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Dynamic Heights and Zonal Geostrophic Transports in the Central Tropical Pacific during 1979–84

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ABSTRACT

Dynamic height is calculated from XBT and surface salinity data in the central Pacific using a mean temperature–salinity (*T*–*S*) relation in the usual way below the thermocline but assuming isohaline water in the upper layer where the temperatures are isothermal. This scheme produces a better estimate of dynamic height than the use of a mean *T*–*S* relationship alone and produces significant improvements near the equator where small pressure gradients imply large geostrophic currents.

During the El Niño of 1982–83, water of very low surface salinity was observed spanning the equator; this event is attributed both to extreme local rainfall and anomalous advection from the western Pacific. Geostrophic transports of the major surface currants are estimated for the period January 1979 through December 1984. The North and South Equatorial countercurrents are found to have the largest annual fluctuations, and the vertical displacements of the thermocline associated with these fluctuations are qualitatively consistent with local Ekman pumping.

A striking anomaly of the 1982–83 El Niño was a strong peak in North Equatorial Countercurrent transport in late 1982; at this time surface flow was eastward from 10°N to 5°S with volume transport on the order of 60–70 × 10^6 m^3 s^{-1}. In mid-1983 NECC transport fell to less than 2 × 10^6 m^3 s^{-1}. During the first four months of 1983 strong westerlies extended from the equator to about 10°S over a broad region in the central Pacific. The wind curl pattern associated with this anomaly led to shoaling of the thermocline by 60 m from 5° to 15°S.

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