ASTRODYNAMICS SYMPOSIUM (C1)
Orbital Dynamics (2) (4)

Author: Prof. Alexandr Zlenko
Moscow , Russian Federation

THE INVESTIGATION OF MOTION IN ONE MODEL OF THE THREE-BODY PROBLEM

Abstract

It is considered the mathematical model of the translational-rotational motion of two viscoelastic spheres in the central gravitational field of the massive material point. Its mass is significantly greater than the mass of the first body. The mass of the second body is considerably less than the mass of the first one. The distance between the bodies is much more then their radii and is much less than the distance from their barycenter to the massive point. The bodies are homogeneous and isotropic. Their axes of rotation are perpendicular to the plane of the orbit. Their deformed state is described by the classical theory of elasticity for small deformations. The Celvin-Voigt model is taken as a model of viscous forces. The bodies are revolving around their barycenter on quasi-circular orbits. Their barycenter is moving also on the quasi-circular orbit around the massive point. The equation of motion are written in the form of Routh. The method of separation of motions and averaging in systems with infinite number of degrees of freedom was used for solving the equations of motions. The system of evolution equations was obtained. This mathematical model was used for investigating the tidal evolution of the Earth-Moon system in the field of attraction of the Sun on the cosmological time intervals. The system of evolution equations was numerically integrated several billion years into the past and into the future. This model gives us qualitatively results without including complex physical processes. The main conclusions of our model are supported by paleontological data, astronomical observations and other theories. For the first time it was presented the possible evolution of the rotational motion of the Moon. The stationary solutions of the evolution system were found and their stability was investigated. In stationary motion the two bodies are situated on one strait line with massive point and in their translational and rotational motion they are in resonance 1:1. That is why the stationary solutions are called the generalized points of libration like L1 and L2.