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ERG Modeling/Theory Team and ERG Science Center: A basis to investigate the dynamics of the inner magnetosphere

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Geospace storms are the largest electromagnetic disturbances in the near-Earth space caused by CMEs and CIRs accompanied by the strong southward IMF. During the geospace storms, it is observationally known that the particle acceleration up to the relativistic energies are taking place as a consequence of dynamic interactions of the magnetic and electric field and particles. Aiming at understanding of physical mechanisms of the particle acceleration and regional couplings in solar-terrestrial system during the geospace storms the ERG project is underway in Japan. One of characteristics of the ERG project is close collaboration between three task teams, namely, the satellite, ground-based observation, and modeling/theory teams.

The ERG modeling/theory team has developed several numerical models for geospace studies. For example, we have developed new physics-based models for the global dynamics of the ring current (GEMSIS-RC model) and radiation belt (GEMSIS-RB model) as a part of the GEMSIS phase-2 project at STEL. GEMSIS-RC 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. GEMSIS-RBW model implement the wave?particle interaction process into the three-dimensional relativistic gyrokinetic test particle simulation code. ERG modeling/theory team has also conducted comparative studies of simulation results and ERG-related ground observations.

In order to provide efficient study environment for the trinity collaboration in the ERG project, we have also developed ERG science center function as a part of the GEMSIS phase-2 project at STEL in collaboration with the THEMIS and IUGONET teams. One of important tasks of the ERG science center is to provide integrated data analysis tools and combined database not only for the ERG satellite but also for related ground-based observations and numerical modeling. The CDF (Common Data Format) is adopted as data format for the ERG database, and the CDF database is incorporated into integrated data analysis tools based on TDAS (THEMIS data analysis software suite). We report the current status of the ERG science center and some of modeling/theory team activities in the presentation.

Keywords: geospace, ERG, modeling, theory, science center, integrated studies