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Dust acoustic shock waves in magnetized dusty plasma

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For the last many years, the study of nonlinear structures in different kinds of plasma environments is a frontline area of research. Shock waves are one of the types of such structures which are formed by the balance between nonlinearity and dissipation in a medium. The shock waves like ordinary waves carry energy and momentum with them and are responsible for accelerating elementary charged particles in our galaxy and give rise to Cosmic rays. A number of observations and in-situ measurements have confirmed the presence of superthermal populations in astrophysical and space plasmas. In fact, two temperature superthermal ion populations have been observed by Geotail spacecraft in Earth's magnetotail. The presence of ambient magnetic field introduces some significant effects in the dynamics of waves propagating in space plasmas. Furthermore, dust is ubiquitous component of space and astrophysical environments. In normal electron-ion plasma, the presence of charged dust gives rise to new propagation modes. The dust grains can be positively or negatively charged depending upon the associated charging mechanism. The charging of dust grains by accumulation of electrons in plasma leads to negatively charged dust grains and substantial depletion of electrons. Various authors have investigated shock waves dynamics in magnetized dusty plasma by deriving KdV-Burgers equation. In present investigation, we have used reductive perturbation method to derive KdV-Burgers equation and investigate the characteristics of shock waves in electron depleted magnetized dusty plasma consisting of two temperature ions. Further, we have derived modified KdV- Burgers equation with higher order nonlinear term for the first time and have studied its solution that has the form of a shock profile. We have analysed the effect of various physical parameters on properties of DA shock waves in context with observations of Geotail space craft in Earth's magnetotail.