Geophysical Research Abstracts,
Vol. 11, EGU2009-1233, 2009
EGU General Assembly 2009

The dynamics and spectral characteristics of the GPS TEC wave packets excited by the solar terminator

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The great variety of solar terminator (ST) -linked phenomena in the atmosphere gave rise to a num¬ber of studies on the analysis of ionosphere parameter variations obtained by different ionosphere sounding methods. Main part of experimental data was obtained using methods for analyzing the spectrum of ionosphere parameter variations in separate local points. To identify ST-generated wave disturbances it is necessary to measure the dynamic and spectral characteristics of the wave disturbances and to compare it with spatial-temporal characteristics of ST. Using TEC measurements from the dense network of GPS sites GEONET (Japan), we have obtained the first GPS-TEC image of the space structure of medium-scale traveling wave packets (MS TWP) excited by the solar terminator. We use two known forms of the 2D GPS-TEC image for our presentation of the space structure of ST-generated MS TWP: 1) - the diagram “distance-time”; 2) - the 2D-space distribution of the values of filtered TEC series dI (, , t) on the latitude and longitude for each 30-sec TEC counts. We found that the time period and wave-length of ST-generated wave packets are about 10-20 min and 200-300 km, respectively. Dynamic images analysis of dI (, , t) gives precise estimation of velocity and azimuth of TWP wave front propagation. We use the method of determining velocity of traveling ionosphere disturbances (SADM-GPS), which take into account the relative moving of subionosphere points. We found that the velocity of the TWP phase front, traveling along GEONET sites, varies in accordance with the velocity of the ST line displacement. The space image of MS TWP manifests itself in pronounced anisotropy and high coherence over a long distance of about 2000 km. The TWP wave front extends along the ST line with the angular shift of about 20°. The hypothesis on the connection between the TWP generation and the solar terminator can be tested in the terminator local time (TLT) system: dT=TOBS-TST, where OBS is the observation time at the given point; TST is the arrival time of ST at the altitude of H over this point. The time delay dT of TWP appearance varies from 2.5 hrs at 30°N to 6 hrs at 45°N. We acknowledge the GEONET scientific group for providing GPS data used in this study. The work was supported by the SB RAS and FEB RAS collaboration project N 3.24, the RFBR-GFEN grant N 06-05-39026 and RFBR grant 07-05-00127.