Acceleration of relativistic electrons in the process of whistler-mode chorus generation

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We discuss acceleration of resonant electrons in the presence of whistler-mode chorus emissions by a self-consistent particle code.

Whistler-mode chorus emissions are narrow band electromagnetic emissions observed in the dawn side of the Earth's magnetosphere. Results of *in situ* observations have revealed that the emissions which often consist of rising tones are generated from the equatorial region of the magnetosphere and that its activity is enhanced during geomagnetically disturbed peorids. Theoretical analyses have also suggested that the generation process of chorus emissions is deeply related to the nonlinear cyclotron resonance with energetic electrons in a non-uniform magnetic field, and several models have been proposed to explain the generation mechanism.

Recently we have reproduced the generation process of chorus emissions by a large-scale particle simulation.

We find that the majority of electrons lose energy contributing to the generation of chorus emissions, while a fraction of resonant electrons having large pitch angle are simultaneously energized through nonlinear wave trapping by chorus emissions.

Simulation result reveals that trapped electrons are effectively accelerated where a small fraction of energetic electrons are energized over 100 keV during 2500 gyro-periods.

We also find a characteristic behavior of highly accelerated electrons showing a turning of direction from equatorward to poleward during the acceleration process, which is explained by the relativistic turning acceleration (RTA) process.

The present study clarifies that the role of nonlinear wave trapping is significant in the energizing process of relativistic electrons by narrowband whistler-mode chorus emissions as well as the generation process of chorus emissions.