Abstract

In this thesis, the nonlinear inertial Alfvén waves are studied in multi-component plasmas, i.e. electron-ion (*e-i*) plasma, electron-positron-ion (*e-p-i*) plasma and electron-ion plasma with stationary dust. We have used the multi-fluid theory, two-potential theory and Sagdeev potential approach to numerically investigate the propagation characteristics of inertial Alfvén waves. The present investigation is divided as follows: In the first study, we have considered the *e-i* plasma and low-β assumption. Both the linear and nonlinear approaches have been used to find the linear dispersion relation and Sagdeev potential, respectively. The density dips are obtained in all the cases. The effects of propagation angle θ, Mach number M, positron concentration p and dust density N_d have been discussed on the propagation characteristics of nonlinear waves. We found that the depth and width of cavitons decreases significantly when positrons are added in to the *e-p* plasma. However, when dust is added to *e-i* plasma, for the case of positively charged dust, the width and depth of the cavitons decreases as compared to *e-i* plasma, whereas for the negatively charged dust, width and depth increases.