Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

PEM09-15 Room:304 Time:May 21 11:45-12:00

Precipitation of Highly Energetic Protons by Helium Branch Electromagnetic Ion Cyclotron Triggered Emissions

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In the Earth's inner magnetosphere, the electromagnetic ion cyclotron (EMIC) triggered emissions scatter energetic protons around the equatorial region. We perform a one-dimensional hybrid simulations with cylindrical parabolic magnetic geometries to investigate the precipitation of energetic protons controlled by the EMIC triggered emissions in the He^+ branch. We generate the EMIC triggered emissions in the He^+ branch of the dispersion relations around the equatorial region of the simulation space. The nonlinear wave growth theory shows a good agreement with the simulation result. Due to the difference of the resonance velocity between the H^+ and He^+ branch triggered emissions, the He^+ branch triggered emissions scatter highly energized protons around the equatorial region, resulting in the precipitations of the particles into the polar regions. Estimation of the kinetic energy of the resonant particles predicts that the energy reaches around 3 MeV outside the plasmapause although the H^+ branch triggered emissions can interact with the particles with 1MeV.

Keywords: EMIC triggered emission, hybrid simulation, proton precipitation, nonlinear wave particle interaction, inner magnetosphere