

Voltage jumps and atmospheric currents according to long-term observations at the Geophysical Observatory "Mikhnevo"

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At the Geophysical Observatory "Mikhnevo" more than 5 years functions sensor cluster for the electric field and vertical atmospheric current registration. The stand works almost in a continuous mode. The range of registration parameters: electric field strength $+ - (3 - 5000)$ V/m, values of atmospheric current $+ - (0.1 - 80)$ pA/m², the discred frequency is $(10-20)$ Hz. Under unperturbed heliophysical conditions during the day, the current follows the magnitude of the field strength, and the field values is close to the known Carnegie curve. The usual values of the field strength are 100-300 V / m, and currents 1-3 pA / m². Current sensors are measured the conduction current (approximately proportional to the value of the electric field) and the displacement current which is proportional to the rate of change of the field.

At Central Russia days under unperturbed heliophysical conditions ("good weather") is 20-40 per year. On other days, meteorological conditions cause distortion of the results of electrophysical observations. The appearance of clouds almost always leads to changes in the electric field and atmospheric currents. A relatively slow increase or decrease in the electric field strength (typical time of field change – a few hours) leads to an approximately proportional change in atmospheric current. This means that we see mainly the conductivity current, which is proportional to the electric field strength.

The approach of a powerful cloud front almost always leads to a strong change of the electric field (the characteristic rise time of ~ 1 hour), the typical magnitude of change of the field is hundreds and thousands V/m. Under this condition current value increase and often exceeds 80 pA/m² (the upper limit of the measurement). During the approach a thunderstorm separate lightning discharges are visible on the field strength records. A winter storms were recorded during the observation period. Several records show strong changes in the electric field and atmospheric currents without of clouds.