Abstract

In this dissertation, we have investigated the nonlinear magnetosonic waves in both non-dissipative and dissipative space plasmas. For the non-dissipative case, propagation characteristics of oblique magnetosonic waves have been investigated a warm plasma where we used reductive perturbation method and derived the KP equation in two dimensions. In the case of KP equation we found compressive and rarefactive solitons for slow and fast magnetosonic modes respectively. For dissipative case, the obliquely propagating magnetosonic waves are investigated in two-dimensional dissipative space plasma where dissipation comes from the kinematic viscosity. We performed the nonlinear analysis and obtained KP-B equation which is governed by the obliquely propagating magnetosonic waves. As a result, we found rarefactive and compressive shock structures for slow and fast magnetosonic modes. KP and KP-B equations have been derived for magnetosonic waves which exhibit soliton and shock solutions, respectively. Since we have considered warm plasma with or without the presence of kinematic viscosity and no restrictions have been imposed on the propagation angle and plasma beta, we obtained both slow and fast magnetosonic modes in both cases. In cold plasma case, only one mode is possible. We applied the observed plasma parameters from the Earth's magnetotail where the magnetosonic waves have been observed in our solitary solutions and concluded that only solitons could be observed but shock structures may not under such conditions.