# FREQUENCY-DEPENDENT Q & $\delta k_2$ CONSISTENT WITH MANTLE LATERAL HETEROGENEITY AND CREEP MECHANICS

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High pressure and temperature experiments indicate that the possible modes of microscale creep throughout Earth's mantle are richly diverse *[Wright, Price & Poirier 1992]*. Recent oscillatory torsion experiments at 300 MPa and 1000'C with Aheim dunite *[Jackson, Paterson & Fitzgerald 1992]* indicate that dislocation motions within olivine grains are responsible for a dispersion in shear modulus $\delta\mu \equiv \mu(\omega_a) - \mu(\omega_o) / \mu(\omega_o)$ that exceeds 4% between $\omega_o$= 2 to $\omega_a$= 0062 Hz. Tidal observations between $10^{-4}$ and $10^{-6}$ Hz indicate that the mantle's modulus dispersion is much smaller, probably below 1 % *[Robertson, Ray & Carter 1994]*. Past theological models of $\delta\mu$ are constructed from superpositions of I-D viscoelastic spring-dashpot analogues. They produce simple, but rather restrictive, power-law dependencies for Q and $\delta\mu$ at tidal frequency. We propose a viable alternative parameterization that is rooted in tomographic imaging of the deep mantle and the Arrhenius law governing all high temperature creep mechanisms. The alternative model predicts tidal $\delta k_2(\omega)$ that is consistent with current observational constraints between $M_2$ and 18.6 yr periods. The model has a long-term viscosity of $10^{21}$ Pa s.

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