Abstract View

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Near-Inertial Wave Propagation In Geostrophic Shear

Eric Kunze

Applied Physics Laboratory and School of Oceanography, University of Washington, Seattle, WA 98105

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ABSTRACT

An approximate dispersion relation for near-inertial internal waves propagating in geostrophic shear is formulated that includes straining by the mean flow shear. Near-inertial and geostrophic motions have similar horizontal scales in the ocean. This implies that interaction terms involving mean flow shear of the form $(v\cdot\Delta)V$ as well as the mean flow itself $[(V\cdot\Delta)v]$ must be retained in the equations of motion. The vorticity ζ shifts the lower bound of the internal waveband from the planetary value of the Coriolis frequency f to an effective Coriolis frequency $f_e\pi = f + \zeta/2$. A ray tracing approach is adopted to examine the propagation behavior of near-inertial waves in a model geostrophic jet. Trapping *and* amplification occur in regions of negative vorticity where near-inertial waves' intrinsic frequency $\&omega_0$ can be less than the effective Coriolis frequency of the surrounding ocean. Intense downward-propagating near-inertial waves have been observed at the base of upper ocean negative vorticity in the North Pacific Subtropical Front, warm-core rings, a Gulf Stream cold-core ring and an anticyclonic eddy in the Sargasso Sea. Waves that are not trapped are focussed into tight beams as they leave the jet.