Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)
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PEM29-04 会場:503 時間:4 月 30 日 10:00-10:15

GEMSIS-RC モデル:ドリフト運動論近似に基づく地球内部磁気圏における高エネルギー粒子と ULF 波動の相互作用の研究
Coupling between ULF waves and high-energy particles in the inner geomagnetosphere based on a drift-kinetic simulation

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Understanding of acceleration mechanisms of electrons to cause drastic variation of the Earth's outer radiation belt is one of outstanding issues of the geospace researches. While the radial diffusion of the electrons driven by ULF waves has been considered as one of the candidate mechanisms, efficiency of the mechanism under realistic ULF characteristics and distribution is far from understood. GEMSIS (Geospace Environment Modeling System for Integrated Studies) of STEL, Nagoya University, is the observation-based modeling project for understanding energy and mass transportation from the Sun to the Earth in the geospace environment. The GEMSIS-Magnetosphere working team has developed a new physics-based model for the global dynamics of the ring current (GEMSIS-RC model). The GEMSIS-RC model is a self-consistent and kinetic numerical simulation code solving the five-dimensional collisionless drift-kinetic equation for the ring-current ions in the inner-magnetosphere coupled with Maxwell equations. In contrast to previous ring current models assuming a force-balanced equilibrium, the new model allows the force-imbalance to exist, which generates induced electric field through the polarization current. The most prominent advantage of the new model is the capability of describing fast time scale phenomena such as injections during substorms and MHD-time scale (ULF) waves.

We applied the GEMSIS-RC model for simulation of global distribution of ULF waves. Comparison between runs with/without ring current ions show that the existence of hot ring current ions can deform and amplify the original sinusoidal waveforms. The deformation causes the energy cascade to higher frequency range (Pc4 and Pc3 ranges). The cascade is more pronounced in the high beta case. It is also shown that the existence of plasmapause strengthens ULFs outside the plasmapause and widens the MLT region where the E_r (toroidal) component is excited from initially-given E_phi (poloidal) component. We also report the basic characteristics of the ring current driven ULF waves and its effects on the electron transport in the inner magnetosphere.

キーワード: ドリフト運動論近似, リングカレント, 放射線帯, MHD 波動, 内部磁気圏, ドリフト共鳴
Keywords: drift-kinetic approximation, ring current, radiation belt, MHD wave, inner magnetosphere, drift resonance