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Analytical research of the motion of fine-dispersed component of space debris in the near-Earth space

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It is known that a particle which moves in magnetosphere's plasma get electric charge which depends on density and temperature of surrounding plasma, a stream of sunlight and speed of the particle. If the motion of a particle from a material with a low photoemission yield is slow enough, we may believe that its electric charge is locally equilibrium in some areas of the circumterrestrial space, i.e. the electric charge depends only on particle position on a trajectory. We determined the conditions of applicability of canonical formulation of a problem of the motion of micro-particle (MP) with locally equilibrium electric charge in the near-Earth space (NES). The general condition of a correctness of the canonical formulation of a problem of the motion of a micro-particle in the NES is possibility to represent all forces reacting upon a micro-particle by usual or generalized potential. At the same time the Lorentz force acting upon the variable electric charge of a MP from the side of the magnetic and electric fields of near-Earth space admits representation with the help of a generalized potential if appropriate constraints are imposed on the character of the variation of the MP charge in the process of its orbital motion and also on the geometrical features of the magnetic and electric fields of the NES. These conditions are satisfied in the earth's plasmasphere due to specific features of spatial distribution of the plasma in this area. This distribution is known to be described by the model of a two-component plasma.

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