Abstract View

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Doppler Sonar Observations of Internal Waves: The Wavenumber-Frequency Spectrum

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ABSTRACT

In May 1980 an 18-day sequence of velocity profiles of the top 600 m of the sea was collected off the coast of Southern California. The measurements were obtained using a pair of Doppler sonars mounted on the Research Platform FLIP. From these data, estimates of the wavenumber-frequency spectrum of the oceanic internal wavefield are obtained. The spectra are characterized by a series of ridges, which occur at near-internal and tidal frequencies as well as higher harmonics and sums of these fundamentals. The ridges run parallel to the wavenumber axis. There is a pronounced near-inertial spectral peak. The near-inertial motions are dominated by a few identifiable wave groups. There is a net downward energy propagation in the near-inertial frequency band. The vertical-wavenumber dependence of a the spectrum is decidedly asymmetric in this region. The asymmetry extends to five times the inertial frequency, making much of the so-called continuum asymmetric. A high-wavenumber cutoff at approximately 60 m vertical wavelength extends from the inertial frequency to approximately 5 cycles per day (cpd). The changing form of the wavenumber dependence of the spectrum. The total variance of the downward propagating motions exceeds that of the upward, primarily because of an excess of downward near-inertial energy. Surprisingly, the net energy transport of the wavefield is upward, of the order 0.003 W m^{-2}. The upward flux results from an excess of high-frequency (5–60 cpd) upward propagating waves. Although these have much less variance than the downward propagating near-inertial waves, they have a far greater vertical group velocity.

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