# ORBITS AROUND IRREGULAR SHAPED BODIES USING POLYHEDRON METHOD FOR THE POTENTIAL

A. A. Silva(1), **O. C. Winter**(1,2), A. F. B. A. Prado(1)

(1) Instituto Nacional de Pesquisas Espaciais – INPE, (2) Grupo de Dinâmica Orbital & Planetologia – UNESP

The conventional spherical harmonic representation of the gravitational potential of non-spherical bodies requires expansions of high degree and order, which are difficult to obtain. The polyhedral method is well suited to evaluate the gravitational field of an irregularly shaped body such as asteroids, comet nucleus, and small planetary satellites. If complete coverage of the surface can be obtained, a polyhedral model of the body can be constructed. With a minimum effort, the method can incorporate important surface features, such as large craters and ridges. Several three-dimensional bodies will have their forms described through a certain number of tetrahedra. With the model constructed, the gravitational potential is determined and orbits around these bodies are obtained. The results consist of a number of trajectories for each one of the bodies constructed with different numbers of tetrahedra. The precision of the method is evaluated in agreement with the number of tetrahedra used to construct the body. It is also studied the behavior of a spacecraft (or field point) around regular and irregular bodies, using such method. The modeling of the bodies starts with a sphere, then a sequence of ellipsoids with range of different axes ratios. The aim of this work is to investigate the utility of the closed-form expressions derived for the potential of some homogeneous bodies with well-defined geometric shapes using a polyhedral method.