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The observation of ionosphere response during Solar Eclipse August 1 2008

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The solar eclipses give us the unique opportunity to study the features of interactions of upper Earth atmosphere with solar radiation. The ionospheric processes occurred during solar eclipse are not investigated properly as powerful diagnostic means seldom situated at the regions with high level of solar disk covering during the quiet geomagnetic conditions. The incoherent scatter radars provide the potentiality to realize the most complete diagnostics of this phenomenon. At the ionosphere investigation by incoherent scatter method there are directly measured the power and it spectrum (or autocorrelation function) of incoherent scatter signal. With using of complex procedure of the receiving signal processing it is possible to estimate the majority of the ionospheric parameters - density and kinetic temperature of electron and ions, the plasma drift velocity and others.

The ionospheric effects of solar eclipse of 1 August 2008 at the Kharkiv radar were measured from the height of 100 km. For solving the problem of simultaneous electron density (Ne) determinations in E and F regions of the ionosphere it was used the dual-frequency measuring channel, which provided the obtaining of height power profiles and complex correlation function with altitude resolution 20 km.

The solar eclipse of 1 August 2008 over the point of observation was partial. The maximal percent of covering of visible solar disk was about 33%. The eclipse was observed from 9.11 (the first touch) till 11.18 UT (12.11 - 14.18 LT). The maximal phase of eclipse was registered at 10.15 UT (13.15 LT) with coefficient of Solar disk covering of about 0.33. The whole duration of this partial eclipse over Kharkiv was equal to 2 h 08 min. This eclipse took place during the low level of Solar activity and in quiet geomagnetic conditions (Kp=1, variations of Dst did not exceed 15 n'). The eclipse over Kharkiv took place after noon hours of LT, i.e. in the conditions of the formed stationary daytime F2 layer of the ionosphere. As covering the Solar disk the decrease of Solar radiation incident flux leads to the balance upset between processes of ionization, loss and transfer of the plasma.

The variations of Ne was led to the form of decrease as the phase of Solar disk covering was increased up to the maximum phase of eclipse; after that with small temporal delay the concentration was practically restored. The maximal decreasing of Ne was registered at the maximum of F2, it can be explained by predominance of the loss processes near the maximum of layer after the eclipse start. The decreasing of Ne was observed at the heights range 150-350 km. The electron density higher 400 km did not varied noticeably. At the height o the F2-layer maximum the electron temperature is decreased per 100-200 K, the changes of the ion temperature behavior was not observed. On the whole the ionosphere response is characterized by short-term change to the evening conditions.

The altitude dependences of electron density and plasma temperatures are presented. The comparisons with ionosphere response at recent solar eclipse 29March 2006 it is carried out.