Soliton dynamics in media with noise

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The soliton dynamics in complex continuous media with the wave field's stochastic fluctuations which is described by the generalized equations of the Belashov-Karpman (BK) system including the Kadomtsev-Petviashvili (GKP) and the nonlinear Schrodinger (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, optical fibers and waveguides and other complex dispersive media, where the stochastic fluctuations of wave field takes place always, on a level with the high-order dispersion effects, influence of dissipation and instabilities of different types. The results on influence of Gaussian noise on structure, stability and interaction dynamics of the multidimensional nonlinear waves and solitons, when the waves and solitons are deformed during the propagation, acquiring oscillating structure 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 are presented.