

Dynamical lifetime of the Oort Cloud new comets under planetary perturbation

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Nearly isotropic comets with very long orbital period are supposed to come from the Oort Cloud. Recent observational and theoretical studies have greatly revealed the dynamical nature of this cloud and its evolutionally history, but many issues are yet to be known. Our goal is to trace the dynamical evolution of the Oort Cloud new comets (OCNCs) produced by evolving comet cloud, hopefully estimating the fraction of OCNCs embedded in the current populations of the solar system small bodies. We combine two models to follow the dynamical evolution of OCNCs beginning from their production until their ejection out of the solar system, obtaining statistics of the dynamical lifetime of OCNCs: The first model is a semi-analytical one about the OCNC production in an evolving comet cloud under the perturbation of the galactic tide and stellar encounters. The second model numerically deals with planetary perturbation over OCNCs' dynamics in planetary region. The main results of the present study are: (1) Typical dynamical lifetime of OCNCs in our models turned out to be $O(10^7)$ years. Once entering into the planetary region, most OCNCs stay there just for this timespan, then get ejected out of the solar system on hyperbolic orbits. (2) While averaged orbital inclination of OCNCs is small, the so-called "planet barrier" works rather effectively, preventing some OCNCs from penetrating into the terrestrial planetary region.

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