Title: Solitary and freak waves in superthermal plasma with ion jet
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Abstract. The nonlinear solitary and freak waves in a plasma composed of positive and negative ions, superthermal electrons, ion beam, and stationary dust particles have been investigated. The reductive perturbation method is used to obtain the Korteweg-de Vries (KdV) equation describing the system. The latter admits solitary wave solution, while the dynamics of the modulationally unstable wavepackets described by the KdV equation gives rise to the formation of freak/rogue excitation described by the nonlinear Schr̈odinger equation. In order to show that the characteristics of solitary and freak waves are influenced by plasma parameters, relevant numerical analysis of appropriate nonlinear solutions are presented. The results from this work predict nonlinear excitations that may associate with ion jet and superthermal electrons in Herbig–Haro objects.