

## **EART162: Equations You Should Know (in addition to high school physics)**

### **Gravity**

Grav. Force  $F = G \frac{m_1 m_2}{r^2}$

Centripetal force  $F = mr\omega^2$

Uniform sphere  $I = 0.4MR^2$

Gravity formula  $\Delta g = 2\pi G \Delta \rho h$   
(42 mGal / km g cc<sup>-1</sup>)

Grav. potential  $U = -G \frac{m}{r}$

Moment of inertia  $I = \Sigma mr^2 = \int r^2 dm$

MoI difference  $J_2 = \frac{C - A}{MR^2}$

Attenuation factor = exp (-kz)

### **Elasticity and Equations of State**

Stress =  $F/A$  Strain =  $\Delta L/L$

Hooke's law  $\sigma = E\varepsilon$

Definition of Poisson's ratio  $\nu$

Bulk modulus  $\frac{d\rho}{\rho} = \frac{dP}{K}$

Hydrostatic assumption  $dP = \rho g dz$

### **Viscosity**

Viscosity definition  $\sigma = \mu \dot{\varepsilon}$

Flow law  $\dot{\varepsilon} = A g_s^{-p} \sigma^n \exp(-Q/RT)$

### **Flexure**

Flexural rigidity  $D = \frac{ET_e^3}{12(1-\nu^2)}$

Flexural parameter  $\alpha = \left( \frac{4D}{(\rho_m - \rho_w)g} \right)^{1/4}$

Flexural equation  $D \frac{d^4 w}{dx^4} + (\rho_m - \rho_w)gw = q(x)$