Solitons on a shallow fluid of variable depth

KHARSHILADZE O., BELASHOV V., BELASHOVA E.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The results of numerical study of evolution of the solitons of gravity and gravity-capillary waves on the surface of a shallow uid, when the characteristic wavelength is essentially greater than the depth, $\lambda \gg H$, are presented for the cases when dispersive parameter is a function of time, and the spatial coordinates $\beta = \beta\,(t;\,x;\,y)$. This corresponds to the problems when the relief of the bottom is changed in time and space. We use both the one-dimensional approach (the equations of the KdV-class) and also two-dimensional description (the equations of the KP-class), in case of need.

Keywords

Dispersion, Evo- lution, Gravity waves, Gravity-capillary waves, KdV-class equations, KP-class equations, Nonlinearity, Numerical study, Shallow uid, Solitons, Stable and unstable solutions, Structure, Varying relief of bottom

References

[1] V. Yu. Belashov, The KP equation and its generalizations. (Russian) In: Theory and Applications, NEISRI FEB RAS, Magadan, 1997.

[2] V. Yu. Belashov, E. S. Belashova, Solitons. Theory, Simulation, Applications. (Russian) Kazan, RIZ "School", 2016.

[3] V. Yu. Belashov, S. V. Vladimirov, Solitary Waves in Dispersive Complex Media. Theory, simulation, applications. Springer Series in Solid-State Sciences, 149. Springer-Verlag, Berlin, 2005.

[4] V. Yu. Belashov, E. S. Belashova, O. A. Kharshiladze, Nonlinear wave structures of the soliton and vortex types in complex continuous media: Theory, simulation, applications. Lect. Notes TICMI 18 (2017), 86 pp.

[5] V. I. Karpman, Non-Linear Waves in Dispersive Media. vol. 71. Pergamon Press, Oxford-New York-Toronto, Ont., 1975.