Paper ID: 48216
student

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

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PERTURBATION EFFECTS OVER A MERCURY ORBITER

Abstract

Solar sails are a type of propulsion mechanism which uses solar radiation pressure to generate acceleration. The fundamental goal while designing this kind of technology is to provide a large and flat reflective film, meanwhile it requires a minimum of structural support mass. In order to analyze the evolution of the orbit of a spacecraft when it is a solar sail around Mercury, the present research investigates dynamical equations of motion which takes into account the central body's irregular shape, the perturbation of the third body and the solar radiation pressure. We present an approach where we present maps to analyze frozen orbits with longer lifetimes around Mercury. A set of initial conditions, which may contribute with scientific missions planned to visit the planet Mercury are presented. Frozen orbits are found, the ones with smaller variation of the orbital elements, helping the orbit control and on saving operational costs. It is also presented an approach to analyze the effect of the non-sphericity of Mercury on the motion of the spacecraft, where the J2 and J3 zonal terms are included along with the C22 sectorial term.