



## True secular wander of a triaxial Earth

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**ABSTRACT:** Secular polar motion has been discovered for about half a century but its mechanism has not been provided till now. Although post glacial rebound and tectonic cryophilic angular momentum can drive Earth's pole to a trend, it has been pointed out that the force can only supply 10 to 20% of the order of energy for pole wander. Earth's pole wanders with angular velocity about  $3.2\sim 3.5$  mas/yr in direction  $77.1^\circ\text{W}$ . The average equatorial dynamical ellipticity is obtained as  $H_{Eq}=(B-A)/C=2.196\times 10^{-5}$  from the relative difference of equatorial inertia momenta  $A$  and  $B$ . Although the amount is 1/150 times tiny than that of the polar dynamical ellipticity, the differences between the major and the minor equatorial inertia momentums of triaxial ellipsoid of inertia momentum may cause Earth's minimum inertia momentum axis wobbling as additional free wobble of period about 14.6 yr modulating upon the Chandler wobble. In this study, we deduce that the unstable solution of Euler rotation equations about the axis of medium inertia momentum as secular wander components along axes  $B$  and  $A$ . Amplitude analysis shows that the secular torsions upon the main equatorial inertia axis may supply almost all the energy order of the wander. Using the known average additional dynamical ellipticity  $H_{Eq}$  the secular wander may be obtained as angular velocity components as 2.21 mas/yr along axes  $B'$  and  $A$ , respectively. The combined true secular wander of velocity 3.12 mas/yr in direction about  $60^\circ\text{W}$  is only a little different to the observation. By consideration of pear-shaped rotation, the velocity and the direction may be exactly the same as observed.