ABSTRACTS (MASTER THESIS)

Relativistic electron precipitation induced by EMIC triggered emissions in the Earth's magnetosphere

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We perform test particle simulations of relativistic electrons [1] interacting with electromagnetic ion cyclotron (EMIC)-triggered emissions in the plasmasphere. EMIC-triggered emissions are generated by energetic protons injected into the inner magnetosphere. EMIC-triggered emissions are characterized by large wave amplitudes, rising-tone frequencies, and coherent left-hand circularly polarized waves [2]. We study trajectories of relativistic radiation belt electrons drifting eastward interacting with longitudinally distributed EMIC-triggered emissions. Some electrons are trapped by wave potentials and efficiently guided down to lower pitch angles [3]. Repeated interactions occur due to the mirror motion and result in the scattering of particles into the loss cone [4]. We use two EMIC wave models for the test particle simulations. One assumes that the wave amplitude is constant, and the other assumes a time-dependent wave amplitude that characterizes subpackets. Both model waves are resonant with 0.5–6.0 MeV electrons and precipitate them. Electrons in the energy range 1.1–3.0 MeV are precipitated most efficiently. Approximately 50% of the total injected number of 1.1–3.0 MeV electrons are precipitated in a timescale of 2 min. We obtain the relativistic electron distribution in equatorial pitch angle and in pitch angle at the atmosphere. Further, we determine the timing and longitudinal location of the relativistic electron precipitation with respect to different particle energies.

References

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