Abstract View

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A Statistical Description of Temperature Finestructure in the Presence of Internal Waves

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ABSTRACT

We have developed a statistical model describing a random field of internal waves passively oscillating a random, locally horizontally uniform temperature finestructure. Here we define finestructure to be non-internal wavelike temperature fluctuations of *any* vertical scale caused by phenomena such as horizontal intrusions or geostrophic eddies. The model allows one to examine the effects of finestructure upon all relevant measurable statistical quantities of the temperature field as a function of the vertical scale of the finestructure. Also, the effects of the time variation of the finestructure itself are considered.

The model was fit to data obtained during the 3-week Mid-ocean Acoustic Transmission Experiment (MATE) in summer 1977 new Cobb seamount in the northeastern Pacific. Various spectra and coherences estimated from temperature time series and vertical profiles were used to make an assessment of the finestructure as well as establish the consistency of the model.

Temperature variance measured at frequencies above the local Väisäiä frequency was used to estimate the magnitude of the high vertical wavenumber finestructure. This high wavenumber finestructure (0.05–1 m^{-1}) with a (wavenumber)$^{--2.5}$ dependence can consistently explain all the observed variance in the measured high vertical wavenumber spectra. At lower wavenumbers (0.002–0.020 m^{-1}) a (wavenumber)$^{-2}$ dependence was observed, and the spectral level found to be approximately equally divided between finestructure and internal waves advecting a constant temperature gradient. The contribution of the finestructure effects to the internal wave frequency spectrum was found to be about a factor of 10 less than that of internal waves advecting a constant temperature gradient.

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