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J2-PERTURBED LOW-ENERGY ORBITS AROUND ENCELADUS

Abstract

The icy moons have drawn the interest of the scientific community due to the indications of water-based life and geological activity observed in a number of these objects. In particular, the presence of plumes of water near Enceladus' south pole has placed this moon in the list of priority targets to search for life and habitability properties. As a result, a growing number of mission plans for the in situ exploration of this object are being proposed. In a previous investigation, a set of heteroclinic connections were designed between Halo orbits around the equilibrium points L1 and L2 of the circular restricted three-body problem of Saturn, Enceladus and the spacecraft, and were proposed as science orbits for the extended observation of the surface of Enceladus. The performance analysis of those solutions showed that they offered long, uninterrupted, low-altitude views of the polar regions at virtually no fuel consumption. The present contribution discusses the refinement of these heteroclinics when the perturbations caused by first zonal harmonic term (J2) of Enceladus and Saturn are taken into account. The formulation, the methodology and the results will be presented, and the performance features of the new trajectories will be analysed and compared with those of the unperturbed model.