Relativistic Electron Variation in the Radiation Belt Inferred from MDS-1 (Tsubasa) Satellite

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Magnetic storm causes a dynamic variation of the electron radiation belt. In the main phase of the magnetic storm, relativistic electrons in the outer radiation belt disappear, while the relativistic electrons reappear during the recovery phase of the storm. Even though many studies have been made since the finding of the radiation belt, major questions are still unanswered; i.e. (1) What processes cause the loss of radiation belt electrons? (2) What processes are responsible for the acceleration of relativistic electrons during the recovery phase of the magnetic storm? To investigate dynamic behavior of the radiation belt together to make JAXA radiation belt empirical model the mission demonstration satellite 1 (MDS-1) was launched on Feb.4, 2002 into the geostationary transfer orbit (GTO) with an inclination of 28 deg. and an orbital period of 10 hours. The MDS-1 satellite was renamed Tsubasa, meaning wings after launch. In this talk we will examine electron loss process as well as increase process by using MDS-1 data. To investigate loss process it is essential to use equatorial measurements with sufficient pitch angle information. MDS-1 data is a very adequate to examine it. For the increase of relativistic electrons, we examined the location of newly appeared outer radiation belt for about 40 magnetic storms. Results demonstrate that the outer belt location is inversely proportional to the magnitude of the magnetic storms. It was found that locations of intense plasma waves are coincide with the peak location of outer belt electrons. Our point is to insist an internal acceleration mechanism, in which source electrons with intermediate-energy are supplied during and after main phase of the magnetic storm. These electrons seeded subsequent enhancement of relativistic electrons with local acceleration processes. Pre-existing relativistic electrons are subjected to convect out by the enhanced convection during the storm main phase, causing a large loss of relativistic electrons in the outer radiation belt. This convection out is simultaneously bringing new source electrons into the heart of outer radiation belt, and they will be accelerated there. We will propose this scenario in this talk.