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MAPPING LONG-TERM NATURAL ORBITS ABOUT TITANIA, A SATELLITE OF URANUS

Abstract

The close polar and circular orbits are of great interest for exploring natural satellites such as Titania, the satellite of Uranus. From a nearly polar and circular orbit, the entire surface of the satellite can be observed as the satellite rotates. In this work we present several maps showing the lifetime of orbits that can be used by a probe about Titania. The asymmetry of the gravitational field due to Titania's coefficient C_{22} is considered, as well as its oblateness coefficient J_2 . The gravitational coefficients of Uranus are also analysed. We present lifetime maps to compare the effects caused by each perturbation, considering different values of the eccentricity of the orbit of the probe. Our results show that low-altitude near-circular orbits have longer lifetimes. The reason is the balance between the third body perturbation and Titania gravitational coefficients. The results also show that the values of ω and Ω are essential to increase the lifetime of the orbits.