

THE ROLE
OF THE ABSORPTION AND DISSIPATION
OF ENERGY FOR THE FORMATION
OF SPECIAL NONLINEAR STRUCTURES
IN THE NON-EQUILIBRIUM MEDIA

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S u m m a r y

The effect of the energy loss processes, which are able to qualitatively change the form and features of nonlinear structures appearing as a result of the development of instabilities whose character is also significantly varied, on the dynamics of nonequilibrium systems, is discussed. It is shown that compact structures of the "wave — trapped particles" type are formed in the systems with a beam of charged particles. These structures, in particular, can considerably enhance the efficiency of the energy withdrawal from the beam, induce the appearance of new instabilities, form an unstable HF emission, etc. One-dimensional structures, HF-filled cavitons, which can change the absorption mode for the wave energy in plasma media, are considered. Both the interchange of energy between a caviton and the external field and the energy transfer to plasma particles can occur when the caviton is destroyed. The evolution of systems being near the stability threshold is discussed, and it is shown that the nonlinear structures with practically linear spectra are formed. The mechanisms of competition of modes in media with and without waves leading to high spatial sharpness of newly formed structures are analyzed, and, in particular, the formation of linear spectra in a weakly above-threshold active medium and in a convectively unstable system is discussed. On the basis of the deduced universal system of equations, the development of turbulent wavy spatial structures in nonequilibrium media, being near the stability threshold, is considered. If the conditions for the development of modulation instabilities are satisfied and if their threshold is slightly exceeded, the anomalously narrow spectra of developed perturbations are formed. This leads to the appearance of a cascade of instabilities which produce self-similar structures. The modulation instabilities of developed spatial structures in wavy and nonwavy media (in particular, those of waves propagating in a medium with cubic nonlinearity and of convection cells in a thin fluid layer) are analyzed. The development of a cascade of instabilities by the example of a secondary modulation instability in a medium with waves is discussed, and the conditions for the formation of self-similar structures on the surface and in the bulk of a solid and the relevant experimental data are considered.