

Numerical Analysis of Mechanisms of Spacecraft - Ionospheric Plasma Interaction

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We consider the disturbances of ionospheric plasma, created of spacecraft moving on the altitudes ≈ 200 km from the earth surface. There is developed the method of numerical modeling of interaction of equilibrium ions of media with disturbed neutral particles (V.G. Spitsyn, *Modeling of radiowave scattering on the ionospheric plasma disturbances, created of space vehicle*, Tomsk: Publishing House "STT", 2002). On the base of solution of system kinetic equations for spacecraft disturbed neutral particles and ions ionosphere are received the numerical results of ionospheric plasma disturbances magnitude. These results are showing the initiation of concentration ions disturbance in a view of weakly shock wave.

The mechanism of ionospheric ionization produced of neutral particles reflected from moving spacecraft is investigated. In the result of solution the kinetic equation for born ions is received that for case of moving the spacecraft across the magnetic field the pattern of concentration ions disturbance is anisotropic. For the spacecraft with across dimension is equal to 2,4 m the maximum eventual value of ionization is 30000 cm^{-3} .

The process of ionospheric plasma interaction with spacecraft exhaust jet is investigated. There is modeling the process of ion ionospheric plasma diffusion in the exhaust jet of spacecraft. The results of computation are shown that the maximum of relative number of ionospheric ions disturbances is disposed in the area of near boundary of jet and consist of the value $\cong 5$. The effect of ion accumulation in this area is explained of ions braking in the gas jet. On the base of these results is developed a model of electron concentration disturbances, created of spacecraft exhaust jet.