ON THE METHOD OF SEARCHING FOR UNDISCOVERED HAZARDOUS COMETS AND METEOROIDS COLLIDING WITH TERRESTRIAL TYPE PLANETS. D. V. Kolesnikov¹ and N. I. Perov²,

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Introduction: It is assumed [1, 2] there are $10^{12} - 10^{13}$ comets, moved along elliptical orbits, in the Oort’s cloud. Stars and gigantic molecular clouds, passing by near the Sun, set some comets of Oort’s cloud move into the internal part of the Solar system. It is considered up to day the discoveries of comets are random and unpredictable [3–4]. A model of forecasting appearances of undiscovered yet minor celestial bodies is presented below.

A Non-Traditional Model of Migration of Comets:
Let us consider a model of interaction of a comet with a preliminary parabolic heliocentric orbit, and a planet of mass $M_{pl}$. The comet at the perihelion of the heliocentric orbit closes with the planet, which moves along circle orbit radius of which equals $r_{pl}$ with velocity $V_{pl}$. An initial angle between the orbital planes of the comet and the planet is equal to $\theta_0$. (Fig. 1). The process of interaction of the comet and the planet will be considered like momentary turn of velocity vector $V_c$ of the comet, experienced the closest approach of the planet. (Fig.2).

![Fig.1. A parabolic comet and a terrestrial type planet.](image)

![Fig.2. Approaching the comet and the planet.](image)

$V_\infty$ is the velocity of the comet at the boundary of the sphere of action of the planet. $R_p$ is the radius of the planet. $\rho$ is the impact parameter of the comet. $a$ and $b$ are real and imaginary semimajor axes of the hyperbola. $\theta$ is the angle by which the velocity of the comet turns in the sphere of influence of the planet. $2\Psi$ is the angle between asymptotes of the hyperbola.

An angle of turn $\theta$ of the comet velocity vector (in the sphere of action of the planet) is maximum, if the comet approaches with the planet at the minimal distance without destroying. For this distance we take the radius of the planet $R_p$ (Roche limit is not taken into account). A target parameter of the comet is $\rho$ should be in excess of $\rho_{crit}$ (for the $\rho_{crit} r_{min}=R_p$), otherwise the comet will collide with the planet and recover from further existence in the given model of motion. The comet with velocity of $V$ enters into the sphere of influence of the Sun, whose mass is $M_{Sun}$. Setting for the heliocentric motion $r_{pl} \approx r$ (for the moment of time of “collision” of comet and planet) we determine by analytically tractable an angle of turn $\theta$ of a velocity vector of the comet in the sphere of influence of the planet, a semimajor axis $a$, an eccentricity $e$, true anomaly $v$ of the comet for the new heliocentric orbit (after scattering the comet by gravitational field of the planet and egress of this object from the sphere of the planet influence) and an angle $\alpha$ between the heliocentric radius–vector of comet $r$ and the vector of the heliocentric velocity $V$. The new perihelion distance of the comet denote by $r_P$.

The parameters of the final orbit of the comet are concerned with some parameters of the original (parabolic in accordance with the model) orbit of the comet as well as the parameters of the planet by the following formulae (1-4), corrected with reference to [3]. Some results are presented in Tab.1.

$$v' = \frac{1}{\sqrt{\left[\frac{M_{Sun} r_{pl}}{M_{pl} r_{pl}}\left(3 - 2\sqrt{2} \cos i_0\right) + 1\right]}}. \quad (1)$$

$$a = \frac{r_{pl}}{4 \cdot v' \left(\sqrt{2} \cos i_0 - 1\right)}. \quad (2)$$
Earth are presented for the case

eccentricities - $e_i$ (circles) and inclinations - $i_f$ - degrees - (strokes) of the model orbits of the comets of Jupiter’s family at the model pairwise two-body problem. $i$ is an initial inclination (radians) of the plane of the parabolic orbit of the comet, at the plane of the circle orbit of the planet. Tisserand criterion equals $C=2.15^2 \cos i$.

**Conclusion:** The considered model of the transition of comets makes it possible to do the following: a) choose more definitely the initial conditions for the process of comet migration; b) dynamically explain the adopted classification of comets into planetary families; c) explain the deficit of observed comets with perihelion distance $r_B<2.5$ AU; d) interpret the formation of the association between a number of short-period comets on one hand and Jupiter (“six-year” comets), Saturn (“13-year” comets ) on the other hand. Discrepancies are found to exist for the well-known families of Uranus (“33-year” comets) and Neptune (“75-year” comets), because it follows from our study that comets with periods of 43 and 81 years must be assigned these families, whereas comets with period of 34 and 19 years must be assigned to the families of Venus and Earth, respectively; e) make out the search-full ephemerides of undiscovered hazardous comets and radiants of unknown meteor streams and some meteoroids.