Nonlinear dynamics of internal gravity waves in a three-layer fluid

Anton G. Chernov (1), Irina V. Bezruk (1), Oxana E. Polukhina (1,2)

(1) Nizhny Novgorod State Technical University, Nizhny Novgorod, Russia (2) Institute of Applied Physics, Nizhny Novgorod, Russia (tme-nn@yandex.ru)

Three-layer stratification is proved to be a proper approximation of sea water density profile in some basins in the World Ocean with specific hydrological conditions. Such a medium is interesting from the point of view of internal gravity wave dynamics. The evolution of internal localized initial disturbances (of different polarities) depending on stratification parameters is studied. Two approaches are used: the first one is based upon the program complex for the numerical simulation of the full two-dimensional (vertical plane) governing equations for incompressible stratified fluid; the second approach is based upon weakly nonlinear evolutionary models (Korteweg - de Vries and Gardner equations). The following stratifications are considered: symmetric and asymmetric cases with different cubic nonlinearity coefficient. Qualitatively different nonlinear wave regimes are shown. The processes of developing of long-living nonlinear localized quasi-stationary (solitary waves) and non-stationary (breathers, or oscillatory wave packets) waveforms are demonstrated. Interactions of two different waveforms are considered.