

البحث الرابع

Title: [Solitary and freak waves in a dusty plasma with negative ions](#)

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Abstract. It is shown that solitary and freak waves can propagate in a dusty plasma composed of positive and negative ions, as well as nonextensive electrons. The evolution of the solitary waves is described by the Korteweg-de Vries (KdV) equation. However, when the frequency of the carrier wave is much smaller than the ion plasma frequency then the KdV equation is also used to study the nonlinear evolution of modulationally unstable modified ion-acoustic wavepackets through the derivation of the nonlinear Schrödinger (NLS) equation. In order to show that the characteristics of the solitary and freak waves are influenced by the plasma parameters, the relevant numerical analysis of the appropriate nonlinear solutions is presented. The relevance of the present investigation to nonlinear waves in astrophysical plasma environments is discussed. VC 2011 American Institute of Physics.