Attitude stabilization of a rigid spacecraft in the geomagnetic field

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An anylytical methods is proposed to study the attitude stablization of a triaxil spacecraft moving in a circular Keplerian orbit in the geomagnetic field. The method is developed on the basis of the electrodynamic effect of the influence of the Lorentz forces acting on the charged spacecraft's surface. We assume that the rigid spacecraft is equipped with an electrostaticalty charged protective shield, having an intrnisic magnetic moment is considered. The main element of this shield is an electrostaticalty charged screen surounding the protected volume of the spacecraft. The rotational motion the spacecraft about its center of mass due to torque from gravitational force, as well as Lorentz and magnetic forcees is investigated.

Possible equilibrium positions of the spacecraft in the orbital coordinate system is obtained. The necessary and sufficient conditions for the stability of the spacecraft's equlibrium positions is discussed using the constructed integral of the equations of motion. Numercial examples shows the influence of the Lorentz and magnetic forces on the stability of the equlibrium positions and on a small spacecraft's oscillations about that position.