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THE EFFECT OF SOLAR RADIATION PRESSURE ON SOLAR ORBITER GRAVITY ASSIST
MANEUVERS

Abstract

In order to achieve the orbit with high inclination relative to the solar equator ($\sim 30^\circ$), Solar orbiter spacecraft must perform the series of gravity assist maneuvers (GAM) by Venus swing-bys. To enable this, the complex orbit with series of resonances with Venus (1:1-1:1- 4:3 -3:2-3:2) has been proposed by the mission designers. All these swing-bys have to be performed very accurately with minimum altitudes above the Venus surface on the order of several hundred kilometers. There are several dispersion sources for targeting the optimal swing-bys and the solar radiation pressure is the most significant. In order to reduce the necessary delta-V for trajectory correction maneuvers, and thus increase the mass budget, it is important to accurately model the effect of solar radiation pressure on the spacecraft orbit. In this paper we present the analysis of this influence on the accuracy of GAMs and the mass budget.