
Sensitivity study of radiation pressure models for precise orbit determination

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Abstract

Keywords

Radiation pressure, orbit determination

Acronyms: LRO Lunar Reconnaissance Orbiter

1 Introduction

Lunar Reconnaissance Orbiter (LRO)

"SRP is the largest non-gravitational perturbation affecting the LRO orbit and inadequate modeling of SRP is the primary cause of large prediction errors for LRO, particularly during high-beta angle periods" [1]

Operational LRO OD does not use lunar albedo due to computational demand, but used for offline reprocessing. Self-shadowing from Mazarico, Zuber, Lemoine, and Smith is used [3]

High OD error during full-sun periods with cannonball model, but acceptable with multi-panel model and real attitude for SA and HGA [4]

albedo radiation significant since no atmosphere exists, up to 30 % [5]

model setup: solar array tracks Sun, HGA tracks Earth [6]
start at start at 26 June 2010 06:00:00 Earth eclipses Sun during this time Moon does not eclipse Sun (Sun beta angle is about -90 deg, see [6])

mass: 1208 kg (1915 kg loaded mass, 644 kg prop used after mission orbit insertion, then 6.315 kg prop used for each of 10 sk maneuvers till 26 june 2010 [7])

2 Models

every irradiance in the list can be thought of as ray

3 Results

for radiation pressure acceleration, add partial/full eclipse to time axis

absolute acceleration magnitude likely influenced by mass uncertainty rp acceleration magnitude increases as mass decreases

References

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