Abstract View

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Vertical Microstructure Measurements in the Central Worth Pacific

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ABSTRACT

Temperature profiles were made, during a period of calm weather in early autumn, in the center of the subtropical gyre in the North Pacific with free-fall microstructure instruments as well as with commerical salinity-temperature-depth recorders. In the depth range of 0.2–2 km the data records show irregularly spaced regions of strong gradients separated by sections with weak gradients, but otherwise lack conspicuous features. The general impression is one of strong stratification and only very weak levels of turbulence. Spectra of the gradient records from the upper kilometer exhibit distinct changes in slope at about 10^{-2} cycle per meter (cpm) and at 10 cpm. These changes in slope are interpreted as the scales at which different types of features dominate the vertical temperature profile: the nearly exponential mean profile is the principal feature for $K<10^{-2}$ cpm, while for $10^{-2}<K<2$ cpm the irregularly spaced structures in the stratification are the principal contributors to the spectra. Wavenumbers >10 cpm have been identified as the micro-structure range and are characterized by a gradient spectrum which rises with increasing wavenumber until diffusion cuts off the temperature fluctuations. The levels of vertical microstructure activity are much lower than found at similar depths in the California Current, and unlike nearshore waters, little horizontal microstructure is found for scales <10 cm. Estimates of the vertical temperature diffusion coefficient K_z from these records are much lower than those predicted by the diffusive thermocline models. However, the data are as yet too limited to regard this as a general conclusion for the central gyre region.

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