Reflection of Internal Waves on a slope

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Abstract

The interaction of internal waves with bottom topography is one of the processes that cause mixing and transport in the ocean. The present study considers the relatively simpler problem of internal waves reflecting from a slope using both laboratory experiments and 3-D numerical simulations. A plane wave, produced using a wave generator, is made to reflect normally on a sloping bottom in a uniformly stratified fluid. We consider both rotating and non-rotating cases. The interaction of the incident and reflected waves produce, apart from higher harmonics, an irreversible wave induced mean flow which grows in time and is localised in the interacting region. The finite extent of the wave generator allows the mean flow to recirculate in the horizontal plane, resulting in a dipolar potential vorticity field. The generation of mean flow and higher harmonics, along with dissipative effects, diminishes the amplitude of reflected wave. We study the momentum and energy budget of the process in order to understand the mechanism of generation of mean flow and its interaction with the wave. The laboratory experiments were carried out on the Coriolis Platform, and the numerical simulations were done using a non-hydrostatic model.

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