

Earth Oblateness Variations: Unraveling Glacial Melting, Ocean Mass Redistribution and Post-Glacial Rebound Effects

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*Abstract*

Earth's dynamic oblateness ( $J_2$ ) has been decreasing due to post-glacial rebound (PGR). However,  $J_2$  began to increase in 1997, indicating a pronounced global-scale mass redistribution within the Earth system. We have determined that the observed increases in  $J_2$  are caused primarily by a recent surge in sub-polar glacial melting, and mass shifts in the Southern, Pacific and Indian Oceans. When these effects are removed the residual trend in  $J_2$  ( $-2.9 \times 10^{-11} \text{ year}^{-1}$ ) becomes consistent with previous estimates of PGR from satellite and eclipse data. Results from Dickey et al. (*Science*, 12/6/2002) will be augmented by our recent work.

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