Effects of EMIC rising tone emissions on magnetospheric plasmas

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We perform self-consistent hybrid simulations on electromagnetic ion cyclotron (EMIC) triggered emissions with a gradient of the non-uniform ambient magnetic field and obtained broadband and clear rising tone EMIC emissions. We also performed the test particle simulations for scattering of the relativistic electrons. Broadband emissions induce rapid precipitation of energetic protons and relativistic electrons into the loss cone since the scattering by the concurrent triggering takes place faster than that of the coherent emissions. The coherent triggered emission causes efficient proton acceleration around the equator because of the stable particle trapping by the coherent rising tone emission. Nonlinear trapping causes significant relativistic electron scattering in wide energy range. Since the frequency of the rising tone emissions reaches close to the gyro-frequency and the emission also induces lower band EMIC waves which are also close to the gyro-frequency, the minimum resonance energy of the electrons reaches 300 keV. The higher energetic electrons (with 6 MeV to 20 MeV) are scattered almost 70 % for both broadband and rising tone cases. The hybrid simulations including cold ion heating are also performed, which shows the selective heating of heavy ions (Helium and Oxygen). These heating mechanism also makes the dynamic spectrum of the EMIC wave complex.