Abstract View

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On the Behavior of Internal Waves in the Wakes of Storms

A.E. Gill

Department of Applied Mathematics and Theoretical Physics, University of Cambridge, Cambridge C83 9EW, England

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ABSTRACT

The Rossby adjustment process in the wake of a storm is studied with a view to finding, within the context of linear theory, how wave dispersion in both the vertical and meridional directions spreads energy which is initially confined entirely to the mixed layer. Comparisons are made between three cases 1) a periodic storm on the *f*-plane (where dispersion is purely vertical); 2) a bounded storm on the *f*-plane; and 3) a bounded storm centered 2700 km from the equator on an equatorial beta-plane. Particular attention is paid to the initial rate of loss of energy from the mixed layer, and some simple formulas which work very well in the cases studied are derived. These show that the rate of loss goes up when the mixed-layer depth is increased, and also that the rate scales as the square of the wavenumber. Values of the rates are sufficient to provide a major source of energy for internal waves below the mixed layer.

The often-observed tendency for phase lines to propagate upward is found in all cases, but the analysis also shows possible shortcomings in the way observations are interpreted. Some attention is also paid to the closer of the ocean floor on the results. Other observed properties of near-inertial waves which are found in the model studies are the following 1) intermittency; 2) storm effects on currents are largest just below the storm track; 3) the horizontal and vertical scales tend to decrease with time after the storm has passed; 4) vertical group propagation on scales comparable with the mixed layer is very slow, and 5) some tendency for bottom intensification is found. Another result is that beta-dispersion can be quite important, and some effect are transmitted to the equator quite rapidly (typically two weeks).