Modeling and the forecast of inter-annual tidal irregularities of the Earth diurnal rotation

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Abstract

By methods of celestial mechanics on the base of dynamic Euler-Liouville's equations the mathematical model of the forced rotary motions of the deformable Earth, adequate to astrometry measurements of the International service of rotation of the Earth (IERS), has been constructed. This model takes into account the gravitational-tidal influence of the Sun and the Moon on the Earth [1], [2]. Authors have been established a fine resonant structure of interaction of long-periodic zonal tides (annual, semiannual, monthly, fortnight) with diurnal and semidiurnal tides. This essential property reliably proves to be true by the spectral analysis of IERS data. In the work the numerical modeling of tidal variations of axial rotation of the Earth has been fulfilled. The basic attention is given to the analysis of variations of duration of day ($l.o.d.\ (t)$) on short intervals of time with the periods one year and less (inter-annual variations) and to their forecast.

Interpolation and the forecast of amendment UT1-UTC where world time UT1 is connected directly to rotation of the Earth, and UTC - the world co-ordinate time corrected on an integer number of seconds are obtained approximately to correspond UT1. In comparison of the real and theoretically obtained trajectory of irregularities of tidal variations of angular velocity of rotations testifies to adequacy of the constructed model to the data of measurements of IERS.

For the first time the approached differential correlation model of variations of angular velocity of rotation of the Earth has been developed. An influence of harmonious and "painted" (color noise) casual gravitational-tidal oscillations caused by luni-solar perturbations on correlation characteristics of non-uniformity of rotation of the Earth has been investigated. Special scientific and practical interest is represented with the short-term "painted" oscillations of duration of day. The appropriate expressions for population means and correlation characteristics $l.o.d.\ (t)$ have been obtained. The carried out computing experiments by a method of statistical modeling confirm the basic properties of the obtained correlation model of inter-annual irregularities of rotation of the Earth.

References

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