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Seasonal variation of Indonesian Throughflow at the Makassar Strait

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The main pathway of the Indonesian Throughflow (ITF) from the equatorial Pacific Ocean to the eastern Indian Ocean is via Makassar Strait. Approximately 80% of the total ITF transport is carried through Labani Channel (118.5E, 2.8S), a ∼45 km wide constriction in this strait. This study investigates the seasonal variation of upper ocean currents in Makassar Strait using a high resolution ocean general circulation model, 0.2 deg and .08 deg. versions of the HYbrid Coordinate Ocean Model (HYCOM). The model includes both the Indian and Pacific Ocean basins and resolves the narrow channel of Makassar Strait as well as other narrow straits in the maritime continent.

The tropical Indo-Pacific basin HYCOM was integrated for the period 1979-2006 with surface forcing fields based on the NCEP-DOE reanalysis 2 (NCEP2) winds and satellite-derived surface radiation. Simulated upper ocean currents along Labani Channel are first compared with those observed at the INSTANT moorings during 2004-2006. The model is able to simulate variations of observed upper ocean currents and the total transport through the channel reasonably well. The annual cycle of upper ocean currents is then calculated using 25 years of model output. The reduction of southward currents at Makassar Strait during May-June and November-December is evident, which is consistent with the INSTANT moorings. It is found that the reduction in May-June results from the propagation of equatorial and coastal Kelvin waves generated in the Indian Ocean by the monsoon transitions. While a similar propagation of Kelvin waves is evident in November-December that affects the transport at Lombok Strait, the waves do not propagate into Labani Channel and thus do not generally influence the southward transport at Makassar Strait during this season.