Geophysical Research Abstracts, Vol. 7, 10147, 2005
SRef-ID: 1607-7962/gra/EGU05-A-10147

The Rotational Stability of an Ice Age Earth

J.X. Mitrovica (1), J. Wahr (2), I. Matsuyama (3), A. Paulson (2)

(1) Department of Physics, University of Toronto, 60 St George Street, Toronto, Canada M5S 1A7 (jxm@physics.utoronto.ca); (2) Department of Physics, Campus Box 390, University of Colorado, Boulder, CO, USA 80309; (3) Department of Astronomy & Astrophysics, University of Toronto, 60 St George Street, Toronto, Canada M5S 3H8

Predictions of glaciation-induced changes in the Earth's rotation vector exhibit sensitivities to Earth structure that are unique within the suite of long-wavelength observables associated with glacial isostatic adjustment (henceforth GIA) and, despite nearly a quarter of a century of research, these sensitivities remain enigmatic. Previous predictions of present-day true polar wander (TPW) speed driven by GIA have indicated, for example, a strong sensitivity to variations in the thickness of the elastic lithosphere and the treatment (phase or chemical?) of the density discontinuity at 670˜km depth. We revisit these issues using a new treatment of the linearized Euler equations governing load-induced rotation perturbations on viscoelastic Earth models. TPW calculations based upon our revised theory resolve the previously described sensitivities and highlight inaccuracies in predictions based on earlier formulations. We complete the talk by describing the impact of rotational effects on predictions of present day rates of change of the geoid (sea surface); these results have implications for analyses of ongoing satellite (e.g., GRACE) missions and geodetic GPS surveys.