Study of Large Amplitude Electron- and Ion- Acoustic Waves in Multi-Component Plasma Containing Free and Trapped Superthermal Electrons

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We consider the nonlinear propagation of electron- and ion- acoustic waves in unmagnetized plasma composed of a free cold electrons, superthermal free and trapped hot electrons, and ions. The properties of these waves are studied by employing the pseudopotential approach. It is found that the electron- and ion-acoustic solitary wave solutions are found when the Mach numbers exceed some critical values. The critical Mach numbers for the ion-acoustic solitons are found to be smaller than those for electron- acoustic solitons. For the plasma parameters considered here, both electron and ion-acoustic type of solitons have positive potential. It is found that the maximum amplitude of electron and ion acoustic solitary waves decreases with the increase of kappa index, κ. Furthermore, it is found that the speed of hot electron- and ion- beam (for a fixed Mach number) reduce the potential of both the electron-acoustic and ion-acoustic solitary waves. Possible applications of this model to the electrostatic solitary structures observed in different boundary layer regions of the Earth's magnetosphere will be discussed.

Keywords: Electrostatic solitary structures; superthermal electrons