Abstract View

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Observations of Upper Ocean Temperature and Salinity Structure During the POLE Experiment

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ABSTRACT

Mid-ocean observations (35°N, 155°W) of temperature and salinity were made from *R/P Flip* during the period 28 January-14 February 1974 as part of the NORPAX POLE Experiment.

Autocorrelations for the time series of depth of several σ_t surfaces confirm the presence of a semidiurnal internal tide whose amplitude is about 10 m. The period of 12.7 h determined from the autocorrelation analysis is not statistically significantly different from the period of the M2 semidiurnal tide (12.4 h). The coherence between pairs of time series of the depth of the σ_t surfaces is high, ranging from 0.97 to 0.91 at the frequency of the peak in the spectrum corresponding to the semi-diurnal tide. The coherence between a given σ_t surface and deeper lying surfaces decreases slowly with the mean separation between surfaces. The vertical coherence scale suggests that most of the energy of the semi-diurnal internal tide is in the low-order modes. The data show that the phase difference between surfaces increases with the mean separation between surfaces at the approximate rate of +35° $(100\ m)^{-}$. Estimates of the vertical and horizontal wavelengths of the observed semi-diurnal internal tide are 1 km and 35 km, respectively.

One-dimensional mixed-layer deepening models fail to predict the mixed-layer depths and temperatures observed during POLE. Horizontal advection, as evidenced from the salinity maximum frequently occurring at the bottom of the mixed layer and other near-surface changes in salinity and temperature not associated with local surface forcing, are responsible for the failure. During the one period in which the one-dimensional models may be applicable a value of the mixing energy flux coefficient $m = 0.0017$ was obtained.

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