

FEATURES OF IONOSPHERIC RESPONSE TO GEOMAGNETIC STORMS OF MARCH 2012.

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Abstract:

The reliability of operation of different technological systems depends on the state of the Earth's ionosphere which in turn depends on Space Weather conditions. Ionospheric response to Space Weather perturbations can be different at different latitudes and longitudes.

We analyzed the ionospheric response along the 70°W meridian of Northern Hemisphere to five geomagnetic storms of March 2012 that were suggested by SCOSTEP as a subject for the comprehensive study. First, we constructed latitudinal dependence of equivalent slab thickness τ using some of ionosondes along this meridian. Second, the F2-layer critical frequency (foF2) values that were absent due to the lack of ionosondes in the considered sector were reconstructed with use of the calculated latitudinal dependence of τ and available Total Electron Content data. Third, the following features of ionospheric response were revealed. Usually, the response began with two-hours (or longer in one case) delay from the storm beginning. During the disturbances the mid-latitude trough was more prominent and the border of the Equatorial Ionization Anomaly northern crest was sharper. During four storms of 7–17 March, the general tendency was the transition from negative disturbances at high latitudes to intense positive disturbances at low latitudes. During the fifth storm, the negative ionospheric disturbance controlled by O/N₂ change was masked by the overall prolonged electron density increase during 21–31 March. Finally, the multiple correlation analysis allowed us to reveal the latitudinal dependence of dominant Space Weather parameter impacts (solar wind, interplanetary magnetic field and geomagnetic field) on foF2 during the considered disturbances.

References: Sergeeva et al., Latitudinal Dependence of the Ionospheric Slab Thickness for Estimation of Ionospheric Response to Geomagnetic Storms // Atmosphere, 2021, doi: 10.3390/atmos12020164.

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