3次元磁場中でのホイッスラーコーラスによる相対論的電子散乱：GEMSIS-RBWシミュレーション

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Relativistic electron scattering by whistler chorus packets in three-dimensional magnetic field: GEMSIS-RBW simulations

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Relativistic electron microbursts, which are bursty enhancements of the precipitation of relativistic electrons of the outer radiation belt, are often observed by low-altitude satellite measurements. These microbursts are likely to play an important role in high-energy electron flux loss in the outer radiation belt. Some observations suggest that the whistler chorus wave is a cause of relativistic electron microbursts. To demonstrate whistler-relativistic electron interaction in three-dimensional magnetic field, we have developed Geospace Environment Modeling System for Integrated Studies - Radiation Belt (GEMSIS-RB) with Wave-particle interaction (GEMSIS-RBW) simulation code. The GEMSIS-RB solves the guiding center equations derived by Briazrd and Chan [1999] in three-dimensional electromagnetic field. This calculates electron parallel and perpendicular momentum, as well as guiding center position, while the wave-particle interaction model solves the equation of motion for the electron momentum change in three-dimensional magnetic field, which can calculate the pitch angle scattering and variations of kinetic energy at local positions along a magnetic field line. The test particle simulation showed that whistler chorus elements produce bursty enhancements of relativistic electron precipitation. We found a few Hz modulations that are embedded in the precipitating electron flux variations, which is associated with the repetition period of the whistler chorus elements. The simulation results reproduced characteristics of the microburst of relativistic electrons measured by the SAMPEX satellite, indicating that the whistler chorus rising tone has a potential to be a source of relativistic electron microbursts. Further, we will discuss electron pitch angle and flux distribution in three-dimensional system during the scattering by whistler chorus waves.