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Author: Dr. Josué Cardoso dos Santos
Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency (JAXA), Japan

Prof. Yasuhiro Kawakatsu
Japan Aerospace Exploration Agency (JAXA), ISAS, Japan
Mr. Takuto Shimazaki
The University of TOKYO, Graduate school, Japan

ANALYSIS OF GRAVITY PERTURBATIONS OVER LOW-THRUST TRAJECTORIES FOR
DESTINY+ MISSION USING EQUINOCTIAL ELEMENTS

Abstract

This work deals with the modeling and analysis of different perturbation forces acting over the trajectory of a spacecraft with a low-thrust acceleration model using Fourier Series expansion and differential equations of motion with singularities removed by adoption of equinoctial orbital variables. The focus of the analysis is to present a discussing where singularities are removed and with the addition of the forces due to the Earth's flattening at the poles and the third-body perturbation due to the moon in the dynamical system. The outcomes are important for the understanding and design of the dynamics adopted in projects such as transportation of cargo to cislunar region (intended for continuous lunar exploration) and the JAXA's DESTINY+ mission, a initiative planned to escape the Earth in a spiral trajectory, swing-by with the Moon and potentially have a flyby with two asteroids. The planned launch date currently is mid of 2024.