MULTI-FREQUENCY ANALYSIS OF OSCILLATION-ROTATIONAL MOTION OF DEFORMABLE EARTH

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ABSTRACT. We have considered an extended theoretical model of the Earth's Pole oscillations in order to study the influence of terms with higher frequencies, based on six fundamental parameters of the model for the Earth's Pole oscillations of Akulenko et al. (2005); that model contains Chandler and annual components and an irregular slow drift (trend) of the average Earth's Pole. The generalization of the model has been realized on the base of celestial mechanical approaches with spectral analysis of the time series of the International Earth Rotation and Reference Systems Service (IERS). The identification of the model parameters has been carried out by the method of least squares.

A theoretical model for multi-frequency oscillation process of the Earth's Pole has been built. The generalization of the main mathematical model of Akulenko et al. (2005), which includes two frequencies (Chandler and annual), has been carried out with the help of celestial-mechanical approaches and oscillation theory methods. The influence of high-frequency actions - both regular (lunar) and irregular - that appears during maximal and minimal (extremal) deviations of the Pole trajectory (x_p, y_p) has been studied. The estimation of the amplitudes has been obtained and the explanation for a few high-frequency harmonics is given. The anomaly in the effects in the Pole motion during the beatings with six-year intervals has been investigated. The relations based on a model of oscillations with forced frequency of lunar-solar precession and parametric disturbances with double Chandler and combined frequencies used for the analysis of irregular motions of the Earth's Pole are presented.

A model based on celestial-mechanical for the irregularities in the rotation of a deformable Earth that fits IERS data adequately has been obtained.

The thin resonance structure of interaction between long-period zone tides (annual, semi-annual, monthly, fortnightly) and diurnal and semi-diurnal ones has been adjusted. This appreciable property is confirmed reliably by spectral analysis of IERS measurements data. The numerical simulation of tidal irregularities of the Earth's axis of rotation has been carried out. The analysis of variations of the length of the day (l.o.d.) on short time intervals with one-year period and less (inter-annual oscillations) and their forecast have been presented. The data set of the differences between the interpolation/forecast and UT1-UTC according to obtained mathematical model has been provided.

REFERENCES

Akulenko L.D., Kumakshev S.A., Markov Yu.G., Rykhlova L.V., 2005, "Gravitational-tidal mechanism of the Earth Pole oscillations", Astronomical Journal, vol. 82, No. 10, pp. 950–960.