A calculation of gas and dust flux densities of inner coma for 67P/Churyumov-Gerasimenko in the vicinity of the comet perihelion

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A calculation of gas and dust flux densities of inner coma for 67P/Churyumov-Gerasimenko in the vicinity of the comet perihelion is shown in the given work with use of results of inner coma model [1]. General Euler equations system of hydrodynamics is used for calculation of gas flux at the approximation of coma axial symmetry. The system of boundary conditions have been defined for the decision of the differential equations system considering available phenomenological data for the comet. It was supposed, that the gas fraction of coma has two components (H_2O-gas, CO – gas).

Dust fluxes from a surface of comet nucleus are characterized by a wide spectrum of possible values of particle mass. The algorithm of work [1] has been used for calculation of dust flux densities. It is based on splitting of a mass spectrum of dust particles into a plenty of small intervals and use of cumulative mass distribution [2]. The new results for a temperature of dust particles and nucleus surface have been applied. Production rates of dust mass both for separate mass classes, and for total mass spectrum have been calculated here.

In the numerical analysis of results it is shown, that carbon monoxide gives main contribution to number density and flux of gas molecules on the night side of nucleus. The given fact specifies basic necessity of the account of CO-component in precision modelling of gas fraction of coma. Distributions of radial and tangential velocities of gas molecules are received. It is shown, that gas and dust propagate almost spherically symmetric. Similar character of gas propagation has been found out in theoretical modelling of coma for comets 46/PWirtanen, 81/PWild 2 [3], C/1995Hale-Bopp [4]. The distribution histograms of number and mass flux densities for various classes of dust particles are also submitted here. Limiting values of a phase angle for which massive particles of the given class still can be lifted from nucleus surface are calculated.

References:

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