

MANTLE VISCOSITY, J_2 , AND THE NONTIDAL ACCELERATION
OF EARTH ROTATION

W.R. Peltier
Department of Physics
University of Toronto
Toronto, Ontario, Canada M5S 1A7

Recent interpretations of laser ranging data for the LAGEOS satellite have rather conclusively established that the observed acceleration in the node of its orbit is just that expected to exist as a residual effect of the last deglaciation event which ended about 6000 years ago. The nontidal acceleration of rotation would be rather different than that observed if there were any significant melting of high latitude continental ice masses currently ongoing. The sensitivity of the expected nontidal acceleration to variations of several elements of the radial viscoelastic structure of the planet is explored using a new normal mode method for the computation of viscoelastic relaxation spectra. These calculations establish that the most important sensitivity is to variations in the mantle viscosity profile. Although the predicted nontidal acceleration does depend upon lithospheric thickness and on the elastic component of the radial structure, the dependence on these components of the structure is much weaker than it is upon mantle viscosity. The observed J_2 is therefore a particularly useful determinant of radial variations in the latter parameter.