

Goce Satellite Orbit - Simulation and Study

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In the 2007 year the first Earth Explorer Core mission; the Gravity Field and Steady - State Ocean Circulation Mission (GOCE) as a part of ESA's Living Planet Programme is planned. The Earth's gravity field will be measured by the gradiometer put into the satellite board. The selected orbit of this satellite is near circular, at the mean altitude 250 km. Our work contains the research of the simulated orbit of the GOCE satellite. For the orbital computations the Cowell numerical integration of the eighth order was used. The GOCE satellite orbit description includes the relative comparison of the various forces acting on the satellite. For the satellite motion determination the geopotential was described by means of the EGM96 model. Additionally, the satellite accelerations due to the atmospheric drag, the Moon gravity, the Sun gravity, the planet gravity, the solid Earth tides, the oceanic tides, the direct solar radiation pressure, the undirect (reflected) solar radiation pressure and the relativity were computed. Besides the reference satellite orbit (i.e. the orbit closed to the GOCE satellite planned orbit as much as possible), the various variants of the satellite orbit were obtained. The satellite motion in these orbital variants is affected or not affected by the chosen forces (for example by the direct solar radiation pressure and the undirect (reflected) solar radiation pressure) with respect to the satellite motion in the reference orbit. To obtain the influence of the chosen forces on the GOCE satellite orbit the comparison between the reference orbit and the mentioned variants of the orbit was performed. The results of this comparison are the differences between the satellite position in the reference orbit and in the disturbed reference orbit (i.e. in the given orbit variant). These differences are compared with the estimated errors of the GOCE satellite orbit determination. From this point of view some forces taking into account in the taken motion model of the GOCE satellite can be neglected.