Geophysical Research Abstracts,
Vol. 10, EGU2008-A-12305, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-12305
EGU General Assembly 2008

System dynamics of polar motion (POM) and length-of-day (LOD) variation

E. Grafarend

Department of Geodesy, Universität Stuttgart, Geschwister-Scholl-Str. 24/D, 70174 Stuttgart, Germany (Email: grafarend@gis.uni-stuttgart.de/Fax: +49 711 685-83285)

In the context of system dynamics the differential equations which govern polar motion (POM) and length-of-day (LOD) variation are derived. Here we assume that the underlying Earth model is a viscoelastic body generalizing a special model of M. Schneider (1999) in terms of the Liouville perturbation theory of the dynamical Euler equations of angular momentum.

We use a rotating, deformable body in a quasi-body fixed frame of reference. In detail, we derive the phase equations for polar motion (POM) equations in a time domain interpreted as a system of coupled integro-differential equations of first order of evolution type. An equivalent system of integro-differential equations of second order is derived proving that the rotating body can be seen as an excited, elliptic harmonic oscillator.

In contrast, we are analyzing the phase equations of length-of-day (LOD) variational equations in the time domain and prove the system equation is an integro-differential type of first order. An equivalent system of an integro-differential equation is derived and can be easily integrated: LOD variations can be described as an excited, damped unharmonic (non-periodic) motion.

DOD is producing a stable attractor in viscoelastic modeling.