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Author: Prof. Rodolpho V. Moraes
Federal University of São Paulo (UNIFESP), Brazil, vilhena.moraes@gmail.com

Ms. Maria Lívia Galhego Thibes Xavier da Costa
Federal University of São Paulo (UNIFESP), Brazil, livia.thibes@gmail.com
Dr. Jean Paulo dos Santos Carvalho
Universidade Federal do Recôncavo Baiano - CETENS, Brazil, jeanfeg@gmail.com
Dr. Antonio Fernando Almeida Prado
Instituto Nacional de Pesquisas Espaciais (INPE), Brazil, prado@dem.inpe.br

ARTIFICIAL SATELLITES ORBITING PLANETARY SATELLITES: CRITICAL INCLINATION AND HELIO-SYNCHRONOUS ORBITS

Abstract

Recent space missions show interest in the exploration of planetary satellites orbiting moons of our solar system. It is interesting to note that for some of the lunar satellites the internal distribution of their masses behaves differently from the internal distribution of the mass's Earth. This fact implies often to change the hierarchical order of the coefficients of the gravitational potential developments. In this work, the changes are analyzed in the orbital behavior of lunar satellites, considering the action of perturbative forces, derived from the gravitational potential of the central body, including harmonics known for such moons. Critical inclination and helio-syncrhonous orbits are considered. Due to the characteristics of gravity field of our Moon, the potential truncated up to the J_9 produces different effects on the frozen orbits when the potential is truncated up to J_7. Also, for artificial satellite orbiting some of Galilean satellites, where the J_2 are of the same order of C_{22}, nonexistence conditions for frozen orbits can be obtained. Approximate analytical solutions are compared with the results of some numerical simulations.