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Nonlinear Farley-Buneman instability with Dust Impurities.

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The regimes of nonlinear stabilization of instability of low frequency waves in magnetized, weakly ionized and inhomogeneous ionospheric dusty plasma are considered. In the lower ionosphere in the E–region, a complex process transforms wind energy into currents creating the E–region electrojet. If these currents exceed a certain critical amplitude, a streaming instability called the Farley–Buneman or a collisional two-stream instability develops. When the number of cooperating waves remains small due to a competition of processes of their instability and attenuation, the turbulence appears in the result of their stochastic behavior. Then even system with finite number of interacting waves can realize a turbulent state in active media. At conditions when electrons are magnetized and characteristic time of density oscillations exceed the rate of electron ion collisions and electron dust collision the drift of electrons perpendicular to magnetic field is the main motion. Consequently, the main nonlinearity appears in result of convection of a density perturbation in one wave by another wave in the perpendicular to magnetic field and mathematically is expressed in a specific vector form The strong collisional damping of waves allow to assume that a typical perturbed state of plasma can be described as finite set of interacting waves. This allow to avoid difficulties of 3D simulations and to make full study of nonlinear stabilization and influence of the dust component in the conditions when the number of interacting waves keeps small by the strong competition of processes wave damping and instabilities

Keywords: Dusty Plasmas, Farley-Buneman Instability, Nonlinear Stabilization.

REFERENCES

1. M. Oppenheim and N. Otani, Geophysical Research Letters, 22, pp. 353-356, 1995.
2. A.V. Volosevich and C.V. Meister, Int. Journal of Geomagnetism and aeronomy, 3 pp.151-156, 2002
3. A. S. Volokitin and B. Atamaniuk, Reduced nonlinear description of Farley-Buneman instability. AIP Conference Proceedings Volume 993, 113 (2008) arXiv:0812.2182