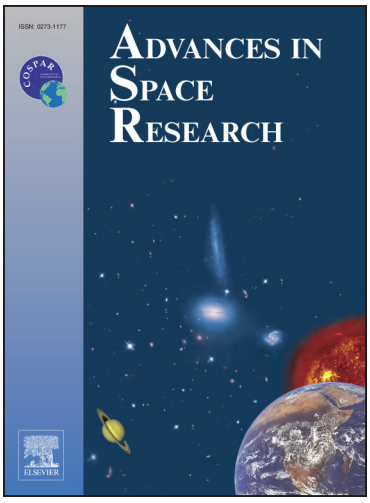


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# Roto-Orbital Dynamics of a Triaxial Rigid Body Around a Sphere. Relative Equilibria and Stability*

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## Abstract

We study the roto-orbital motion of a triaxial rigid body around a sphere, which is assumed to be much more massive than the triaxial body. The associated dynamics of this system, which consists of a normalized Hamiltonian with respect to the fast angles (partial averaging), is investigated making use of variables referred to the total angular momentum. The first order approximation of this model is integrable. We carry out the analysis of the relative equilibria, which hinges principally in the dihedral angle between the orbital and rotational planes and the ratio among the moments of inertia $\rho = (B - A)/(2C - B - A)$. In particular, the dynamics of the body frame, though formally given by the classical Euler equations, experiences changes of stability in the principal directions related to the roto-orbital coupling. When $\rho = 1/3$, we find a family of relative equilibria connected to the unstable equilibria of the free rigid body.

*Keywords:* Roto-orbital dynamics; relative equilibria; averaging

## List of symbols

| | |
|---|---|
| $a_i$ | Coefficients of the $M$-subsystem |
| $A$, $B$, $C$, | Principal moments of inertia |
| $\mathbf{A}$ | Rotation matrix relating vectors in the body $\mathcal{B}_1$ and inertial frames |

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