

Effects of the Indonesian Throughflow on Indo-Pacific Circulation

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Effects of the Indonesian Throughflow on the circulation and thermal structure of the Pacific Ocean are investigated using a global ocean general circulation model (OGCM) and various observations. The model is the parallel version of the MIT primitive equation OGCM. The meridional resolution is 0.3 degrees within 10 degrees of the equator, gradually increasing to 1 degree in the subtropics. The zonal resolution is 1 degree. There are 46 levels in the vertical, with 10 m resolution in the upper 150 m. The model, after spinup, was driven by real time NCEP reanalyzed surface fluxes from 1989 to 1997. Two experiments are conducted; one with open Indonesian passages and the other without. Comparisons were made between the two model solutions and with observational data from the TOGA-TAO arrays, WOCE hydrography, current meter moorings, etc.

With closed Indonesian passages, warm water from the Indonesian Seas (which would otherwise flow into the Indian Ocean with open passages) cause a systematic warming of the tropical Pacific thermocline resulting in large model deviations from observations. Closing the passages has little effect on the exchange rate near 10N. However, the actual exchange between the tropical and northern subtropical Pacific is significantly smaller with open than with closed passages because a significant amount of thermocline water from the northern subtropical Pacific flows into the Indian Ocean through the Indonesian passageway. Exchange near 10S is affected more significantly by the closed passages than that near 10N. Effect of the closed passages on seasonal and interannual variabilities of the tropical Pacific, as well as implications to decadal variability and to regional Pacific modeling are also discussed.