

POSSIBLE SOURCES OF PLANETARY CROSSERS. E. M. Pittich¹ and N. A. Solovaya², Astronomical Institute, Slovak Academy of Sciences, Dúbravská cesta 9, 845 04 Bratislava, Slovak Republic, ¹pittich@savba.sk, ²astrosol@savba.sk.

The investigation of two groups of small bodies in the solar system which can be possible sources of bodies the perihelion distance of which lies inside the terrestrial planetary orbits.

The first group includes asteroids from the main asteroid belt, which orbits close to the boundary of the Hill stability criterion. Asteroids with high inclination orbits can under the influence of the gravitational forces of other planets periodically changing their orbital eccentricities and inclinations in such a way that they can become planetary crossers for a certain period.

In the case when the initial eccentricity e is equal to 0.2 and 0.4, and for initial inclinations $i = 60\text{--}120^\circ$, the eccentricities change periodically within a wide range and the perihelion distances are less than 1 AU. Asteroids moving on these orbits can cross the terrestrial planetary orbits in their nodes. When an asteroid and a terrestrial planet are at the same time near to one of the asteroid nodes, the probability of collisions is high.

The high probability of the collision occurred not so rarely. For example, the collision of asteroids with the initial values $e = 0.2$, $i = 100^\circ$, and argument of perihelion $\omega = 120^\circ$ occurs with period about 5000 years and of asteroids with the initial values of $e = 0.4$, $i = 60^\circ$, and $\omega = 0^\circ$ with period less than 5000 years. Consequently, there is a real possibility of collisions of high inclination asteroids with the Earth or other terrestrial planets.

To the second group includes sungrazers, comets with very small perihelion distances and eccentricities close to 1.

The evolution of the orbits of the sungrazers is similar to the evolution of the orbits of high inclination asteroids. Within the investigated period of 500,000 years the semi-major axes of the sungrazer orbits have small periodic perturbations. The eccentricities and inclinations of their orbits change within a wide range. Therefore, their perihelion distances also vary widely, from close to 0 AU to 1.5 AU.

The comets that come close to the terrestrial planetary orbits can be candidates for collisions with these bodies. The possibility of the collisions of sungrazers with the terrestrial planets is not negligible. For example, within 20,000 years the Earth can collide with the sungrazers moving in orbits with eccentricities from 0.9900 to 0.9993.

For eccentricities higher than 0.9993 the orbits are long-periodical, close to the parabolic ones. Comets with such orbits reach the Kuiper belt and more distant outer part of the solar system.