THE REACTION OF MID-LATITUDE IONOSPHERE ON STRONG IONOSPHERIC STORMS ON THE BASE OF THE EAST-SIBERIAN GROUND-BASED RADIO INSTRUMENT NETWORK DATA

Shpynev Boris,A.V. Tashchilin,A.P. Potekhin,V.I. Kurkin,A.V. Medvedev,K.G. Ratovsky,A.V. Zavorin,E.L. Afraimovich,

STP SD RAS Lermontov 126, p/o Box 4026 Irkutsk Irkutskayi region Russia.

Abstract:

In present study we conduct the analysis of mid-latitude ionosphere parameters dynamics during strong magnetic storms firstly on the base of ISTP incoherent scattering radar for 2000-2004 years. As an additional data for the analysis we used Russian chirp-sounder network data, vertical sounding data of DPS-4 Digisondes and GPS receivers data. For comparative analysis we considered only strong storms when ionosphere effects had sharply denominated character and F2 region structure had sufficient variations thus gaining the subauroral ionosphere properties. Amongst strong perturbations of the last years we considered the events 15-16.07.2000, 20.03.2001, 14-10.4.2002, 27-30.05.2003, 29.10-01.11.2003,9-12.11.2004 and 17-20.01.2005. This geomagnetic perturbation cover all seasons of the year for high solar activity, and thus allows us to study general regularities and differences in manifestation of strong geomagnetic perturbations in mid-latitude ionosphere for different geophysical conditions.As a general characteristic of all specified events we saw sharp reduction of electron density (Ne) in main storm phase due to restructuring of ionosphere convection structure from corotation type to convectional type. We also observed more low (2-3 times) Ne values in restoration period. The indicator that polar oval region during these events had shifted to middle latitudes is registration of coherent echo signals by Irkutsk radar. These signals formed under scattering on E-layer irregularities caused by plasma instabilities in west ring electro jet region. Coherent echoes have been observed practically for all specified events. After drift system returning to corotation type in the recovery stage for the morning and daily hours we observed as a rule the positive perturbation of Ne density. When the main storm phase was in day hours we observed positive perturbation before the beginning of Ne sharp reduction. The values of electron and ion temperatures under Ne reduction in recovery phase are at the average exceed the non-perturbing ionosphere temperatures by 300-500K, especially in morning sector. The morphologic analysis of the ionospheric data over East-Siberian region has revealed the following regularities in the ionospheric response to geomagnetic storms in the different seasons. It was founded that the negative storms were dominant in the summer throughout the storm whereas the positive ones were dominant in the winter for the main phase course and negative ones happened to be during the early recovery phase of the storm. A model analysis has showed a good agreement between the simulated results and measurements,

as well as the crucial role of the neutral composition variations to fit the calculated and the observed ionospheric parameters.