Stability and Dynamics of Multidimensional Solitons in Complex Continuous Media (Space Plasma, Atmosphere and Hydrosphere)

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The multidimensional soliton dynamics in complex continuous media which is described by the generalized equations of the Belashov-Karpman (BK) system including the generalized Kadomtsev-Petviashvili (GKP), the derivative nonlinear Schrodinger (DNLS) and the generalized nonlinear Schrödinger (GNLS) classes of equations is studied analytically and numerically. In our investigations we take into account the generalizations relevant to various complex physical media including space plasma, atmosphere, hydrosphere and other complex dispersive media, with due account of the wave field's stochastic fluctuations that takes place always, on a level with the high-order dispersion effects, influence of dissipation and instabilities of different types. The results on evolution, structure, stability and interaction dynamics of the multidimensional nonlinear waves and solitons are presented. The analysis of stability of solutions is based on study of transformational properties of the Hamiltonian of the corresponding system. The structure of possible multidimensional solutions and their collisional interaction is studied numerically. This is consistent representation of the both earlier known and new original results obtained by authors and also some generalizations in theory of the nonlinear waves and solitons in complex dispersive media with presence of stochastic fluctuations of the wave field. Some applications of obtained results in real physical media including space plasma, atmosphere and hydrosphere are presented.