Polarity Switches Of Acoustic Solitons In Multi-Component Space Plasmas

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Various three- and four-component space plasma models composed of one or two (different masses and temperatures) ion species and one or two (different temperatures) electron species are considered in investigating ion-acoustic and electron-acoustic solitons. A reductive perturbation method is used to derive Korteweg- deVries equations that describe small-amplitude solitons for the different models. The focus in the study is on how to induce polarity changes in the supported soliton structures through parameter variations of the number density and temperature of the different species and the charge-mass ratio of the two ion species (where the model is composed of two ion species). No restriction is placed on the masses, the sign and the number of charges of the ion species. The effects of treating all plasma components as adiabatic fluids as opposed to neglecting only the inertia of the hot electrons are also investigated. A comparison of the results based on the different models will provide useful insight into what plasma compositions are required so that polarity switches in the supported soliton structures can occur.