

ABOUT THE DYNAMICS AND ROTATION OF THE ARTIFICIAL SATELLITES

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ABSTRACT. In the present work the results of the investigation of the unguided artificial objects which belong nowadays to Space Debris, have been considered.

The experience of the analysis of these results has proved that such objects may serve indicators in basic perturbing moment study. One of the methods of perturbation revealing is investigation of the objects orientation changes in space.

Key words: Artificial satellites

The analysis of the prolonged observations showed that the uncontrolled artificial satellites which are distinguished by their mass, size and shape can be a good indicator of different processes in the circumterrestrial cosmic space. Any such satellite "tries to please" disturbing moments. The latter are born by the asymmetry of the Earth's and the Moon's gravitational fields, the aerodynamic processes, the Earth's magnetic field, the pressure of the Solar radiation, the reaction of the inner mobile parts of the satellite. The difficulty in the solution of this problem is connected with the separation of these moments into individual components of the resultant interaction. Researches of the changing of the satellite rotation period around its own center of mass, and the Earth in the present case are insufficient.

The definition of the orientation character of one of main object's axes, and its changing are an important step to success. These affirmations are caused by our experiment. We determined the secular precession period, and the sector of the gong character. According to the theory, the triaxial satellite will be regularly precesses around the direction of the vector of the angular momentum in the gravitational field which acting with another field in resonance. The vector of the angular moment precesses around the perpendicular to the orbital plane.

The obtained data concerning the character of the secular precession allowed us to conclude about the mechanism of the influence of the main disturbings moments in their interaction to the satellite. For example,

the Moon's effect is clearly displaying on the rotation of the heavy satellites with the single stereometric shape. During the year seasonal changing of the rotation period has been noticed in light satellites especially of large diameters. The analysis of the orientation character of the satellite "Pageos" ($m = 56$ kg, $d = 32$ m, $H \approx 4000$ km), and the theoretical calculations of the action of the all possible disturbing moments concerning it have been carried out. The obtained data displayed that the interaction of two disturbings moments such as the magnetic moment, and the solar radiation pressure have been the cause of the seasonal changing of the rotation period of the present satellite. This interaction has a resonance character.

"Midas-4". From the results of the observations of the satellite "Midas-4" the orientation of this object was determined. It was found, that the rotation object is realied around lengthwise axis, which is directed to the center of the Earth. This axis carried out the forced nutation with angle $9^\circ - 12^\circ$. Period of the nutation vibrations with the period of proper rotation 1:3. During some years the period of the rotation changed from 105 sec to 135 sec. These results were compared with the Wolf numbers of the Solar activity. The period is increased with the Solar activity.

Rocket-bearer of "Cosmos-546". During one year the orientation of the object was investigated. Examination of the results showed that the body turned somersault.

Somersault axis penetrates the body at the angle 53° to the lengthwise axis and it is directed to the centre of the Earth's. As a results of the secular precession of the vector of angular momentum this axis is vibrating as to orbital plane with the $P \approx 28$ days and the angle $\approx 27^\circ$.

The method of the orientation definition of the uncontrolled satellites have been carried out at the Uzhgorod University. Results of the photometric, and positional observations for the Earth's artificial satellites are the base of the abovementioned methods. All the experimental data have been obtained at the Uzhgorod University.