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PARTIAL REFLECTION MEASUREMENTS OF THE LOWER IONOSPHERE MODIFICATION DUE TO ATMOSPHERIC ELECTROSTATIC FIELD

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It is a well-known fact that electric field can produce large disturbances in parameters of the lower ionosphere. Our experimental results have revealed that a possible cause of the appearance of large enough variations in the electron collision frequency is the effect of external electric fields of atmospheric origin. This provides an opportunity to measure electric field in the lower ionosphere using remote sounding facilities employing radio-wave techniques.

During 1978 - 1994 at Kharkiv State University, variations in the effective electron collision frequency were investigated in the ionospheric D region under different solar and geophysical conditions by means of the partial reflection technique (operating frequency of f = 1.8-3.0 MHz, pulse length of 25 μs, pulse repetition rate of F = 1 per second).

The distribution of variations in the effective electron collision frequency was obtained at the 60-66 km altitude range in the lower ionosphere (experimental errors within this altitude range were less than 50%). A technique emplying the experimental values of the effective electron collision frequency was developed for estimating the variations in atmospheric electric fields at the lower boundary of the ionosphere. From our measurements follows that there is the electric field $E > 0.25$ V/m in approximately 70% cases when partial reflection signals could be received from the mentioned-above altitudes. The mean magnitudes of the electric field intensity as a function of altitude were as follows: E(60 km) = 1.0±0.2 V/m, E(63 km)=0.5±0.1 V/m, E(66 km)=0.3±0.1 V/m.

Therefore, these facts must be taken into account in the investigations of ionospheric processes, meteorological, and propagation effects.

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