Abstract View

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A Source of Annual Baroclinic Waves in the Eastern Subtropical North Pacific

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ABSTRACT

Subsurface temperature and surface salinity observations along the great circle transect between San Francisco and Honolulu are used to investigate the source of annual baroclinic long waves in the eastern subtropical North Pacific Ocean. Long-term mean, 15-day values (1966-74) of depth of the 9°C isotherm (indicative of thermocline depth) and of surface salinity are each fit by least-squares method with a time varying cosine, yielding phase and amplitude of the mean annual cycle at standard locations every 92.6 km (50 mi) along the transect.

Local wind stress curl is expected to influence the observed depth of the 9°C isotherm through the mechanism of Ekman pumping. Therefore, its annual cycle is computed in a manner like that of the depth of the 9°C isotherm, and its effect removed from the latter. The residual annual cycle has phase and amplitude profiles along the transect that closely resemble that of model annual baroclinic long waves emanating, from a line source of large-amplitude wind-stress curl, running from 21–38°N between 115 and 125°W.

This annual baroclinic long wave has associated with it, surface geostrophic currents of up to 6 cm s^{-1} in the high-salinity gradient region of the transition zone crossed by the transect. These surface currents are found to redistribute the annual mean salinity through local advection, producing an annual cycle of advected surface salinity that propagates westward with phase and amplitude that are comparable to observed salinity.