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Evolution of solitary waves in complex media with variable dispersion

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We study the problem of dynamics of the 2D and 3D solitary waves in complex media with the varying time and space dispersive parameters $\beta=\beta(t,r)$. For example, studying of the evolution of the 3D FMS waves in magnetized plasma, which is described by the KP equation $\partial_t h+\frac{3}{2}v_A\sin\theta\, h\partial_x h+\beta(t,\mathbf{r})\partial_x^3 h=(v_A/2)\int_{-\infty}^{x}\Delta_\perp h\,dx$ where $h=B_\perp/|\mathbf{B}|$, $\theta=(\mathbf{k}\hat{}\mathbf{B})$, when β is a function of the Alfvén velocity $v_A=f[B(t,r),n(t,r)]$ (n is the plasma density) and the angle θ: $\beta=v_A(c^2/2\omega_{0i}^2)(\cot^2\theta-m_e/m_i)$. Similar situation has place for the ion-acoustic (IA) waves in collisional dusty plasma when in the absence of dissipation and dust-charge variation the dispersion law are $\omega=kV_s$ where $V_s=\sqrt{((\frac{T_e}{m_i})(\frac{n_{i0}}{n_{e0}})+(\frac{T_i}{m_i}))}$ is the IA speed in dissipationless plasma with constant-charge dust. It is clear that the dispersion will be variable with variation in time and space of ratio of plasma components (for example, in case of heterogeneous distribution of dust in space). In this case the corresponding equations are similar to that for IA surface waves. We present here the results of numerical simulation of the solitary waves in the KP model distracting from a specific type of medium for different model functions β which are: sharp "break" of $\beta=\beta(r)$; 2) gradual change of "height" $\beta=\beta(t,\mathbf{r})$; and "oscillations" of $\beta=\beta(t)$. As a result we have obtained the different types of stable and unstable solutions including the solutions of the mixed soliton non-soliton type for different characters of dispersion variations.

Biography

Vasily Yu Belashov has completed his PhD in Radiophysics and Doctor of Science in Physics and Mathematics. His main fields includes: theory and numerical simulation of the dynamics of multi-dimensional nonlinear waves, solitons and vortex structures in plasmas and other dispersive media. Presently, he is Professor in the Kazan Federal University. He was Coordinator of studies on the International Program Solar Terminator (1987-1992), and took part in Programs WITS/WAGS and STEP. He is author of 288 publications and books: "*Solitary Waves in Dispersive Complex Media: Theory, Simulation, Applications*", Springer-Verlag GmbH, 2005; "*The KP Equation and its Generalizations. Theory and Applications*", Magadan, NEISRI FEB RAS, 1997.

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