

# **ELECTROSTATIC WAVES IN THE DOUBLE-KAPPA PLASMA OF SATURN'S MAGNETOSPHERE**

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Recent Cassini measurements (Schippers et al., J.G.R., 113, A07208, 2008) show that the electrons in Saturn's magnetosphere have a two-temperature, two-kappa distribution over the region between about  $5.4 R_S$  and  $18 R_S$ . Using a kinetic model, we investigate electron-acoustic waves in this double-kappa distribution. We show that in the absence of any sources of free energy, conditions for the existence of EA waves that may be weakly damped occur only beyond approximately  $13 R_S$ , the temperature and density ratios of the two electron components in the region closer to Saturn being such that EA waves are strongly damped.

Based on a multi-fluid model, we also study ion-acoustic waves in a double-kappa plasma, using data typical for various regions in Saturn's magnetosphere to explore the behaviour of the dispersion relation.

Finally, we consider the possible existence regions for solitary ion-acoustic structures in a double-kappa plasma, with particular reference to Saturn's magnetosphere.

Saturn, electron-acoustic, ion-acoustic

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