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Direct Measurements of Turbulence in the Pacific Equatorial Undercurrent

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ABSTRACT

Measurements of small-scale fluctuations of temperature are used to estimate turbulent parameters such as viscous dissipation rate (ϵ), dissipation rate of temperature variance (χ), and turbulent diffusion coefficients of momentum (v_T) and temperature (D_T). Results from two locations are reported: one in the center of the undercurrent (ON 150W) and one toward the northern edge (IN 150W); both at depths of about 100 m where high vertical shear and high vertical stability are found. Universal similarity and local isotropy assumptions were used to determine the dissipation rates from measured spectra. While ϵ ($\sim 0.08 \text{ cm}^2 \text{ sec}^{-3}$) was about the same at both locations, χ at ON [$7 \times 10^{-5} (\text{°C})^2 \text{ sec}^{-1}$] was larger by a factor of 9. Even greater differences were found in D_T : $27 \text{ cm}^2 \text{ sec}^{-1}$ at ON vs $0.52 \text{ cm}^2 \text{ sec}^{-1}$ at 1N indicating large vertical mixing at the equator. From two independent methods v_T yielded about the same results within 15%: $12 \text{ cm}^2 \text{ sec}^{-1}$ at 1N and $25 \text{ cm}^2 \text{ sec}^{-1}$ at ON.

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