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ANALYSIS OF THE EXTERNAL REGION OF THE PLUTO SYSTEM FOR DIFFERENT VALUES OF INCLINATION AND ECCENTRICITY OF THE PARTICLES

Abstract

Pluto and Charon form a binary system due to the large mass ratio ($\mu = 0.12$) and the small distance (d = 19570km) between them. Four small satellites, discovered after the launch of the New Horizons spacecraft, are located exterior to Charon's orbit. Styx, Nix, Kerberos and Hydra have very small eccentricity and are all coplanar with Charon's orbital plane. In this work we analysed external regions for a set of particles with different values of eccentricity and inclination. From our numerical simulations, taking into account the gravitational effects of Pluto and its five satellites, we generate diagrams of a versus e and a versus I (where a is the semi major axis, e is the eccentricity and I is the inclination of the particles) after a timespan of 10^5 orbital periods of Charon (about 650000days). The external region was divided into three: a) region 1 between $1.5d$ to $2.5d$ - Styx and Nix are located in this region; b) region 2 between $2.5d$ to $3.5d$ - Kerberos and Hydra are located in this region, and c) region 3 external to Hydra's orbit. For particles with $I \leq 90°$, our results show that less than 30% of the initial set of particles remains in regions 2 and 3, while in region 1 less than 5% survived after 650000days. However, about 30% of particles located in region 1 survives when its $I > 90°$. When the Solar Radiation Pressure is included in the system, only a small number of particles larger than $10\mu m$ stays in the system. Smaller particles are ejected or collide with the massive bodies in a very short period of time.