

SPACE EXPLORATION SYMPOSIUM (A3)  
Solar System Exploration (5)

Author: Dr. Silvia Maria Giuliati Winter  
Universidade Estadual Paulista-UNESP, Brazil, silvia@feg.unesp.br

Prof. Othon Winter  
UNESP - Univ Estadual Paulista, Brazil, ocwinter@pq.cnpq.br

Dr. Rafael Sfair  
UNESP - Univ Estadual Paulista, Brazil, rsfair@feg.unesp.br

Dr. Ernesto Vieira Neto  
UNESP - Univ Estadual Paulista, Brazil, ernesto@feg.unesp.br

STABLE REGIONS LOCATED INTERIOR TO CHARON'S ORBIT: THE ENCOUNTER WITH THE  
NEW HORIZONS MISSION IN 2015

**Abstract**

The recent discovery of a new satellite located in the Pluto system, temporally named P4, raised many questions regarding the safety of the New Horizons spacecraft during the encounter with Pluto in 2015. Pluto and Charon form a binary system since its mass ratio is about 0.1165 and the distance between them is less than 20000km. Nix, Hydra and P4, located exterior to Charon's orbit, complete the system, although many other small bodies or dust particles can be located in this peculiar system.

Giuliatti Winter *et al.* (2010) have analysed stable regions located interior to the orbit of Charon, where the mission will cross the orbital plane of the system. Periodic and quasi periodic orbits were found around Pluto and Charon. In this work we investigated a specific region, named region 1, for different values of the orbital inclination and argument of pericentre of the particles. Region 1, for  $I = 0$ , can be visualized in a diagram semimajor axis ( $a$ ) versus eccentricity ( $e$ ) at  $0.55 - 0.7d$ ,  $d$  is the Pluto-Charon distance, for values of the eccentricity in the range  $e = [0.2 - 0.85]$ .

Our results showed that the size and location of region 1 depend on the initial orbital inclination of the particles. The maximum value is reached for  $I = 0$  and this region completely disappears at  $I = 110^\circ$ . After  $I = 130^\circ$  it starts increasing again until reaches the maximum value when all the particles are in retrograde orbits with  $I = 180^\circ$ . From these results we could identify the maximum orbital radius for each value of the orbital inclination of the particle and we concluded that the New Horizons mission will pass close to most of these orbits.

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