[구SE-13] Relativistic Radiation Belt Electron Responses to GEM Magnetic Storms: Comparison of CRRES Observations with 3-D VERB Simulations

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Understanding the dynamics of relativistic electron acceleration, loss, and transport in the Earth's radiation belt during magnetic storms is a challenging task. The U.S. National Science Foundation's Geospace Environment Modeling (GEM) has identified five magnetic storms for in-depth study that occurred during the second half of the Combined Release and Radiation Effects Satellite (CRRES) mission in the year 1991. In this study, we show the responses of relativistic radiation belt electrons to the magnetic storms by comparing the time-dependent 3-D Versatile Electron Radiation Belt (VERB) simulations with the CRRES MEA 1 MeV electron observations in order to investigate the relative roles of the competing effects of previously proposed scattering mechanisms at different storm phases, as well as to examine the extent to which the simulations can reproduce observations. The major scattering processes in our model are radial transport due to Ultra Low Frequency (ULF) electromagnetic fluctuations, pitch-angle and energy diffusion including mixed diffusion by whistler mode chorus waves outside the plasmasphere, and pitch-angle scattering by plasmaspheric hiss inside the plasmasphere. We provide a detailed description of simulations for each of the GEM storm events.

[구SE-14] Statistical Analysis on the trapping boundary of outer radiation belt during geosynchronous electron flux dropout : THEMIS observation

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Geosynchronous electron flux dropouts are most likely due to fast drift loss of the particles to the magnetopause (or equivalently, the "magnetopause shadowing effect"). A possible effect related to the drift loss is the radial diffusion of PSD due to gradient of PSD set by the drift loss effect at an outer L region. This possibly implies that the drift loss can affect the flux levels even inside the trapping boundary. We recently investigated the details of such diffusion process by solving the diffusion equation with a set of initial and boundary conditions set by the drift loss. Motivated by the simulation work, we have examined observationally the energy spectrum and pitch angle distribution near trapping boundary during the geosynchronous flux dropouts. For this work, we have first identified a list of geosynchronous flux dropout events for 2007-2010 from GOES satellite electron measurements and solar wind pressures observed by ACE satellite. We have then used the electron data from the Time History of Events and Macroscale Interactions during Substorms (THEMIS) spacecraft measurements to investigate the particle fluxes. The five THEMIS spacecraft sufficiently cover the inner magnetospheric regions near the equatorial plane and thus provide us with data of much higher spatial resolution. In this paper, we report the results of our investigations on the energy spectrum and pitch angle distribution near trapping boundary during the geosynchronous flux dropout events and discuss implications on the effects of the drift loss on the flux levels at inner L regions.