Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

PEM12-01 Room:101A Time:May 26 14:15-14:30

Ionizing effects of magnetospheric electrons in the low-latitude ionosphere during recurrent magnetic storms

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The general concept of the near-Earth radiation asserts that fluxes of energetic electrons in the equatorial ionosphere and outside the region of South Atlantic Anomaly are stably tenuous and negligible due to permanent effective scattering and losing energy in interaction with atmospheric neutrals. In literature, this region is called a forbidden zone because it locates below the inner allowed Störmer zone or inner radiation belt. Radiation monitoring by a fleet of the NOAA satellites in low-Earth orbit have revealed significant enhancements of energetic electrons in the forbidden zone during enhanced substorm activity and geomagnetic storms. A regular occurrence of the enhanced forbidden energetic electrons (FEE) in the solar cycles 23 and 24 relates closely to recurrent magnetic storms. Superposed epoch analysis shows high probability of the FEE enhancement occurrence during first three days of a recurrent storm. Due to ionizing effect, the FEE enhancements contribute significantly to ionospheric positive phase during recurrent geomagnetic storms.

Keywords: magnetosphere-ionosphere coupling, recurrent magnetic storms, forbidden electron enhancements, positive ionospheric storms

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Recurrent ionospheric storms during solar minimum

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Ionospheric storms related to geomagnetic disturbances are a subject of great scientific interest. We present a comprehensive analysis of perturbations in the low- and mid-latitude ionosphere during moderate recurrent geomagnetic storms (RGSs) in the solar minimum of 2007 - 2008. It is shown that during so-called recurrent ionospheric storms (RIS), the heliospheric - magnetospheric - ionospheric - thermospheric coupling remains highly efficient even during solar minimum. Analysis of global ionospheric maps of vertical total electron content (VTEC) derived on the base of GPS network showed that VTEC has a tendency to decrease and negative ionospheric storms occur right before the onset and on the late recovery phase of RGS. A positive ionospheric storm is developed on 2 to 4 day after the onset, i.e. on the recovery phase of RGS produced by high-intensity long-duration continuous auroral activity. The ionospheric response reveals prominent longitudinal and local time variations. Such effects as penetrating electric fields of interplanetary and magnetospheric origin, disturbance dynamo electric fields, neutral winds and thermospheric chemical composition changes are considered as possible mechanisms responsible for the observed recurrent ionospheric storms.

Keywords: ionospheric storms, recurrent geomagnetic storms, corotating interaction regions, high-speed solar wind