Theoretical Study of Obliquely Propagating Electron-Cyclotron waves in the Vast Magnetosphere of Saturn

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Abstract:

Various radial distances were inspected in Saturn's magnetosphere during Voyager and Cassini missions. Voyager 1 provided evidence on number densities and energies of hot and cold components of electron distribution, in 6-18 R_s. Voyager observed fluctuations in the intensity range of 20-30KeV indicate that electrons are on high energy tail of resonant spectrum. Population of plasma present in the rotationally dominated inner magnetosphere of Saturn is identified by the observed plasma waves in the magnetosphere. Electromagnetic electron cyclotron (EMEC) waves have been studied for bi-maxwellian and loss-cone distribution function. Electromagnetic electron cyclotron (EMEC) waves have been studied by both kinetic approach and linear approach. The effect of generalized distribution function on EMEC instability is evaluated using the dispersion relation by calculating growth rate. The main objective of the present investigation is to examine the effect of generalized distribution index j in view of the observations in Saturn magnetosphere has been applied to the magnetosphere of Saturn to the observations made by Cassini. It is observed that the effect of increasing the Saturn's radii (R_s) with distribution index is to increase the growth/damping rate till 12 R_s but it shows an opposite behaviour beyond 12 R_s to 18R_s.The results are deduced for the space plasma parameters appropriate to the Cassini of the Saturn's magneto-plasma.

Keywords: Electromagnetic electron-cyclotron waves, Saturn's magnetosphere, Solar plasma, Generalized distribution function.