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Oscillations of the thermospheric wind during passage of the Large Scale Traveling Ionospheric Disturbances

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Amplitudes of thermospheric meridional wind velocity oscillations related with the passage of large-scale traveling ionospheric disturbances (LSTIDs) were derived from data of observations of the night ionospheric $F2-$layer. Observations were carried out at the Institute of Ionosphere (Almaty, 76˚55' E, 43˚15' N) in 2000 - 2007 by a digital ionosonde "Parus". Data processing allowed to obtain time variations in the electron density ($N_h(t)$) for series of fixed altitudes and variations of the $F2-$layer peak height (h_mF) and the $F2-$ layer bottom height ($h_{bot}F$). We developed a technique for estimation of amplitudes of thermospheric wind oscillations by using parameters of oscillations of the $h_mF$and $h_{bot}F$. The distributions of LSTIDs periods, amplitudes (Δ*hmF* and Δ*hbotF*) of variations of altitudes of the $F2$- layer peak and its bottom are presented for the disturbed and quiet geomagnetic fields. Periods are distributed in the range of 40 to 200 min with a maximum occurrence probability in the range of 60 to 140 min for conditions of the disturbed magnetic field and in the range of 80 to 160 min for the quiet field. Maximum occurrence probability for Δh_mF lies in the range of 20 to 80 km for the disturbed magnetic field and in the range of 20 to 60 km for the quiet one.

Results of calculating the amplitudes of oscillations of the thermospheric wind velocity at the $F2-$ layer peak and bottom showed that they were distributed in the range of about 10 to 130 m/s with most probable values ??lying in the range of about 40 to 70 m/s. It was found that the average amplitudes of velocity oscillations at the $F2-$ layer peak exceeded the average amplitudes at the $F2-$ layer bottom by the value of $\approx$ 9.0 m/s. This excess appears to be due to the diffusion term contributing in the ion velocity along the magnetic field lines. On the heights of the $F2-$ layer bottom located below about 300 km, this contribution is small and the technique allows deriving the true value of the oscillation amplitudes of the neutral wind velocity. On the heights of the $F2-$ layer peak located usually above 300 km, this contribution becomes significant, and evaluation of the oscillation amplitudes of the thermospheric wind velocity are overstated by the value of the diffusion term.