Abstract View

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Correlation of Current and Sea Level in the Eastern Equatorial Pacific

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ABSTRACT

Upper-ocean current and temperature records from neat 0°, 110°W are compared with Galapagos Island sea level measurements (0°3′S, 91°28′W) for the period March 1980 to July 1981. Low-frequency (periods greater than 30 days) near surface zonal currents (20 and 50 m) were well correlated with local wind, but deeper currents (100 and 150 m) and sea level were not. Response to the local wind was studied in terms of linear dynamics. Periods where zonal acceleration was in phase with zonal wind stress were found; however, overall these two series were uncorrelated. The direct relation of low-frequency wind stress and surface current (rather than acceleration) suggests a quasi equilibrium response on these time scales. The response at deeper levels was investigated by comparing the zonal transport per unit width (vertically averaged zonal Velocity) in the upper 200 m with sea level. These series were significantly correlated (with 95% confidence) at a lag of 10.5 d indicating eastward phase propagation at a speed of 2.3 m s^{-1} which is consistent with a first baroclinic-mode Kelvin wave. This interpretation also explains the relative amplitudes of sea level and transport fluctuations as well as the correlation of zonal velocity and vertical displacement (estimated from temperature time series) at 100 m. This first vertical-mode Kelvin wave signal was dominated by event-like structures (high sea level, eastward velocity) which occurred in boreal spring or the two years studied. The residual near-surface zonal velocity was also maximum in spring. Thus, the annual cycle in the eastern Pacific appears to have at 1east two components with different vertical structures.