rossby wave propagations seem to have a strong influence on atmospheric conditions associated with the MJO. The downwelling phase of equatorial Rossby waves corresponds to strengthening of OLR anomalies in spatial extent and magnitude across the equatorial Indian Ocean, while the upwelling phase appears to weaken atmospheric MJO activity.
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