Abstract

In this dissertation, we have investigated the fully nonlinear ion-acoustic waves in both Maxwellian and Non-Maxwellian plasmas. For the non-Maxwellian case we use kappa distribution function, which is generally observed in space plasmas and has more particles at high energies than the Maxwellian distribution function. We considered two models to study the nonlinear ion-acoustic waves, one is cold fluid model in which ion temperature has been ignored and the other one warm fluid model in which ion temperature has been incorporated. Moreover, for the non-Maxwellian case we again consider two cases, in the case-(i) the expression of density computed from the kappa distribution function has been expanded in the small potential limit and in the case-(ii) the expression of density has been used without expanding in the small potential limit. We adopt the fully nonlinear Sagdeev potential technique the derived the Sagdeev potential for different cases. For both cases (i) and (ii) we found that soliton amplitude increases but width decreases when κ increases. We also found that soliton amplitude increases but width decreases when Mach number and angle of propagation increase but ion to electron temperature ratio decreases. However, for fully nonlinear case (case-(ii)) the amplitude of soliton is larger as compared to the soliton amplitude for the case (i).