Nonlin. Processes Geophys. Discuss.,
https://doi.org/10.5194/npg-2019-12-RC2, 2019

Nonlinear Processes in Geophysics
Discussions
Open Access
EGU

Interactive comment on "On the nonlinear and Solar-forced nature of the Chandler wobble in the Earth's pole motion" *by* Dmitry M. Sonechkin et al.

Christian Bizouard (Referee)

christian.bizouard@obspm.fr

Received and published: 29 May 2019

At contemporaneous time scales (below 100 years) the non-linear terms commonly removed in Liouville equation cause negligible effects below 10 micro-arc-seconds, that cannot have any observable impact on the Chandler wobble. This conclusion can be easily reached by comparing numerical solutions of linear and non-linear Liouville equations written for an Earth composed of a quasi-elastic mantle and hydrostatic oceans, and undergoing the hydro-atmospheric mass redistribution and luni-solar torque. Therefore I am very skeptical on the search for non-linear effects on polar motion over periods shorter than 100 years. The key point of the non-linear effect that the author wants to evidence is the perturbation of first order formalized by Eq. 7. But this perturbation remains undefined, not quantified in function of the input forcing. Whereas

Printer-friendly version

Discussion paper

the author try to explain the splitting of the Chandler band in a few harmonics through the influence of luni-solar tides, it does not prove anyhow to which extent this one can really excite the Chandler wobble, in this regard the Eq. (8) is totally esoteric. One of the most interesting aspect of the development given by the authors is the prediction of a free mode at frequency $3\Omega_{eu}$, where Ω_{eu} is, I guess, the Chandler frequency for a real Earth (many notations are not properly defined throughout this paper). This would imply a signal at 433/3 144 days in polar motion.

Furthermore the second part of the paper, investing possible link between Chandler wobble variability and solar activity, is quite decoupled from the first part of the paper. Moreover, the fact of eliminating three solar cycles for obtaining linear correlation with the amplitude of the period of the Chandler wobble is very questionable.

In conclusion I consider that the author has not proved anyhow that the Chandler wobbles results from “non-linear solar-forced” processes. Both mathematical developments and observational analysis are not convincing or not enough deepened.

Interactive comment on Nonlin. Processes Geophys. Discuss., https://doi.org/10.5194/npg-2019-12, 2019.

Printer-friendly version

Discussion paper