ON THE PROBLEM OF GALACTIC DUST DISCOVERING

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Introduction: Particles arrived in the Solar System from interstellar medium are found but their nature is not cleared [1, 2]. Discovering of such particle fluxes and working out the criteria of galactic meteors identification is a problem of the modern astronomy [2]. Below light pressure and effect of Pointing-Robertson as well as gravitational force acting on the particle from the Sun are taken into account.

The based equations: The model equation of particle motion we put in the form (1) [3]

$$d^2\mathbf{r}/dt^2=-GM'\mathbf{r}/r^3-2b'v\cos(u)\mathbf{e}_r/r^2-b'v\sin(u)\mathbf{e}_t/r^2 \quad (1)$$

Here, v is velocity of the considered particle, u is an angle between the vector of the velocity **v** and the heliocentric radius-vector **r** of the particle, $\mathbf{e}_r$ and $\mathbf{e}_t$ are units' orts of radial and tangent directions of the particle vector acceleration, $b'=\pi R^2 q r_{SE}^2/(Mc^2)$, $M'=M_S - \pi R^2 q r_{SE}^2/(GMc)$, G is the gravitational constant, c is the velocity of light, R is a radius of the particle, q is the solar constant, M' is reduced mass of the Sun, M_S is the mass of the Sun, M is mass of the particle, r_{SE} is the averaged distance between the Earth and the Sun. Using the density ρ of the spherical black particle we have $M=\frac{4}{3}\pi R^3\rho$, $b'=(3/4)qr_{SE}^2/(\rho Rc^2)$, $M'=M_S-(3/4)qr_{SE}^2/(\rho RGc)$.

If the particle moves along the straight line in the gravitational field of the Sun (light pressure and effect of Pointing-Robertson are also taken into account), then equation (1) is simplified (u=π) and after integrating (1)

$$\frac{v-v_0}{2b'}+\frac{GM'}{(2b')^2}\cdot\ln\left(\frac{2b'v-GM'}{2b'v_0-GM'}\right)=\frac{1}{r_0}-\frac{1}{r}. \quad (2)$$

Where v_0 is the initial velocity of the particle, r_0 is the initial positions of the particle, the final distance of the particle from the Sun is equal to $r=r_{SE}$.

Example: Graph of v (v_0, ρ·R) functions, presented in figure (Fig.1), are plotted for values: q=1360 Wt. /m^2, $r_{SE}=1.49597\cdot10^{11}$ m, $M_S=2\cdot10^{30}$kg, r_0=100000 AU, $G=6.672\cdot10^{-11}$ m^3/ (kg·s^2), $c=3\cdot10^8$m/s; $0<v_0<100000$m/s, $0<\rho\cdot R<1000$ kg/m^2.

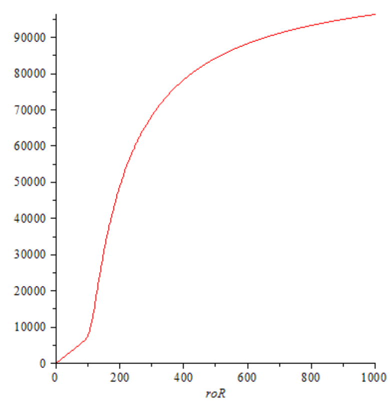

Fig.1. Dependence of v near the Earth's orbit on ρ·R for v_0=100000 m/s

Conclusion: The small values of the radii R and the low density ρ of the particles make the velocities of interstellar meteoroids near the Earth's orbit tend to zero even for the large initial velocities of these meteoroids (Fig.1). So, the interstellar meteoroids in some cases have almost zero velocities near the Earth's orbit and majority of them may be lost for their searching in accordance with the method [4], using only the criterion of high velocities of interstellar meteoroids.

References: [1] Hajdukov'a M., Paulech Jr. and Paulech T. (2007) *Contrib. Astron. Obs. Skalnat'e Pleso.* V. 37. P. 18-30. (http://www.ta3.sk/caosp/Eedition/FullTexts/vol37no1/pp18-30.pdf). [2] Kramer E.N. and Smirnov V.A. (1999) *Solar System Research*. V. 33. P.77. [3] Radzievskii V.V. (2003) *Photogravitational Celestial Mechanics.* Nijnii Novgorod: Editor Chief Yu. A. Nikolayev. 196 pp. (In Russian). [4] Slivinskii A.P., Bushuev F.I., Kalyujnyi N.A. and Shulga A.V. (2013). *NTR*. V. 92. N 2. P. 28-34.