Geophysical Research Abstracts
Vol. 12, EGU2010-12187, 2010
EGU General Assembly 2010

Influence of Electron Nongyrotropy and Anisotropy on Parallel Wave Propagation: Numerical Analyses

M. Virginia Alves and Fernando J. R. Simões Jr.
Instituto Nacional de Pesquisas Espaciais - INPE, LAP, Sao Jose dos Campos, Brazil (virginia@plasma.inpe.br)

Observations in space plasma have shown that high energy particles have some degree of gyrophase organization. The importance of nongyrotropic electron distribution in the upstream of the Earth's bow shock is yet not fully understood. A nongyrotropic magnetoplasmas with a background magnetic field B_0 in the x direction have at least one particle population whose unperturbed distribution function depends on the gyrophase angle ϕ = arctan(v_z/v_y), where v_z and v_y are the velocity components perpendicular to B_0. This work investigates the influence of a nongyrotropic electron beam on the coupling between the electromagnetic modes of parallel propagation in the presence of a background gyrotropic plasma. We use plasma parameters based on observational data from the Earth's bow shock. We assume that the distribution functions are of type F(v_k, $v_\perp$), in which the velocities are considered both parallel (v_k), and perpendicular ($v_\perp$) to the background magnetic field. Positive ions provide an immobile neutralizing background. We numerically solve the dispersion relation to find what conditions are necessary to generate plasma instability and mode coupling. We explore the importance of the relevant parameters in driving instabilities: the ratio of electron plasma frequency to electron cyclotron frequency, the gyrophase angle, and the temperature anisotropy. We confirm previous results that nongyrotropy can bring mode coupling. However, it occurs only for specific degrees of nongyrotropy. More important, we observe that when the anisotropy in the system brings sufficient free energy to start instabilities, the presence of nongyrotropic electrons plays an important role to change the growth rate, both in amplitude and in the range of wave number.