Generation of steady-state nonlinear localized internal waves from initial impulse in a three-layer fluid

Ekaterina Rouvinskaya (1), Alexey Korol (1), Oxana Kurkina (1), Andey Kurkin (1), Tatiana Talipova (1,2), and Ayrat Giniyatullin (1)

(1) Nizhny Novgorod State Technical University n.a. R.E. Alekseev, Department of Applied Mathematics, Nizhny Novgorod, Russian Federation (aakurkin@gmail.com), (2) Institute of Applied Physics, Department of Nonlinear Geophysical Processes, Nizhny Novgorod, Russian Federation (tgtalipova@mail.ru)

The process of long internal steady-state breather generation from sign-variable initial impulse in a three-layer fluid is studied numerically in the framework of full nonlinear (Euler) and weakly nonlinear (Gardner) hydrodynamic models. Such a wave can influence upon sediment transport, mixing of stratified layers of ocean water and also can lead to development of internal waves of anomalously large amplitudes. The comparison of results is carried out and effect of weak variation of water stratification on the generated internal wave field is studied. The influence of a constant flow on the nonlinear wave generation process is also studied. It is shown that in situations when existence of the solitary waves of the first mode is impossible, solitary waves of the second mode can appear with amplitudes comparable to the leading breather amplitude of the first mode.

Keywords: internal waves; breathers; solitons; weakly nonlinear model; full nonlinear model; numerical modeling.