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Supersolitons that propagate obliquely to the magnetic field in a plasma with adiabatic ions, Boltzmann distributed cool electrons and Cairns or Kappa-distributed hot electrons

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Arbitrary amplitude nonlinear ion-acoustic waves are investigated in a three-component magnetised plasma consisting of inertial adiabatic ions and two-temperature electrons. The existence of nonlinear solitary wave structures is determined using the Sagdeev pseudopotential formalism, under the assumption of quasineutrality. The direction of wave propagation is oblique to the ambient magnetic field. The cool electrons are assumed to be Boltzmann distributed, however, the distribution of the hot electrons is varied in order to study the influence of superthermal kappa and non-thermal Cairns distributions on the supersolitons. A supersoliton has a distinct deformed appearance in potential and in the electric field in contrast to a regular soliton. The regions in parameter space that support the existence of supersoliton structures are identified, by varying the physical parameters such as obliqueness, the Mach number, cool ion temperature, and superthermal and non-thermal effects of the hot electrons. Whilst the main thrust of our study is to identify parameter combinations which support the existence of supersolitons, we will also investigate the conditions which are needed for which the positive potential supersolitons can coexist with negative potential solitons. An interesting aspect relating to coexisting solitons such as the polarity switching of solitons having similar characteristics as Korteweg-de Vries solitons which cannot propagate at the acoustic speed will also be investigated.

Apply to be considered for a student ; award (Yes / No)?

No

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N/A

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