

Lunar orbit stability for small satellite mission design

Andres Dono

The irregular nature of the lunar gravity field will severely affect the orbit lifetime and behavior of future lunar small satellite missions. These spacecraft need stable orbits that do not require large ΔV budgets for station-keeping maneuvers. The initial classical elements of any lunar orbit are critical to address its stability and to comply with mission requirements. This publication identifies stable regions according to different initial conditions at the time of lunar orbit insertion (LOI). High fidelity numerical simulations with two different gravity models were performed. We focus in low altitude orbits where the dominant force in orbit propagation is the existence of unevenly distributed lunar mass concentrations. These orbits follow a periodic oscillation in some of the classical elements that is particularly useful for mission design. A set of orbital maintenance strategies for various mission concepts is presented.