多成分プラズマにおける斜め伝播EMIC波の線形解析

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Linear dispersion analyses on EMIC waves in oblique propagation in multi-component plasmas

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We have made linear dispersion analyses on EMIC waves in oblique propagation in multi-component plasmas. For the analyses, we have used KUPDAP (Kyoto University Plasma Dispersion Analysis Package), which was developed in late 1980s. The interface was not user-friendly. For efficient interactive operation, we have installed graphic user interface on it. Recently, it has been pointed out that electromagnetic ion cyclotron waves (EMIC waves) are regarded as a potential cause of loss of relativistic electrons by pitch angle scattering and precipitation into the polar regions. Most analyses are confined to parallel propagation because EMIC waves have the maximum growth rate in parallel propagation. However, there are observations of EMIC waves in oblique propagation. We thus put focus on oblique propagation in multi-component plasmas. EMIC waves get elliptically polarized in oblique propagation while relativistic electrons are circularly polarized. Pitch angle scattering of relativistic electrons may become less efficient in oblique propagation than in parallel propagation. EMIC triggered emission with rising-tone frequencies makes pitch angle scattering of relativistic electrons more efficient than EMIC waves of a constant frequency. The generation mechanism of EMIC triggered emissions is explained by the nonlinear wave growth theory[1]. Thus, we have modified KUPDAP to include functions that show wave polarization, group velocity and nonlinear growth rate of EMIC waves.

References
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