Generation of Internal Waves in the Deep Ocean by an Oscillating Background Flow Along a Corrugated Slope and Evolution of the Energy Spectrum Among a Large Number of Internal Waves

Ranis N. Ibragimov
Department of Mathematics & Statistics
McMaster University

Abstract

In the first part of the talk the process of internal wave generation by the interaction of an oscillatory background flow

$$(U_0 \cos(\omega_0 t), V_0 \sin(\omega_0 t), W_0 \sin(\omega_0 t))$$

over three-dimensional bottom topography will be discussed. The topography considered is a uniform slope with a superimposed corrugation running directly up and down the slope. An analytical and numerical analysis and estimation of the flux of energy into internal wave field will be presented. Since waves are generated not only at the fundamental frequency ω_0, but also at all the harmonic frequencies less than the buoyancy frequency, the energy flux for both low and high frequency waves will be presented.

In the second part of the talk a large number of resonantly interacting triads will be considered in order to investigate the evolution of the energy spectrum due to solely resonant triad interactions. To this end we solve the evolution equations for a large number of resonant triads to determine the temporal evolution of the energy distribution among the various possible wave numbers and frequencies. Our model involves internal waves with frequencies spanning the range of possible frequencies, i.e., between a maximum of the buoyancy frequency for horizontal wave vectors to a minimum of the inertial frequency for vertical wave vectors (two limiting cases). Because of the inclusion of high-frequency waves we don't make the hydrostatic approximation.