Atmospheric electric field features in conditions of atmospheric technogenic originated aerosol pollution

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Long-term electric field observations in the atmospheric surface layer under the megacity (Moscow) conditions are considered. The analysis of daily, seasonal and annual variations of the electric field potential gradient was carried out according to the Geophysical monitoring center of Institute of geosphere dynamics of Russian academy of sciences data. To clarify the contribution of technogenic compounds to the electric field variations, a comparative analysis was performed using the data obtained in Mikhnevo Geophysical observatory. The observatory was chosen as a reference point for comparative esteems, since it is located 80 km far from Moscow, and there are no industrial enterprises or other technogenic atmospheric pollution sources in the vicinity. In the analysis, along with the electric field potential gradient variations data, atmospheric pollutants data were used. Concentrations of CO, NOx, SO2 and dusts (coarse particulate matter PM10 and fine particulate matter PM2.5) were chosen as the main air pollution indicators. Suspended particles (PM) are a mixture of solid and liquid particles in the air in suspension. Sources of suspended particles in the atmosphere are motor vehicles (internal combustion engines) and products of chemical reactions involving gaseous pollutants.

It is shown that the megapolis influence is manifested in an increase of the electric field potential gradient amplitudes, which can be attributed to the aerosol particles concentration difference in the observation points. Analysis of the data obtained allows estimating the megacity anthropogenic aerosol contamination level.

On fair-weather days, in 90% of cases, there is a good correlation between the electric field potential gradient and pollutant concentrations. In the spring-summer months, in the nighttime, an increase in the concentrations of NO2 and fine particles in the air leads to an increase in the electric field strength. From autumn to spring, an increase in the electric field intensity at night is not observed, but daily maximums are observed, which correlate with an increase in the concentration of fine particles in the air.