Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

PEM027-05 Room: Function Room B Time: May 24 14:45-15:00

Extreme flux enhancement and persistent loss of relativistic electrons at geosynchronous orbit

Ryuho Kataoka[1*], Yoshizumi Miyoshi[2]

[1]Tokyo Tech, [2]STE Lab, Nagoya University

We report average profiles of the solar wind and outer radiation belt during the extreme flux enhancement of relativistic electrons at geosynchronous orbit (GEO). It is found that seven of top ten extreme events at GEO during solar cycle 23 are associated with the magnetosphere inflation during the storm recovery phase as caused by the large-scale solar wind structure of very low dynamic pressure (<1.0 nPa) during rapid speed decrease from very high (>650 km/s) to typical (400-500 km/s) in a few days. For the seven events, the solar wind parameters, geomagnetic activity indices, and relativistic electron flux and geomagnetic field at GEO are superposed at the local noon period of GOES satellites to investigate the physical cause. The average profiles support the "double inflation" mechanism that the rarefaction of the solar wind and subsequent magnetosphere inflation are one of the best conditions to produce the extreme flux enhancement at GEO because of the excellent magnetic confinement of relativistic electrons by reducing the drift loss of trapped electrons at dayside magnetopause. We also report that the relativistic electrons at GEO were persistently quiet in 2009 for almost a whole year. The solar wind speed, which has been known as a primary parameter controlling the outer belt electrons, was very slow in 2009 as expected, but still at a comparably low level as of 1997 when we did not observe such a persistently quiet condition. Here we show that the extremely weak interplanetary magnetic field of the very slow solar wind plays an essential role to diminish the source processes themselves such as magnetic storms and substorms, and in turn to suppress the relativistic electron flux at GEO over the time scale of a year, probably as an inevitable consequence of extremely weak open magnetic field of the Sun just after the extremely weak solar minimum in 2008.