Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

PEM04-14 Room:311 Time:April 28 16:30-16:45

Relativistic electron microbursts induced by EMIC triggered emissions in the dipole magnetic field

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We perform test particle simulations of relativistic electrons interacting with electromagnetic ion cyclotron (EMIC) triggered emissions with rising-tone frequencies. We assume that the geomagnetic field is dipole because EMIC triggered emissions and radiation belt electrons are observed in the inner magnetosphere [1]. EMIC triggered emissions are generated by energetic protons injected into the inner magnetosphere and drifting westwards in the longitudinal direction. We study trajectories of relativistic electrons drifting eastwards interacting with EMIC triggered emissions over different longitudinal ranges. When relativistic electrons in the radiation belt interact with EMIC triggered emissions, some of them are trapped by a wave potential and efficiently guided down to lower pitch angles. Repeated interactions result in scattering of relativistic electrons into the loss cone [2]. Counting relativistic electrons which fall into the polar region, we find that half of the relativistic electrons interacting with EMIC triggered emissions are precipitated. We derive conditions of kinetic energies and pitch angles for efficient precipitation of relativistic electrons.

References

[1] Pickett, J. S., et al. (2010), Cluster observations of EMIC triggered emissions in association with Pc1 waves near Earth's plasmapause, Geophys. Res., 37, L09104.

[2] Omura, Y., and Zhao, Q., (2013), Relativistic electron microbursts due to nonlinear pitch-angle scattering by EMIC triggered emissions, J.Geophys.Res., 118, 5008-5020.