STRUCTURE AND STABILITY ON MULTIDIMENSIONAL NONLINEAR WAVES IN SPACE PLASMA

Vasily Yu Belashov[1], Elena S Belashova[2] and Oleg A Kharshiladze[3]

[1]Institute of Physics, Kazan Federal University, Russia
[2]Institute for Computer Technologies and Information Protection, Kazan National Research Technical University named after A.N. Tupolev - KAI, Russia
[3]Ivane Javakhishvili Tbilisi State University, M Nodia Institute of Geophysics, Georgia

The structure and stability of the multidimensional nonlinear waves and solitons forming on the low-frequency branch of oscillations in complex continuous medium with dispersion, such as plasmas, are studied analytically on the basis of the Belashov-Karpman (BK) system which includes the Kadomtsev-Petviashvili and derivative nonlinear Schrodinger classes of equa-tions and takes into account the generalizations relevant to various complex physical media, associated with the effects of high-order dispersion corrections, influence of dissipation and instabilities. This is consistent representation of the both early known and new original results obtained by author and also some generalizations in theory of the nonlinear waves and solitons in complex dispersive media. The analysis of stability of solutions is based on study of transformational properties of the Hamiltonian of the system. The structure of possible multidimensional solutions is investigated using the methods of qualitative analysis of proper dynamical systems and analysis of the solutions' asymptotics. As a result, we have constructed a classification of possible solutions for the BK system and have obtained the conditions of existence of the 2D and 3D soliton solutions in this system. Some applications of obtained results in plasmas (for the fast magnetosonic (FMS) and Alfvén waves, and for the internal gravity waves at heights of the F-layer of the ionosphere) are considered.

vybelashov@yahoo.com