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Resonant long–short wave interaction in an unbounded stratified fluid[1] ALI TABAEI, T.R. AKYLAS, MIT — A finite-amplitude theory is developed for the interaction of 'flat' internal wavetrains with induced mean-flow disturbances in a uniformly stratified Boussinesq fluid. Flat wavetrains, which feature predominantly vertical modulations, interact resonantly with the induced mean flow since the modulation scales are compatible with those of gravity–inertial waves in the weak-rotation limit. This long–short wave interaction is described by a coupled set of evolution equations for the vertical wavenumber, the wave envelope and the induced mean flow. In contrast to wavepackets equally modulated in the vertical and horizontal directions, which are non-resonant so the mean flow is slaved to the packet, flat wavetrains in the course of their evolution leave a wake of gravity–inertial waves behind. It turns out that finite-amplitude wavetrains can develop 'caustics' as a result of their interaction with the induced mean flow, consistent with fully numerical simulations. Modulational instability of a uniform wavetrain interacting with the induced mean flow is also addressed.

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