THEORETICAL SIMULATION OF THE INFLUENCE OF WINDS AND GAS DENSITIES OF NEUTRAL ATMOSPHERE ON THE FORMATION OF SEASONAL VARIATIONS OF ELECTRON DENSITY OF F2 REGION

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The results of theoretical simulation show that the density of atomic oxygen O and the wind of neutral atmosphere are the dominant factors determining the seasonal difference of electron density in the F2 layer. The neutral wind determines the seasonal difference of altitude of electron density maximum in the F2 layer.

The calculations were carried out on the days of winter and summer solstices at local time 12.00 for quiet geomagnetic conditions. The level of solar activity for these calculations was characterized by Covington index of 100.

The height scale of neutral gases in winter is less than in summer. The predominant neutral gas at the altitudes of the F2 region is atomic oxygen O. Further to this, at altitude of 200 km the winter value of atomic oxygen O density exceeds the summer one by 1.66 times, and at an altitude of 250 km it is 1.29 times.

According to the results of theoretical calculations of the altitude profile of electron density, the winter value of the electron density at the maximum of the F2 layer ($0.897 \cdot 10^6$ cm^{-3}) is greater than the summer one ($0.819 \cdot 10^6$ cm^{-3}). At the same time, the altitude of the main maximum in winter is less than in summer (236 km and 295 km, respectively).

We studied the influence of isolated factors on the formation of the profile, such as zenith angle, temperature of neutral gases, density of neutral gas, and neutral wind velocity.

Summer values of the neutral gas density undervalue the results of theoretical calculation of electron density at the maximum of the F2 layer in winter, and winter values of the neutral gas density overvalue the results of the summer calculation by about 1.75 times. The larger values of atomic oxygen contribute to larger values of electron density.

The effect of a winter decrease of electron density due to a change of Sun zenith angle is of about 10%.

Summer values of the meridional neutral wind overvalue the results of theoretical calculation of electron density of the F2 layer in winter, and winter values of the meridional wind undervalue the results of summer calculation by about 1.51 times.