

GPS-reconstruction of spatial parameters of large-scale ionospheric irregularities

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For the first time two-dimensional spatial image of ionospheric irregularities registered in northern hemisphere after sudden storm commencement on October, 29 2003 was reconstructed using data of the ground-based two-frequency GPS-receivers' network.

For a spatial image of ionospheric irregularities to be reconstructed we used TEC variations mapping technology developed in ISTP SD RAS. The spatial image analyzing made it possible to distinguish two types of irregularities: the main ionospheric trough (MIT) and large-scale traveling ionospheric disturbances (LS TIDs) of auroral origin. Propagation velocity of the MIT was about 100 m/s. Polar wall of the MIT propagated down to 40° of geomagnetic latitude on the nightside.

We found that the LS TIDs formed almost indivisible annular structure. For more comprehensive analysis of the registered LS TIDs the GPS data from five sectors in different parts of northern hemisphere (Kamchatka Peninsula, Eastern Asia, Europe and Northern America) were used. It was found that LS TIDs were of solitary wave type with duration of 1-2 hours for all the sectors. Their propagation velocity varied from 900 to 1700 m/s depended on the region; the velocities on the dayside were higher than on the nightside. Directions of the LS TIDs propagation were close to equatorward.

To localize the LS TIDs' apparent sources we used TEC data spatio-temporal processing method developed in ISTP SD RAS. The method was based on supposition of annular disturbance propagating from point source. Spatial distribution of the sources denoted almost simultaneous LS TIDs' generation over all auroral oval.