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# The spatio-temporal characteristics of the wave structure excited by the solar terminator as deduced from TEC measurements at the global GPS network

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Recent investigations have shown that movement of the solar terminator (ST) causes generation of acoustic-gravity waves (AGW), turbulence and instabilities in the ionosphere plasma. Among all the sources of gravity waves, the moving ST has a special status, since it is a predictable phenomenon, whose characteristics are well known. Considering the ST as a stable and repetitive source of AGW, one can derive information about atmospheric conditions from the response of the medium to this input. The great variety of ST-linked phenomena in the atmosphere gave rise to a number of studies on the analysis of ionosphere parameter variations obtained by different ionosphere sounding methods. However, virtually all experimental data were obtained using indirect methods for analyzing the spectrum of ionosphere parameter variations, which can result from a number of factors. This causes difficulties in the reliable identification of ST-linked AGW, because in general case AGW can be generated by different sources either of natural or of anthropogenic origin. To identify ST-generated wave disturbances it is insufficient to register the time dependence of ionosphere parameters or their spectrum. It is necessary to measure the spatial structure of these disturbances and to compare it with spatial-temporal characteristics of ST. Another important requirement implies the continuous, global character of observations. Using long-term (1998-2007) total electron content (TEC) measurements from the IGS GPS global network and dense networks of GPS sites in USA (CORS) and Japan (GEONET), we have obtained the first evidence for the wave structure excited by the solar terminator (ST). We have found two main types of the observed TEC disturbances: large-scale (LS) 60-min variations with amplitude of about 0.5-1 TECU and medium-scale (MS) 15-min variations with amplitude of about 0.05-0.1 TECU. The first type of disturbances was predicted in theoretical investigations and registered earlier using different methods of ionosphere radio sounding. The second type of the observed TEC disturbances is MS traveling wave packets (MS TWP) generated when the time derivative of TEC amount to its maximum. That ST-generated wave packets have been found for the first time. We have obtained the first data regarding the spatio-temporal characteristics and the statistics of MS TWP. There is no correlation between TWP amount and Dst-index value. We found that ST-generated wave packets have duration of about 1-2 hours and time shift of about 1.5-6 hours after the ST appearance at the altitude of 300 km. The TWP wave front extends almost along ST-line. The wavelength of ST-generated wave packets is about 100-300 km. The space image of MS TWP is characterized by pronounced anisotropy (the ratio between lengthwise and transversal scales exceeds 10) and high coherence over a long distance of about 2000 km. 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.