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Interaction of an Inertia-Gravity Wave Packet with a Baroclinic Shear Flow

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We investigate the interaction of an internal gravity wave packet in a rotating fluid with a baroclinic shear flow, using ray equations and three-dimensional direct numerical simulations of the Boussinesq equations. In this problem, the intrinsic frequency of the wave packet increases as it propagates, due to the horizontal shear of the background flow. The packet is trapped where the intrinsic frequency reaches its upper bound and is amplified there. When the horizontal shear of the background flow is low enough, ray equations predict that the packet may further penetrate into that flow through reflection within a wave guide. The numerical simulations show that the packet is actually dissipated before reflecting because its group velocity and horizontal scale strongly decrease during the interaction. Consequently, the wave packet does not induce any significant transport across the shear flow.

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