Test particle simulation of relativistic electrons interacting with EMIC triggered emissions in the radiation belts

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Abstract

We perform test particle simulations of relativistic electrons interacting with Electromagnetic Ion Cyclotron (EMIC) triggered emissions in a dipole field [1, 2]. 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 through mirror motion result in scattering of relativistic electrons into the loss cone [3]. By assuming the dipole geomagnetic field, we study effects of longitudinal drift of relativistic electrons. EMIC triggered emissions are generated by energetic ions drifting westwards in the longitudinal direction, therefore, they have various longitudinal ranges. We drive conditions of kinetic energies and pitch angles for efficient resonance with EMIC triggered emissions over different longitudinal ranges. Some of the precipitating relativistic electrons can penetrate deep into the neutral atmosphere affecting the atmospheric chemistry [4]. 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 obtain the pitch angle distribution in the ionosphere of the polar region.

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978-1-4673-5225-3/14/$31.00 ©2014 IEEE