Abstract

In this thesis we have discussed linear and nonlinear characteristics of drift waves, drift shock waves and coupled kinetic-acoustic Alfven waves in electron-ion plasma. Density of trapped electrons is calculated by using product bi (r,q) distribution. By using two potential theory for low β assumption linear dispersion relation of coupled kinetic-acoustic Alfven wave is derived. The plot of linear dispersion relation of coupled kinetic-acoustic Alfven wave is compared for different distribution function. By employing Sagdeev potential approach solitary structures are observed only for sub Alfvenic mode.

Considering inhomogeneity in electron-ion plasma linear dispersion relation drift wave is derived. The electrons follow product bi (r,q) distribution function. A comparison of the linear dispersion relation of ion drift wave is carried out for different electron distribution functions. It is observed that drift wave frequency is smaller for spiky distribution $(r < 0)$, whereas its value is larger for flat topped distribution$(r > 0)$. In the nonlinear regime solitary drift waves have also been investigated for different values of spectral indices r and q. For $r = 0$ rarefactive solitary structures are are observed whose amplitude varies directly with the increase of high energy particles (increasing the value of q). For flat topped distribution $r > 0$ there exists only compressive solitons. For spiky distribution $r < 0$ both compressive and rarefactive solitary strucures are observed. This is the unique characteristics of spiky distribution that is not observed with Maxwellian and Kappa distribution.

Linear and nonlinear analysis of drift shock wave have also been done by considering dissipative effects. During linear analysis, it is observed that frequency of drift wave is significantly modified with the inclusion of disspative effects. Effect of variation high energy particle on the drift wave frequency is also observed. In the nonlinear regime, variation in the strength and steepness of positive and negative polarity drift shock waves are investigated for different values of r, q, temperature, magnetic field strength and collision frequency. The negative polarity drift shocks have been observed for only specific range of r i.e. $0.5 > r > -0.25$. For rest values of r under condition $q(r+1) > \frac{3}{2}$, positive polarity shocks have been observed. The strength and steepness of these positive polarity drift shocks have been found

for different values of q, different temperature and for different values of magnetic field strength. The results obtained in this thesis are general and can be applied to any region of space and interstellar medium.