

Multiple reflections and related mixing during internal tide generation and propagation

*Qiang Li¹, Xianzhong Mao, Ran Liao

1. Tsinghua University

Property changes of carrier media can cause wave reflection. Therefore, in a stratified fluid, if barotropic tides propagate across either horizontal varying topography or stratification, internal tides may be generated, and if internal tides do, reflection or wave scattering will be observed. In the real ocean, complex bathymetry structure and variable horizontal stratification related to fronts, submeso- to meso-scale eddies and general circulations can cause internal tide generation and reflection from multiple locations, rather than a single point. This multiple reflection problem for internal tide generation and propagation is investigated first using a 2D analytical linear model, and then a fully nonlinear regional ocean model. Multiple reflection happens between topography, horizontal stratifications, or both of them. Conversion rate for barotropic tidal forcing or reflection coefficients for incident internal tides are not a simple sum of individual ones from each reflection points, but depend on their distance. Resonance will happen if the distance is equal to half a wavelength of corresponding internal tides. Since high-mode internal waves are generated during this process, related mixing and dissipation are also estimated according to instability criteria, and then validated using a high-resolution numerical model.

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