Modeling of Proton Mirror and Cyclotron Instabilities in the Solar Wind by Kappa distribution

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As the solar wind contains superthermal and suprathermal charged particles. These highly energetic charged particles are often possess a non-thermal high energy tail in the velocity distribution function. This feature deviates the distribution from its standard Maxwellian shape and turn it into the Kappa distribution function. The anisotropies are created due to interactions of protons, electrons, and other charged particles with the waves which results in the bi-Kappa formation of distribution.

The present work is based on formalism of kinetic theory for Mirror mode and cyclotron instabilities in linear and velocity-moment based quasilinear regimes. The anisotrioc bi-Kappa, model of protons, electrons, and other charged particles is thus adopted in the literature for interpreting the data as well as in the context of the analysis of wave-particle interactions. It has been observed that the instabilities like Mirror mode and Cyclotrons can be excited by the bi-Kappa protons in the solar wind. The quasilinear theory of these instabilities represents the saturation behavior. Applications of the formalism are made for instabilities close to the marginally unstable state, which is typical of the solar wind near 1 AU.

References

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