The Method of TID Characteristics Reconstruction from Simultaneous Measurements by Oblique Incidence and Vertical Incidence Ionosondes

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Abstract

The radiophysical complex of the Institute of Solar-Terrestrial Physics for ionospheric investigations consists of ionosonde DPS-4 in Irkutsk (52.25N, 104.27E), Irkutsk incoherent scatter radar which is located about 100 km to the north-west from Irkutsk and chirp-ionosonde (its receiving point is located close to Tory settlement about 100 km to the south-west from Irkutsk). On account of its capabilities the complex can be used as diagnostic tool for investigation of travelling ionospheric disturbances (TID).

The work is devoted to the method for reconstruction of TID propagation characteristics by means of cross-correlation and spectrum analysis of simultaneous measurements data obtained by vertical incidence ionosonde and oblique incidence chirp-ionosonde. The height electron density profiles for spaced-apart points are used as data for the analysis.

The electron density profiles in Irkutsk are reconstructed from the DPS-4 ionogram using the Reinisch and Huang method with the extrapolation above the peak height. The height electron density profiles for oblique incidence path midpoint are reconstructed according to the Reinisch-Huang method (as it is in DPS-4 ionosonde) from height-frequency characteristic (for path midpoint) which calculated through chirp-ionosonde data by means of the modified Smith method.

TID propagation characteristics were reconstructed for the 16th of December of 2006 (when was magnetically disturbed day) through electron density obtained by DPS-4 ionosonde in Irkutsk and electron density profiles reconstructed for path midpoints of Norilsk–Tory and Magadan–Tory paths (Fig. 1) from chirp-ionosonde data (in this case the distance between points of triangle is about 1500 km).