

Relative amplitude of medium-scale traveling ionospheric disturbances as deduced from global GPS network

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We worked out a new method for estimation of relative amplitude dI/I [%] of total electron content (TEC) variations, corresponding to medium-scale (30-300 km) traveling ionospheric disturbances (MS TIDs). Daily and latitudinal dependences of dI/I and dI/I probability distributions are obtained for 52 days of 1999-2005 with different level of geomagnetic activity. Statistical estimations were obtained for the analysis of 10^6 series of TEC with 2.3-hour duration. To obtain statistically significant results three latitudinal regions were chosen: North America high-latitudinal region (50-80°N, 200-300°E), 59 GPS receivers; North America mid-latitudinal region (20-50°N, 200-300°E), 817 receivers; equatorial belt (-20 +20°N, 0-360°E), 76 receivers. We found that average daily value of the relative amplitude of TEC variations $\langle dI/I \rangle$ changes from 0.3 to 10 %, proportionally to the value of geomagnetic index K_p . This dependence is strong at high latitudes ($\langle dI/I \rangle = 0.37 \cdot K_p + 1.5$) and it is some weaker at mid latitudes ($\langle dI/I \rangle = 0.2 \cdot K_p + 0.35$). At the equator belt we found the weakest dependence $\langle dI/I \rangle$ on the geomagnetic activity level ($\langle dI/I \rangle = 0.1 \cdot K_p + 0.6$). The most important and the most interesting result of our work is that during geomagnetic quiet conditions the relative amplitude of TEC variations at night considerably exceeds daily values: by 3-5 times at equatorial and at high latitudes and by 2 times at mid latitudes. But during strong magnetic storms the relative amplitude dI/I at high and mid latitudes is controlled by the geomagnetic activity instead of local time. The relative amplitude of TEC variations depends weakly on solar activity index F10.7. Some of the obtained results do not agree with the known mechanisms of ionospheric irregularities generation at different latitudes and may be useful for development of corresponding theory.