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SEARCH FOR ORBITS IN THE JUPITER SYSTEM TO EXPLORE THE GALILEAN MOONS

Abstract

In order to obtain a deeper understanding of the system of Jupiter and its Galilean moons, some missions intend to visit this planetary system. They can be designed in several different trajectories: some can be closer to Jupiter and others can have semi-major axes below the moons, above them or in regions between a pair of bodies of this system of five large objects. Orbits in those locations may help to observe several bodies in a single orbit. In this way, a detailed investigation of these regions is essential for a better comprehension of the dynamics of spacecrafts being disturbed by such bodies. In this context, the present paper proposes to perform a study of this type to try to find the more appropriate orbits to place spacecrafts traveling in these regions. Regions covering distances below the Galilean moons until above them are considered with different inclinations. Such investigation can offer a deeper understanding about the quantity of energy that is transferred and/or removed by each body in the system. This idea not only indicates the best orbits, but it also shows in details the contribution of each perturbing force. Several numerical simulations are performed in order to explore different regions to be considered for the spacecrafts. The contribution of the forces and the consequences in the trajectory of the spacecraft are shown. The planet and the moons are assumed to be irregular bodies with terms related to this fact in their gravitational potential. These results are essential in order to find less disturbed regions in this planetary system and, therefore, they are important to help the space agencies to save operational costs for the missions.