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Effect of the second ion species on positive amplitude electron acoustic solitary wave

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Several in situ space borne measurements have revealed large amplitude positive polarity structures in the different regions of magnetosphere. They have been observed in the magnetotail (GEOTAIL), the polar magnetosphere (POLAR), the mid altitude auroral zone (FAST) and more recently, in various regions of the Earth's magnetosphere including the magnetosheath, cusp and the bow shock (CLUSTER). Interestingly, many of these regions are populated by thermally energetic ions where the ion temperatures are known to be greater than that of electrons ($T_i > T_e$). Such a condition may well trigger electron acoustic instabilities leading to the generation of electron acoustic solitary waves. The authors studied the generation and properties of an electron acoustic solitary wave in a magnetized multi-ion plasma where the wave is assumed to be propagated obliquely with the ambient magnetic field. The effects of different parameters have been studied in detail. It is observed that the presence of a second ion species plays a crucial role in determining the shape and size of the positive potential solitary wave. In the case of a single-ion dominated plasma, extremely narrow and small amplitude positive polarity solutions are found which have very special cusp-like potential profiles. On the other hand, the presence of the second ion species ensures the occurrence of regular bell shaped positive polarity solitary waves and also the double layers. The results are applicable to the recent observations in the magnetosheath and polar regions by CLUSTER spacecraft.