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Upper Ocean Shear and Density Variability at the Equator during TROPIC HEAT

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ABSTRACT

A four and one-half day time series of upper-ocean shear and density observations was collected in the tropical Pacific Ocean in November 1984. The measurements were made on the equator at 139°50'W during a period when the equatorial undercurrent was well developed and 20–30 day period velocity fluctuations were prominent. Shear observations were collected with a ship-mounted acoustic-Doppler velocity profiler; density data were obtained from a loosely tethered microstructure instrument. The mean shear profile during the series strongly reflected the structure of the undercurrent; however, the meridional component contributed significantly to the magnitude of the total shear. The mean Richardson number was large near the undercurrent core, but fell to values less than 0.5 25 m above and below the core, and was below 0.25 in the upper 40 m for most of the sample period. Buoyancy frequency varied on a diurnal time scale in the upper 50 m owing to the solar heating cycle, but a compensating diurnal shear cycle was found only above 24 m. Consequently, the Richardson number varied diurnally in the depth range of 25–50 m. The shear and density fluctuations at depths greater than 50 m were not clearly connected to the diurnal near-surface features and exhibited no dominant periodicity. As has been seen in previous internal wave studies, the data below the diurnal surface layer exhibited a cutoff at $Ri \sim 0.25$, perhaps indicative of shear mixing control of the Richardson number distribution.

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