The role of near-Sun objects in determining the population of Chelyabinsk-type bodies

V. Emel'yanenko[1]

[1]Institute of Astronomy, RAS, Moscow, Russia

We have calculated the orbit of the Chelyabinsk object, applying the least-squares method directly to its astrometric positions (Emel'yanenko, Naroenkov, Jenniskens, Popova, 2014). A study of the backward dynamical evolution by integrating equations of motion for particles with orbits from the confidence region has shown that the majority of the Chelyabinsk clones reach the near-Sun state. An analysis of other meteorites with well-determined orbits also demonstrates frequent approaches of these bodies to the Sun in the past. In addition, we have found many observed near-Earth asteroids that had small perihelion distances in the past. In extreme near-Sun cases, asteroids should experience thermal and tidal disintegration. It is interesting to note that examples of such near-Sun objects are probably observed now as 'sunskirting comets'. Some members of the Kracht and Marsden families have been observed in a few apparitions. A detailed investigation of their forward motion shows that these bodies evolve to orbits of typical near-Earth objects. Thus they can generate Chelyabinsk-sized bodies in near-Earth space. We conclude that encounters of small bodies with the Sun play an important role in the production of near-Earth objects.