Other professional sciences

DYNAMICS OF MULTIDIMENSIONAL NONLINEAR WAVE STRUCTURES OF THE SOLITON AND VORTEX TYPES IN COMPLEX CONTINUOUS MEDIA

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The results of theoretical and numerical study of stability, structure and dynamics of the 2D and 3D solitons and nonlinear waves described by the equations of the Belashov-Karpman) system which includes the classes of the generalized Kadomtsev- Petviashvili, 3-DNLS and 3-GNLS equations, and also the 2D and 3D vortex systems described by the Euler-type equations, are presented. The generalizations (relevant to various complex physical media), accounting for high-order dispersion corrections, dissipation, instabilities, and stochastic fluctuations of the wave fields are considered. Such objects are interesting because their study plays an important role both in studying their general dynamics and in modeling nonlinear wave processes in the upper atmosphere (ionosphere) and hydrosphere, as well as in studying the propagation of wave structures in a magnetized plasma. The relevance of the topic is determined by the existing problems of the theory of multidimensional nonlinear waves and vortex formations in media with dispersion, the role that wave processes of hydrodynamic type in dispersive media can play, as well as the need to take into account the effects inherent in real media. Special attention is paid to the applications of the theory in such fields of modern physics as space plasma physics, hydrodynamics and physics of the upper atmosphere. The work is performed according to the Russian Government Program of Competitive Growth of Kazan Federal University. This work was also supported by the Shota Rustaveli National Science Foundation (SRNF), grant no. FR17 252.