POSSIBLE COLLISIONS OF TNOS WITH SMALL BODIES ON HIGH ECCENTRICITY ORBITS

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We present the results of investigation of dynamical behaviour of objects from the Kuiper belt after their collisions with small bodies moving on model orbits similar to the Kreutz cometary orbits.

Analytical theories about the existence of periodical solutions in the outer variant of the averaged restricted three-body problem (the Sun–Jupiter–asteroid) established the existence of the periodic solutions corresponding to Keplerian osculating orbits in which the eccentricity, inclination and semi-major axis have only periodical perturbations. The node possesses by the secular motion. Therefore, only additional forces can change orbits of the Kuiper-belt objects such that the bodies can migrate to the inner or outer part of the solar system.

One of the possible nongravitational forces that can change a near-circular orbit of some Kuiper object to an elliptical one is the collision with a comet on the high eccentricity orbit. The orbital velocity of a comet from the Kreutz group with a near-parabolic orbit in the region of the Kuiper belt (heliocentric distance 30–50 AU) is 7.7–5.9 $\mathrm{km\,s^{-1}}$. Therefore, the change of the velocity of a target Kuiper object by such collision cannot exceed this value.

In our study we used model orbits of the Kuiper belt objects with different values of the eccentricity and semi-major axis and studied their orbital behaviour after the collision which changed their orbital velocity by not more than 1 $\mathrm{km\,s^{-1}}$. Depending on the change of the orbital velocity vector, the object will migrate to inner or outer part of the solar system.