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Dynamic behavior of the radiation belt electrons during the big magnetic storm

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Outer radiation belt electrons vary largely at the commencement of the magnetic storm. According to the JAXA satellite observations, followings have been identified; i.e. i) MeV electrons in the outer radiation belt disappear, ii) 300keV electrons disappear largely, iii) 30˜100keV electrons increase intensity, and iv) demarcation energy between increase and decrease may be in between 100keV and 300keV, depending on the individual magnetic storm.

These observation results suggest that loss of highly energetic electrons occurs in a wide energy range together with a transportation of the intermediate energy electrons to the outer radiation belt zone.

We have paid a particular attention to the very big magnetic storms to investigate a dynamical behavior of so-called slot region (L˜2.5). For the very large magnetic storm, 300keV electrons moved to the slot region and the injection of 30˜100keV electrons was also identified till the slot region. The movement of the electrons is likely caused by the terrible large electric field, which appears during the big magnetic storm.

The electrons in the slot region, then, decrease their intensities, and some of them drifted inward to the inner radiation belt region. The inward motion is caused by the radial diffusion and we are trying to estimate time constant by investigating the electron pitch angle characteristics obtained by the JAXA satellite. Outer belt electrons, on the contrary, increase their intensities, which is very common during the normal magnetic storm.

Keywords: Radiation Belt Electron, Magnetic Storm, Slot Region, Electron Accerelation, Doffusion