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Long-Lasting Marine Heatwaves Instigated by Ocean Planetary Waves in the Tropical Indian Ocean During 2015–2016 and 2019–2020

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Marine heatwaves (MHWs) in the tropical Indian Ocean (TIO) showed remarkable increases in duration and frequency during the satellite observing era, responding to rising sea surface temperature. Long-lasting MHWs were found in three upwelling regions of the TIO in 2015–2016 and 2019–2020, closely related to persistent downwelling oceanic planetary waves. In 2015, a prolonged MHW (149 days) in the western TIO was initiated by the downwelling Rossby waves associated with the co-occurring super El Niño and positive Indian Ocean dipole (IOD) events. In the following year, the negative IOD sustained the longest MHW (372 days) in the southeastern TIO, prompted by the eastward-propagating equatorial Kelvin waves. In 2019–2020, the two longest MHWs recorded in the southwestern TIO (275 days in 2019 and 149 days in 2020) were maintained by the downwelling Rossby waves associated with the 2019 extreme IOD. This study revealed the importance of ocean dynamics in long-lasting MHWs in the TIO.