ABSTRACT

The objective of this study is to investigate linear and nonlinear propagation of kinetic Alfven waves (KAWs) and coupled kinetic Alfven-acoustic (CKAA) waves in non Maxwellian plasmas. Theoretical frame works that employed Maxwellian, kappa and Cairns distributions could not explain observations of flat top and spiky distributions. Generalized (r, q) distribution function encompasses both low energy and high energy parts of the observed velocity distributions and provides good quantitative fits of the observed data. KAWs has been observed to play an important role in acceleration and heating of plasma particles in space and laboratory plasmas. The study is carried out by using two-potential theory and solitary structures are obtained by applying Sagdeev potential approach. A comprehensive study has been carried out to ascertain how the formation of compressive and rarefactive solitary structures of KAWs and CKAA waves depend on the low and high energy parts of the electron distribution function. It has been shown that out results agree well with Fast and Freja observations of the nonlinear KAWs. An important feature of our study is the formation of rarefactive solitary structures. The analysis of compressive and rarefactive solitary structures of CKAA waves reveals that flat top at low energies of the electron distribution are responsible for the formation of compressive solitary structures whereas the spikes at low energies allow the formation of both compressive and rarefactive solitary structures. We have extended our investigations of CKAA waves for electron-positron-ion (e-p-i) plasmas, particularly highlighting the role of nonthermal electrons and positrons following generalized (r, q) distribution. The significance of this study is to emphasize the existence of density dip solitons for spiky distribution at low energy. The relevance of the study presented in this thesis with reference to astrophysical, space and laboratory plasmas has also been discussed.