MODELING AND DIAGNOSTICS OF AEROELECTRIC STRUCTURES IN THE LOWER ATMOSPHERE

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As was recently found, the atmospheric boundary layer comprises aeroelectric structures manifested in short-period electric-field pulsations (with period from several to several hundred seconds). The formation of aeroelectric structures is most rapid under conditions of intensive convection. The sizes of such structures are determined by characteristic variation scales of aerodynamic and electrodynamic parameters of the atmosphere (including the surface-layer height and the atmospheric “electrode” layer scale) as well as heating inhomogeneities of the ground (water) surface. Formed as a result of convective processes or capture of positive and negative charged particles (both ions and aerosols) by convective cells, aeroelectric structures move in an air flow along the Earth’s surface. Since the further evolution of convective cells results, in particular, in cloud formation relationship between such convective cells of the atmosphere and the aeroelectric-structure evolvement leads to the assumption that charge separation and accumulation processes are characteristic of even early stages of cloud formation. Obviously, development of the methods of diagnostics and modeling of aeroelectric structures is important for a study of both convective and electric processes in the lower troposphere. The test-structure method developed in this paper is aimed, first of all, at solution of the mentioned problems.
This paper is devoted to numerical modeling of the electric-field dynamics in the atmosphere by the test-structure method. The method of diagnostics of aeroelectric-structure (AES) parameters based on measurement of short-period electric-field fluctuations is proposed and implemented. Thunderstorm applications of the test-structure method based on the local experimental data is considered. Aerosol influence on relaxation time of AES is investigated.

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