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Accounting for non-stationary effects in the model of the Earth's pole motion

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Nowadays the problem of constructing a model of the Earth pole motion is relevant both in theoretical and in applied aspects. The main difficulty of accurately describing the Earth pole motion is that it has non-stationary perturbations leading to the changes in both the average parameters of its motion and the motion as a whole.

The main process of the Earth pole coordinates fluctuations is the sum of the quasi periodic Chandler component and annual one. The approximation of the Earth pole motion is generally accepted to be a few parametric two-frequency model with constant coefficients. Relatively slow changes in the parameters of the Chandler and annual components make it possible to use this approximation in the time intervals of 6–7 years, that is, during the period of the Chandler and annual components modulation. This model has low algorithmic complexity and describes the main process of pole oscillations with acceptable accuracy.

However, due to the non-stationary perturbations there are effects in the Chandler and annual components that are not typical for a simple dynamical system that is described by linear differential equations with constant coefficients. Such changes can also be observed in the dissipative systems with not only with the amplitude variations but also when oscillation process is in steady-state condition [1].

In this work the effect of changing in the Earth pole oscillatory mode is revealed, which consists in a jump-like shift in the average frequency of the pole around the midpoint (the motion of the Earth pole midpoint is a pole trend of a long-period and secular nature), which leads to a change in the average speed of its motion.

A method is proposed to determine the moment when the average frequency is shifted, which is important for refining the forecast model of the Earth pole motion. Using this method a modified model of pole motion is developed and the dynamic effects in its motion are considered, caused by the change in the amplitudes ratio of the Chandler and annual harmonics.

References

[1] Barkin M.Yu., Krylov S.S., Perepelkin V.V. Modeling and analysis of the Earth pole motion with nonstationary perturbations. IOP Conf. Series: Journal of Physics: Conf. Series 1301 (2019) 012005; doi:10.1088/1742-6596/1301/1/012005