Parametric variations of lower hybrid dromions in auroral plasma

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Dromions are exact nonlinear solutions of a large class of two dimensional partial differential equations and may be considered as an extension of the familiar soliton solutions to the two dimensional space. They have stable, localized structures with an exponential decay in both space dimensions and are characterized by time-dependent boundary conditions [Fokas and Santini, 1989]. While solitons have been used extensively to model coherent wave phenomena in plasmas, dromions have received little attention in terms of application to experimental observations. In a recent work, the authors have shown that the shape and size of an electron acoustic dromion can be consistent with those of monopolar and bipolar pulses observed by the high resolution measurements of POLAR and FAST satellites [Ghosh *et al.* 2002,Ghosh *et al.* 2004]. In the present work, it is shown that the nonlinear evolution of a two dimensional nonlinear lower hybrid wave can be described by the coupled Davey-Stewartson (I) equationts. The corresponding dromion solutions are studied in detail. The study is further extended to examine the time evolution of the dromion solution, study its stability and discuss its boundary conditions in the context of auroral plasmas. The effect of different parameters on the shape and size of the dromion solutions is also been estimated and is compared with the previous results of electron acoustic dromion.

References:

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