Conservation of mass

$$\frac{d}{dt}\int_V \rho dV = -\int_A \rho \mathbf{u}\cdot\mathbf{n} dA$$

$$\frac{\partial \rho}{\partial t} + \nabla\cdot(\rho\mathbf{u}) = 0$$

$$\frac{1}{\rho}\frac{D\rho}{Dt} + \nabla\cdot\mathbf{u} = 0$$

$$\rho = \rho(p, T, \text{composition})$$

- $\alpha \equiv -\frac{1}{\rho}\left(\frac{\partial \rho}{\partial T}\right)_p$
- $\kappa_T \equiv \frac{1}{\rho}\left(\frac{\partial \rho}{\partial p}\right)_T$