Abstract View

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The Relation of Near-Inertial Motions Observed in the Mixed layer During the JASIN (1978) Experiment to the Local Wind Stress and to the Quasi-Geostrophic Flow Field

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ABSTRACT

Oscillations with near-inertial frequencies were an energetic component of the upper ocean velocity field observed at each of two moorings separated by 44 km during the Joint Air Sea INteraction (JASIN) experiment during the late summer of 1978. At each mooring the amplitude of the inertial motion was highest in the mixed layer, where it was nearly depth-independent. Previous work (Pollard and Millard, 1970; Pollard, 1980) had found that the amplitude and phase of inertial motion in the mixed layer was related to the local wind stress. In this case, the loacal winds, measured at each mooring, were coherent; but the time series of mixed-layer, near-inertial motion at one mooring bore little resemblance to that at the other mooring. During JASIN 1978 the differences in the inertial response at the two moorings coincided with differences in the quasi-geostrophic flow field in the vicinity of the two moorings. Inclusion of the horizontal gradients of the quasi-geostrophic flow in model equations provides a source of damping and frequency shifting. Divergence in the quasi-geostrophic flow damps the inertial motion. Vorticity in the quasi-geostrophic flow shifts the frequency of the inertial response to either above or below the local inertial frequency. Upward flow was observed at one mooring as the boundary between two adjacent eddies passed the mooring site, and that observed vertical velocity was used to estimate divergence. Using that divergence, the model equation Save a prediction similar to the inertial response observed at that mooring; both observation and prediction had lower amplitude than anticipated from the observed wind stress.

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