



Small-scale ionosphere irregularities generation due to intensive large-scale AGW break-up

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We observed breaking up of intensive large-scale (LS) atmospheric acoustic gravity waves (AGW) into small-scale (SS) waves at mid-latitudes during the strong magnetic storms on 29-30 October 2003. This process was promoted by steep gradients in an environment of “vertical” total electron content (TEC). The TEC gradients were enhanced by the LS AGW propagation, so a probability of breaking up effect became stronger.

By using data from GPS receivers located in Northern America and in Eurasia huge-amplitude solitary LS disturbances were detected. Such perturbations of TEC of a duration of about 40 min appeared after the significant alterations of geomagnetic field intensity. Originated in the auroral area, LS disturbances propagated with the azimuth of about 235° over Northern America and of about 190° over Eurasia, with a velocity about 1400 m/s and 1000 m/s, respectively. Relative amplitude of observed irregularities amounted to 30-40 %.

We noticed increasing of amplitude of SS TEC variations at the moment of maximal amplitude of LS TEC variations. Moreover, SS structure propagated following the solitary intensive AGW at a distance more than 4000 km. Definitely, displacement of SS ionosphere structure through distance more than 2-3 wavelength (about 100 km) was caused by the intensive LS disturbance propagation. Propagating of the huge-amplitude LS AGWs with the velocity exceeded or about the sonic speed caused augmentation of entire TEC variations power spectra by a factor of 100 and of the TEC variations spectra within periods 2-10 min by a factor of 1000. We also observed increasing of GPS phase slips density and of GPS positioning errors indices at the area of intensive SS disturbances generation.