ON THE MODELS OF COMETARY'S ORBITS EVOLUTION. D. G. Modulina[1] and E. N. Tikhomirova[2], [1] Astronomical Observatory, State Pedagogical University, Respublikanskaya 108, Yaroslavl 150000, Russia, e-mail: fisik-programmist@mail.ru , [2] Valentina V. Tereshkova Cultural-Educational Centre, Tchaikovsky 3, Yaroslavl 150000, Russia, e-mail: en_tihomirova@mail.ru.

Introduction: The interest to integrated problems of celestial mechanics increases now [1]-[5]. In [1] the model of comets motion (with a zero mass m) like Kreutz ones in the gravitational fields of the Sun with the mass m_S and planets with the masses m_{pi} is considered. We estimated the interval of comet motion time from a perihelion to an aphelion equal t=255.5288 of years - for the comet C/1843 D1 (the Great Comet of 1843). This size corresponds (closely) to a half of the motion period of the considered comet (T=515.2126 of years). The perturbations from Jupiter are taken into account.

The aim of this work is forecasting of comets appearance near the Earth and the estimation of their danger degree.

Fundamental Equations: Let's consider movement of a variable mass point at the isotropic radiation law in the Newtonian gravitation field of n – motionless concentric circles.

The equation of point motion is

$$m\frac{dv}{dt} = -v\cdot\frac{dm}{dt} + F \qquad (1)$$

The mass changes under the law

$$m(t) = m_0\cdot(1-\alpha\cdot t) \qquad (2)$$

$$\frac{d^2z}{dt^2} + \frac{dz}{dt}\cdot\frac{1}{m}\cdot\frac{dm}{dt} - \sum_{i=1}^{n}\frac{m_i\cdot z(t)}{(R_i^2+z(t)^2)^{3/2}} = 0 \qquad (3)$$

The equations (1)-(3) are reduced to the following quadrature

$$U(t) = \frac{dz}{dt}$$

$$\frac{dU}{dt} = U(t)\cdot\left(\frac{\alpha}{1-\alpha\cdot t}\right) + \sum_{i=1}^{3}\frac{G\cdot m_i\cdot z(t)}{(R_i^2+z(t)^2)^{3/2}}$$

As a result of its decision (Runge-Kutta method of the 4th order), we received the following relation graphs:

Fig.1 A comet movement with an increasing mass

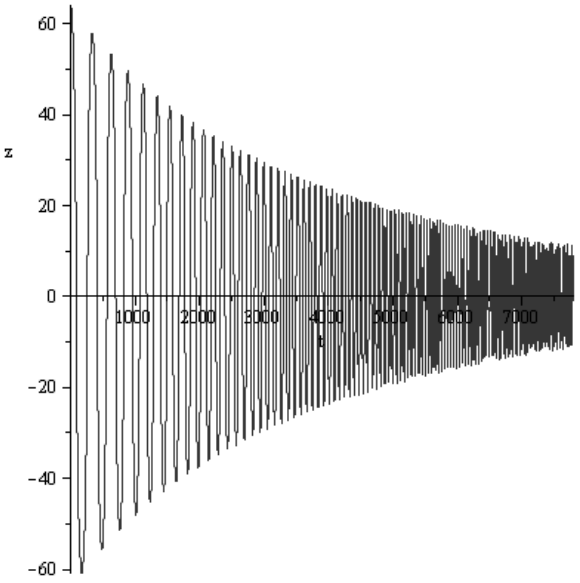


Fig.2 A comet movement with a decreasing mass

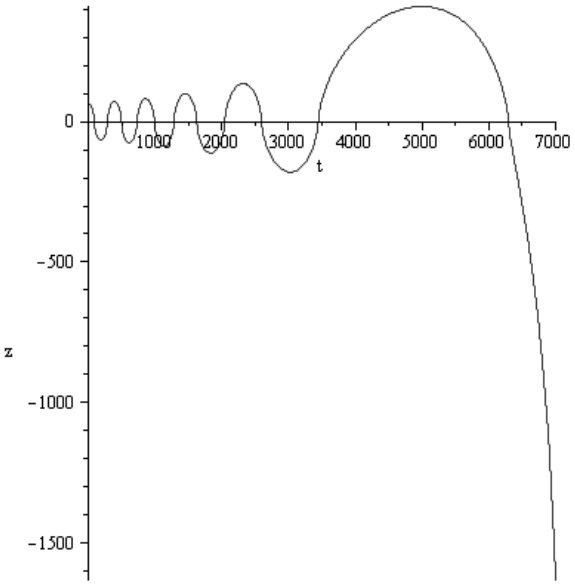
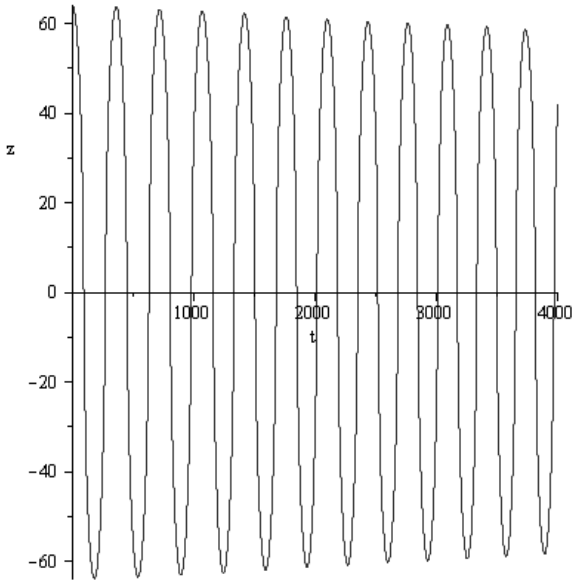


Fig.3 A comet movement with a constant mass



Conclusion:

1. The model allows to estimate the period of movement of comets taking into account perturbations (from quadratures).
2. From observation and calculations: at the Saturn and the Jupiter conjunction the center of mass of system the Sun-the Jupiter-the Saturn is always behind the Sun (the natural protection of Earth against the comets).
3. At mass loss a comet is jumped out of the Solar system (according to the model).
4. At absorption mass a comet comes nearer to the center of the Solar system (asymptotically).

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