Analysis of the Chandler wobble of the Earth

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We study the Chandler wobble (ChW) of the pole, using such methods for its extraction as singular spectrum analysis, Panteleev filtering, and least-squares collocation. The moving least-squares filter (MLSF) [1] shows, that ChW has average period of 433 days and phase jump over π in 1930-th. The ChW amplitude is not stable and strikingly decreased in 1930-th and the 2010-th. The ChW envelope model contains 83- and 42-year quasi-periodicities. Based on the Euler-Liouville equations we solved the inverse problem of chandler input excitation reconstruction [2]. The excitation envelope was found to have 20-year variations.

The analysis of the modulated signal with 433-day carrier frequency in a sliding window demonstrates the specific effect, we called the "Escargot effect". Its nature is the following: when extracted on a secular period (150 year), the ChW oscillation is purely prograde, and its spectrum pike is splitted, reflecting the 40-year modulation; but, when extracted in a sliding window at the instantaneous chandler frequency, a retrograde component with a 20-year envelope appears, reflecting the change of ellipticity parameters.

Chandler excitation envelope and amplitude of instantaneous retrograde component of ChW look to be similar. The explanation was found through consideration of the Euler-Liouville equation.

Besides global geodynamics, ChW modelling is important for polar motion prediction and its application and answering the question: are the climate changes on Earth and its rotation parameters interrelated [3]?

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Literature

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