**Meteorological storm influence on regional TEC disturbance**

O.P. Borchevkina, A.V. Timchenko, F.S. Bessarab, Y.A. Kurdyaeva, I.V. Karpov, G.A. Yakimova, M.V. Klimenko

West Department of Pushkov Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation Russian Academy of Sciences, 236017 Kaliningrad, Russia

This study presents a comprehensive analysis of the impact of Storm Laura, which was observed over Europe and the Baltic Sea on March 12, 2020, on the state of thermosphere-ionosphere system. The investigation of ionospheric disturbances caused by the meteorological storm was carried out using a combined modeling approach, incorporating the regional AtmoSym model and the global GSM TIP model. This allowed for the consideration of AWs and IGWs generated by tropospheric convective sources and the investigation of wave-induced effects in both the neutral atmosphere and ionosphere.

The simulation results showed that three hours after the activation of the additional heat source, an area of increased temperature exceeding 100 K above the background level is formed over the meteorological storm region. This temperature change had a significant impact on the meridional component of the thermospheric wind and TEC variations. For example, meridional wind changes reached 80 m/s compared to the meteorologically quiet day, while TEC variations reached 1 TECu.

To analyze the ionospheric state during the meteorological storm, we utilized TEC maps from the CODE, MOSGIM, and the West department IZMIRAN. The difference between TEC values obtained from observations on March 12, 2020 and March 10, 2020 was analyzed.

All maps show a similar negative TEC effect in the European sector, reaching 2–3 TECu in the experimental data and up to 1 TECu in the modeling results. However, the localization of the negative effect differs slightly, likely due to differences in the map generation techniques.Good agreement was obtained with experimental TEC maps from CODE, MOSGIM, and WD IZMIRAN, which revealed a similar negative TEC value effect over the meteorological storm region.

A comparison of numerical modeling results with experimental data suggests that atmospheric gravity waves generated in the meteorological storm region and propagating from the troposphere have a significant impact on the thermosphere-ionosphere system. Moreover, the modeling results show reasonable agreement with the experimental data.