
The movement of the solid core in the cavity of a rotating non-spherical shell

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The article presents the analysis of the integrable cases of the restricted problem of translational-rotational motion of a rigid body (core) in the cavity of steady rotating gravitating non-spherical shell. Only the gravitational interaction of bodies is considered. The canonical equations of rotational motion in Euler variables and Andoyer variables were obtained. The cases of integrability of the restricted problem when the core is an axisymmetric rigid body are studied. In these cases solution of the problem is reduced to a simple quadrature reversal and can be represented in terms of elliptic functions. This research reveals new possibilities for the study of relationships of core and heavenly body mantle forced relative motions and variations of natural processes on the planets and satellites. Dynamic studies of the Earth mantle — liquid core — rigid core system are of great interest for the modern geodynamics.

Keywords: non-spherical rigid body, elliptic integrals, Andoyer variables, the mantle – core system, microgravity, interaction of blocks, Space Station blocks.

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