Solid pole tide in global GPS and superconducting gravimeter observations: signal retrieval and inference for mantle anelasticity

Benjamin F Chao*[1] and Hao Ding[2]

[1]Inst. Earth Sciences, Academia Sinica, Taiwan – Taiwan
[2]Wuhan University, China – China

Abstract

The mantle anelasticity plays an important role in Earth's interior dynamics. Here we seek to determine the lower mantle anelasticity through the solution of the complex Love numbers at the Chandler wobble period. The Love numbers $h21$, $l21$, $\delta 21$ and $k21$ are obtained in the frequency domain by dividing off the observed polar motion, or more specifically the pole tide potential, from the observed GPS 3-D deformation and SG gravity variation. The latter signals are obtained through the array processing method of OSE (optimal sequence estimation) that results in greatly enhanced SNRs from global array data. The resultant Love number estimates $h21$=0.6248–0.013i, $l21$=0.0904–0.0008i, $\delta 21$=1.156–0.003i and $k21$=0.3125–0.0069i are thus well-constrained in comparison to past estimates that vary considerably. They further lead to estimates of the corresponding mantle anelastic parameters *fr* and *fi*, which in turn determines, under the single-absorption band assumption, the dispersion exponent of $\alpha = 0.21 \pm 0.02$ with respect to the reference frequency of 5 mHz. We believe our estimate is robust and hence can better constrain the mantle anelasticity and attenuation models of the Earth interior.

*Speaker