Abstract View

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An Analysis of Inertial Oscillations Observed Wear Oregon Coast

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ABSTRACT

Nearly two months of current meter data taken during the summer of 1973 at eleven depths at a station off the coast of Oregon in 100 m of water have been analyzed. The spectra show an 8% increase in the frequency of the inertial peak ($\omega \approx 0.064$ cph) above the local f (=0.059 cph). Because of the close proximity of the tidal frequencies to the local f, a sharp bandpass filter centered at ω = 0.064 cph was used to isolate the inertial motions. The results showed that the amplitude of the inertial oscillations decayed slowly with depth, but the decay within about 10 m of the bottom was more rapid. A lagged correlation of the inertial currents clearly showed an upward propagation of phases throughout the water column, at a speed of about 0.1 cm s^{-1} within the depth range 20–60 m, but generally higher both above and below this mid-depth. The inertial currents were found to turn clockwise (looking down) with depth, which corresponds to an upward phase and downward energy propagation, and the vertical phase speeds implied by the rates of turning agreed remarkably well with the lagged correlation calculations. The vertical wavelength was found to be of the order of the water depth. The vertical flux of energy into the bottom boundary layer during the occurrence of inertial bursts was estimated to be of the same order as the rate of turbulence production within the boundary layer, signifying that the inertial bursts can cause appreciable boundary layer stirring. The average hodographs of the horizontal velocity vectors were found to be ellipses of axis ratio 1.03–1.28; a majority of them had their major axes aligned roughly perpendicular to the coast, signifying propagation in that direction. It was found that the simple wind-forced model of Pollard and Millard does qualitatively reproduce many of the observed features of the inertial currents in the surface layer.

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