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On the Annual Cycle of Upper-Ocean Circulation in the Eastern Equatorial Pacific

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ABSTRACT

An oceanic general circulation model is used to investigate the annual cycle of the near-surface currents in the eastern equatorial Pacific Ocean; in particular, the causes of the springtime increase of eastward momentum that reverses the westward surface flow and intensifies the Equatorial Undercurrent are examined. A set of process experiments are carried out that isolates effects due to three forcing mechanisms: local zonal and meridional winds, and remote zonal winds. It is demonstrated that the springtime weakening of the local easterly trades is the primary cause of the eastward-momentum increase. In addition, due to meridional advection, the local southerly wind drives a westward current on the equator throughout the year; this flow is weakest in the spring, and therefore this process also contributes to the anomalous eastward flow. On the other hand, remote forcing tends to weaken the springtime momentum increase: Anomalous easterlies in the far-western and central Pacific during the winter excite upwelling-favorable Kelvin waves that generate anomalous westward flow in the eastern Pacific during the early spring.

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