Verification of thermospheric-ionospheric coupling scenario using analysis of ionospheric storm effects in Irkutsk

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It is known that the behavior of the ionosphere during geomagnetic storms at middle latitudes is connected with thermospheric-ionospheric coupling effects which are the generation of traveling atmospheric disturbances, changes in neutral winds and composition disturbances. All these phenomena result in changes of ionospheric electron density.

According to the scenario of thermospheric-ionospheric coupling during disturbed geomagnetic conditions daytime positive ionospheric storms are produced by traveling atmospheric disturbances and by changes in the global wind circulation /1/. Negative storm effect is attributed to neutral gas composition disturbance which propagates toward middle latitudes during night and which subsequently rotate into the day sector. So ionospheric effect of geomagnetic storm depends on local time of a middle-latitude station.

Morphological analysis of vertical sounding data obtained in Irkutsk (52,3N, 104,3E) from 2003 to 2005 has been carried out. About 100 disturbed days were selected for the analysis. The level of geomagnetic activity was determined by Kp-index and auroral AE-index. Ionospheric response has been estimated by the relative deviation of F2-region critical frequencies from median values. The set of the data has been divided into two groups depending on local time of storm commencement. The duration, the time delay from the magnetic storm onset and the amplitude of ionospheric disturbance were determined for each selected day. As specific cases we considered consecutive storms when positive disturbance had been developed on the background of previous negative storm.

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1. Prolss, G.W., On explaining the local time variation of ionospheric storm effects //Ann. Geophysicae, 1993, N 11, P.1-9.