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DECADAL VARIATIONS IN THE EARTH'S SHAPE FROM SLR AND GRACE

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For over three decades, Satellite laser ranging (SLR) has recorded the global nature of the long-term and long-wavelength climate induced hydrological mass redistribution within the Earth system, which results in significant variations in the Earth's shape and gravity field. The Earth's shape (geoid) can be approximately represented by a triaxial ellipsoid defined by six parameters, including the polar (or the dynamic oblateness) and equatorial flattering (or equatorial ellipticity, b) and the orientation (e) of the equatorial principal axis. Those fundamental parameters can be determined by the degree-2 Stokes coefficients C20, C22 and S22. Study the variations in the gravity coefficients can improve our understanding of the long and short-term climate forcing on the Earth system. Analysis of satellite Laser ranging and data over four decades has shown that significant quadratic variation and decadal variations in the Earth's dynamic oblateness (characterized by geo-potential zonal coefficients, C20) are well correlates with the short and decadal tropical variability characterized by the El Niño-Southern Oscillation Index. The quadratic variation is combination of a GIA-induced linear decrease and a slowly increasing rate due to global mass redistribution associated with the melting of the glaciers and ice sheets. Earth's equator is flattering with a rate of 0.014 mm/year and a significant drift of the equatorial principal axis shifted from westward to eastward during ~2000 based on the 35 year SLR and 15 year GRACE data. Those variations are results of both the on-going global isostatic adjustment (GIA) following the last ice age and climate-induced mass transport as well as the changes in the dynamic pressure loading on the core-mantle boundary (CMB). Detail analysis will be presented.

BIOGRAPHY

Minkang Cheng did his PhD in Aerospace Engineering, University of Texas at Austin, USA in August 1988. He has Research experience in satellite dynamics and geodesy for gravity and earth rotation. He published his papers recently entitled as "Decadal variation in Earth's oblateness (J2) from satellite laser ranging data" in *Geophysical Journal International*; "The unexpected signal in GRACE estimates of C20" in Journal of Geodesy and "Deceleration in the Earth's oblateness" in *Journal of Geophysical Research*.

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