Geophysical Research Abstracts
Vol. 18, EGU2016-6588-1, 2016
EGU General Assembly 2016

Resonant scattering of radiation belt electrons by EMIC waves in a hot plasma

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The full kinetic linear dispersion relation in a warm, multi-ion plasma with hot ring current protons is used to calculate the linear growth rate of parallel propagating electromagnetic ion cyclotron (EMIC) waves. Significant wave growth at relatively small wave numbers occurs for both H and He band EMIC waves at the magnetic equator. We find that the growth of H and He band EMIC waves remains strong when they propagate to higher latitudes (< 30 degrees). The full hot plasma dispersion relation and cold plasma dispersion relation are used individually to quantify the quasi-linear bounce-averaged pitch angle diffusion rates for radiation belt electrons due to H and He band EMIC waves. The results demonstrate considerable differences in the rates of pitch angle scattering caused by He band EMIC waves between the use of hot and cold plasma dispersion relation. He band EMIC waves can also resonate with lower energies electrons when the impact of hot plasma is included. In contrast, much smaller differences are seen in the resonant scattering rates for H band EMIC waves. Our study strongly suggests that the effect of hot plasmas should be carefully taken into account to approach improved understanding of the exact role that EMIC waves plays in driving the dynamical evolution of radiation belt relativistic electrons.