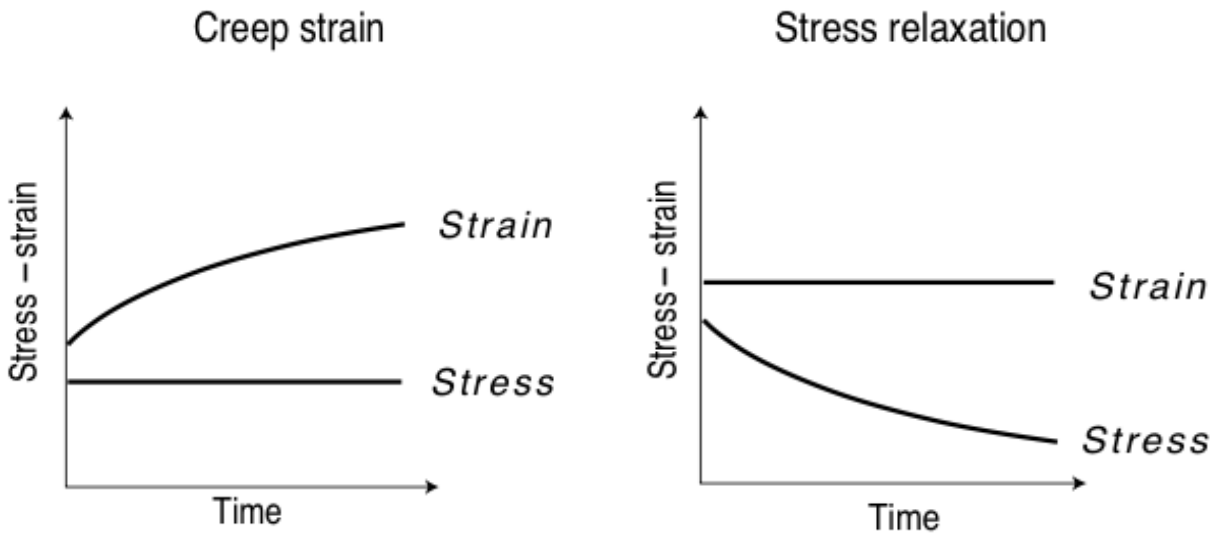
Poroelasticity

Other viscous effects



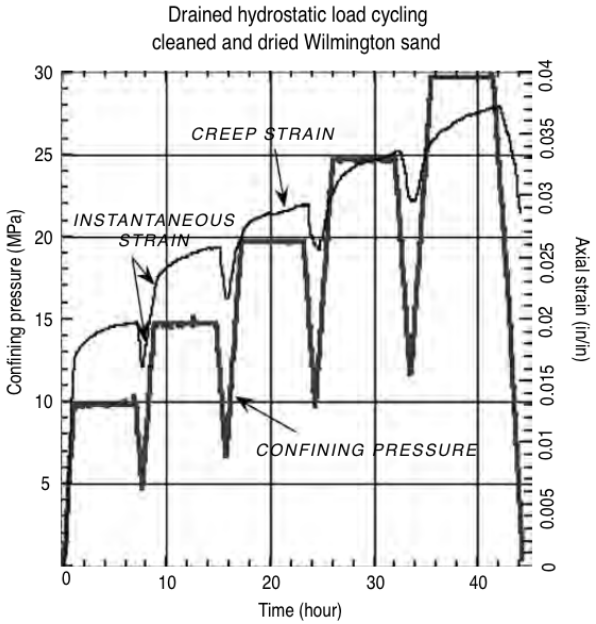
 Zoback, *Reservoir Geomechanics* (Fig. 3.10c,d, pp. 75)

Constitutive model for creep

Power law

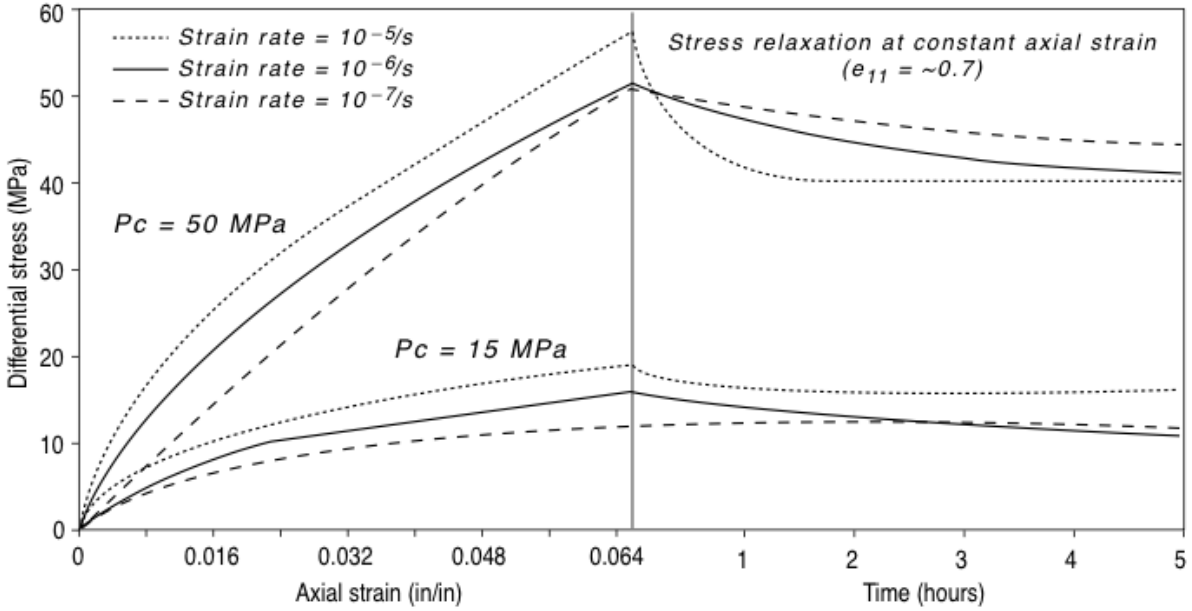
$$\varepsilon(t) = \varepsilon_0 + ct^n$$

Creep



 Zoback, *Reservoir Geomechanics* (Fig. 3.8, pp. 73a)

Stress relaxation



 Zoback, *Reservoir Geomechanics* (Fig. 3.11b, pp. 77)

Thermoporoelasticity

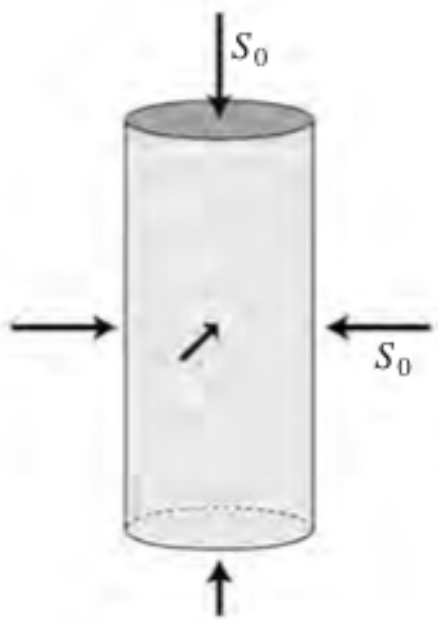
$$\boldsymbol{\sigma} = \mathbf{S} - \alpha P_p \mathbf{I} - K\alpha_T \Delta T \mathbf{I}$$

α_T is coefficient of thermal expansion/(contraction)

Rock failure

Types of tests on rocks

Hydrostatic compression

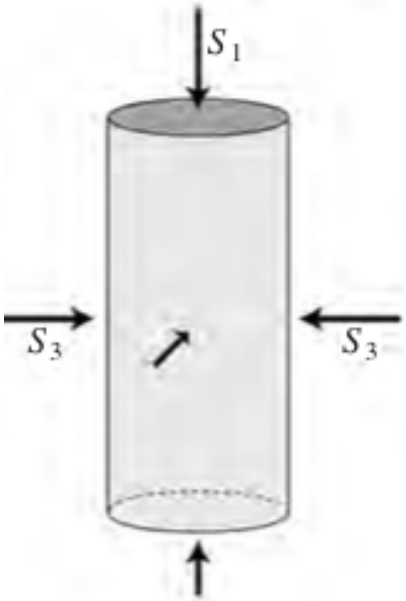


$$S_0 = S_1 = S_2 = S_3$$

Uniaxial compression

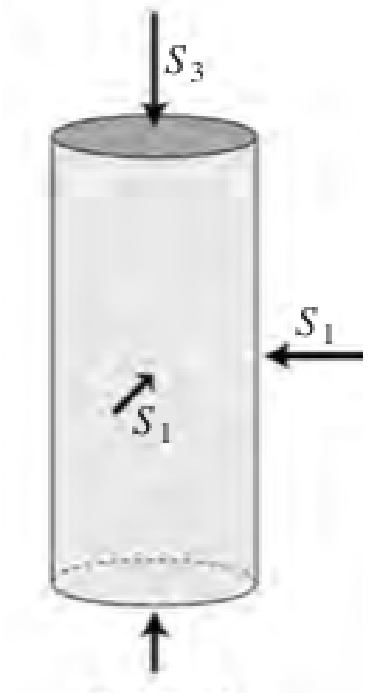
$$S_0 \neq 0 \quad S_2 = S_3 = 0$$

Triaxial compression



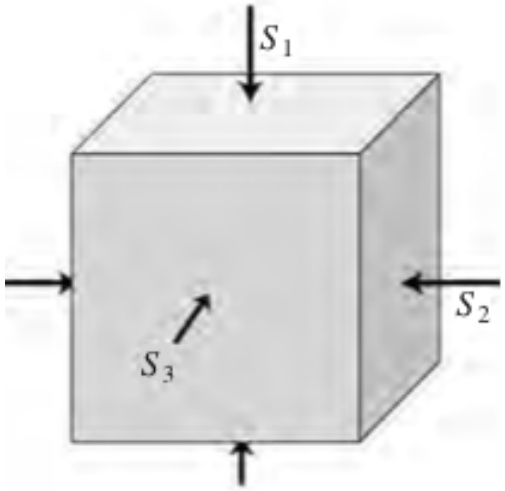
$$S_1 > S_2 = S_3$$

Triaxial extension



$$S_1 = S_2 > S_3$$

True triaxial



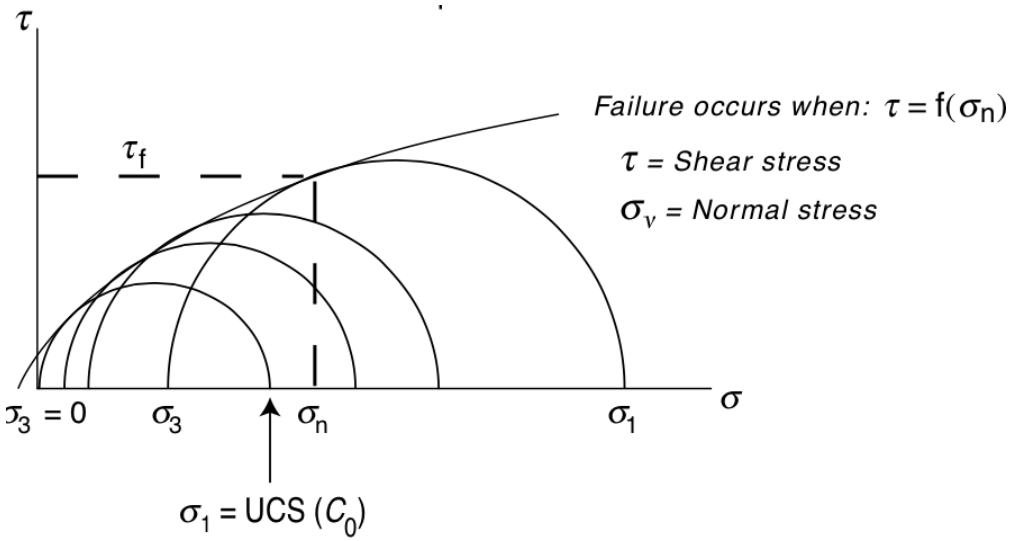
$$S_1 \neq S_2 \neq S_3$$

Mohr's circles

$$\tau_f = \frac{1}{2}(\sigma_1 - \sigma_3)\sin(2\beta)$$

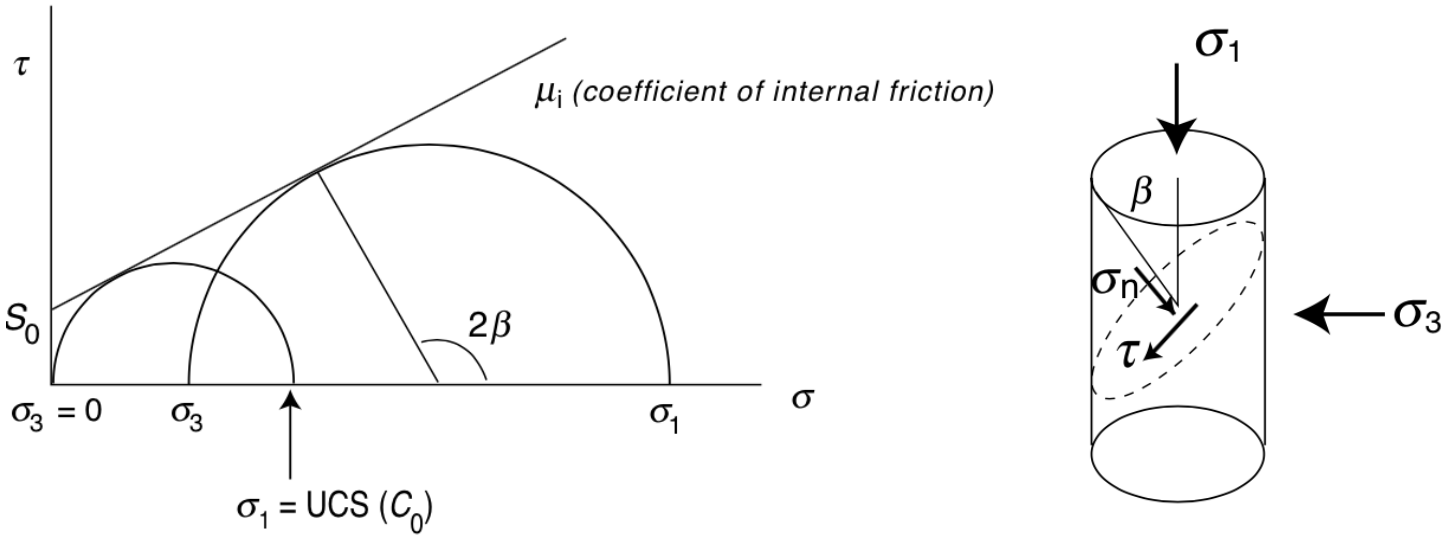
$$\sigma_n = \frac{1}{2}(\sigma + \sigma_3) + \frac{1}{2}(\sigma_1 - \sigma_3)\cos(2\beta)$$

Mohr Envelope



 Zoback, *Reservoir Geomechanics* (Fig. 4.2b, pp. 88)

Linearized Mohr Envelope

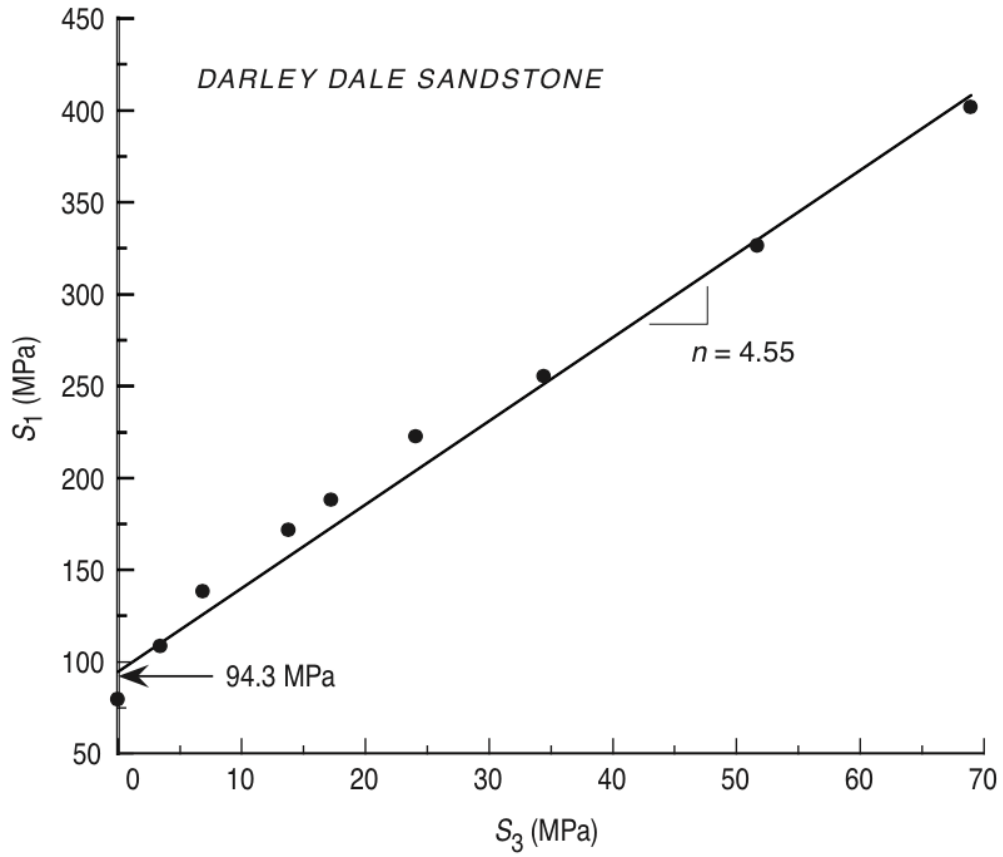


Mohr-Coulomb failure

$$\tau = S_0 + \sigma_n \mu_i$$

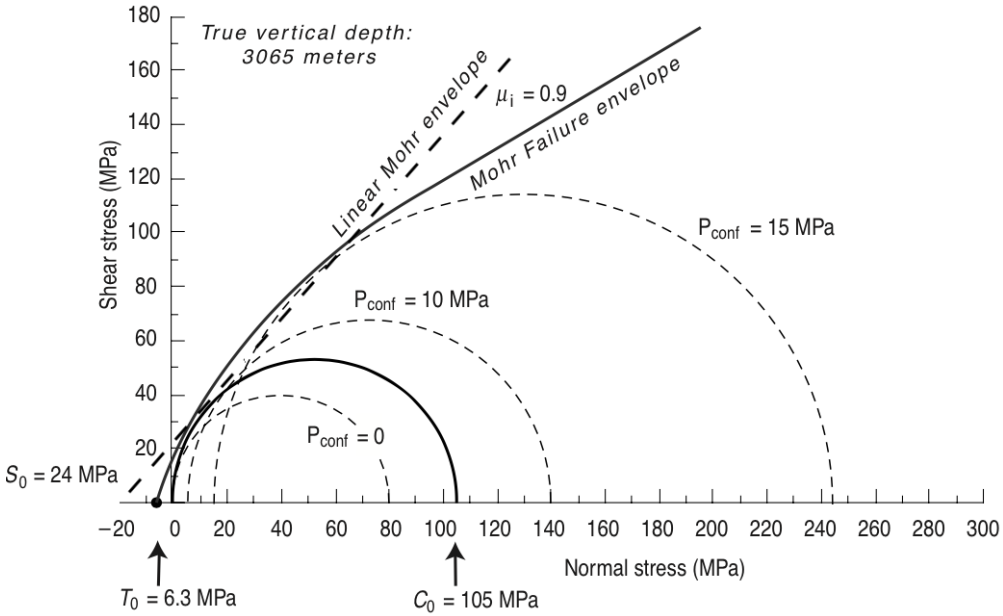
$$C_0 = 2S_0 \left(\sqrt{\mu_i^2 + 1} + \mu_i \right)$$

Triaxial tests on sandstone



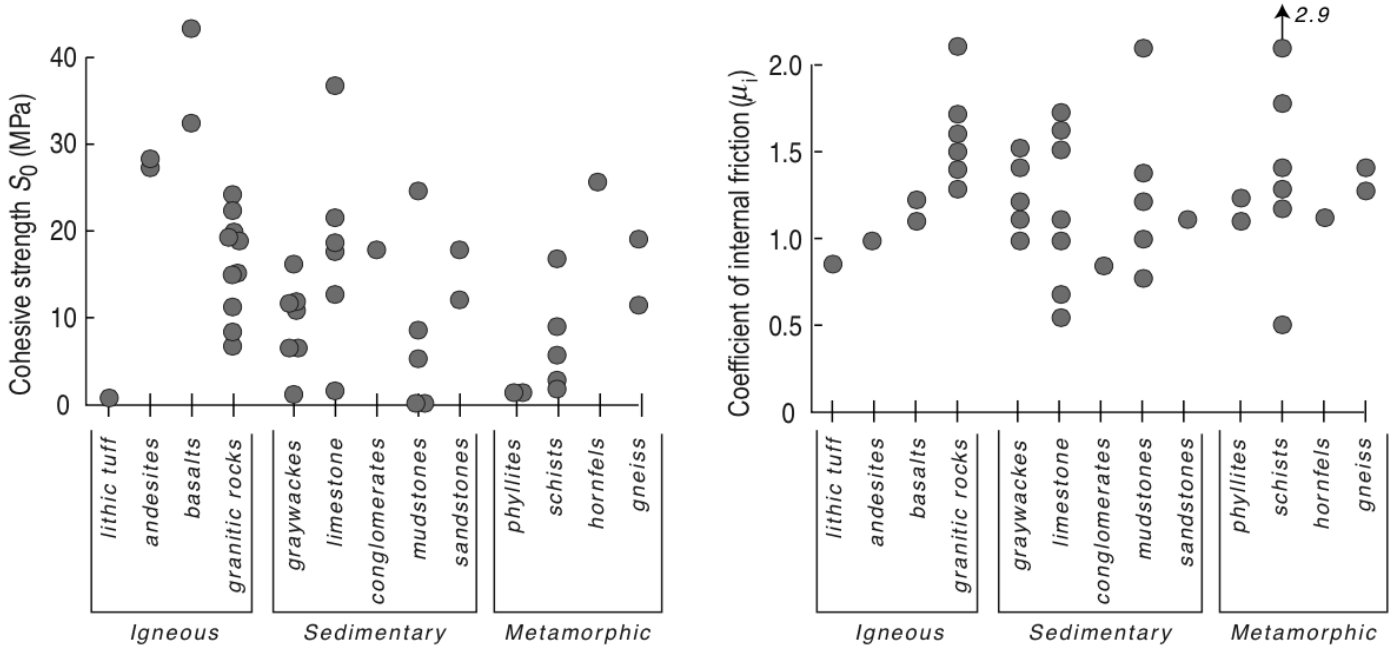
$$\mu_i = \frac{n-1}{2\sqrt{n}}$$

Mohr Envelope for Sandstone

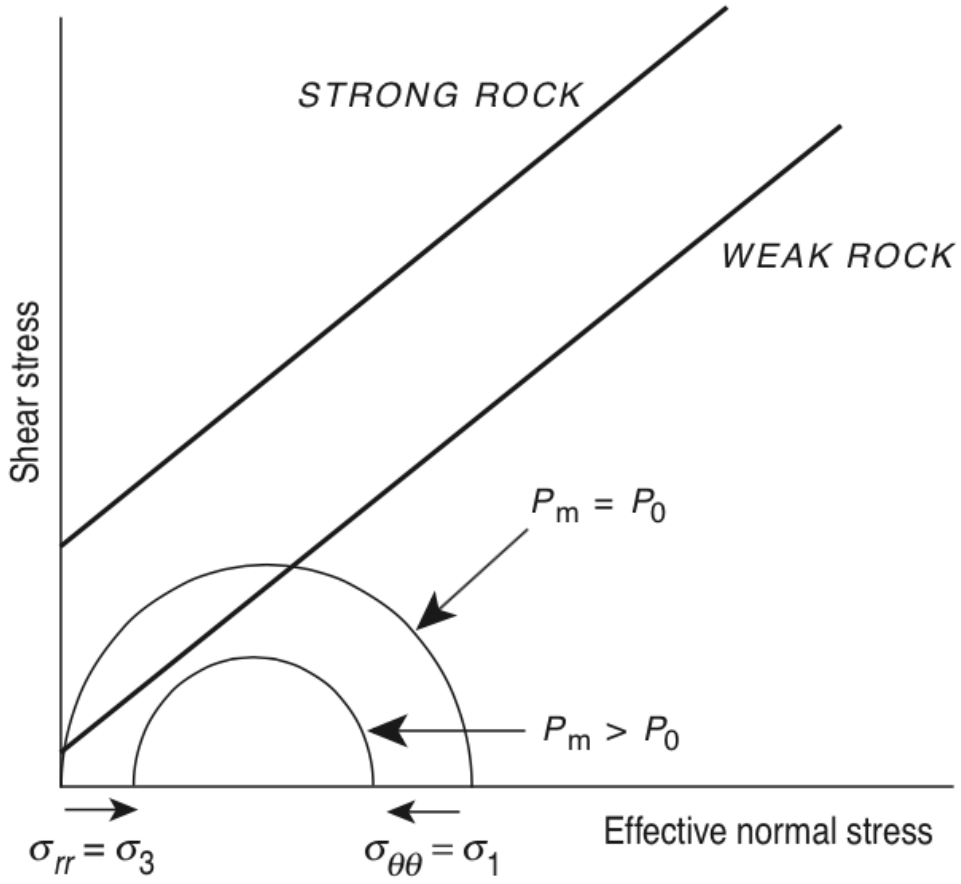


 Zoback, *Reservoir Geomechanics* (Fig. 4.3a, pp. 88)

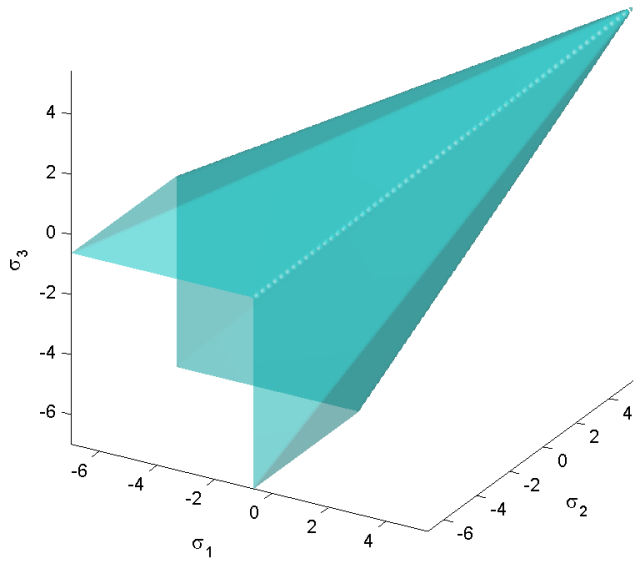
Cohesion and internal friction data



Cohesion and internal friction data

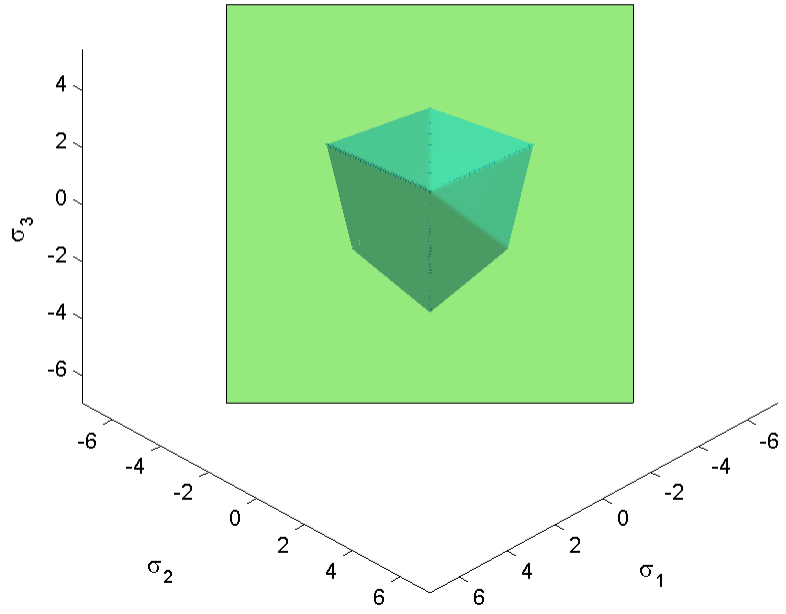


Yield surface



Mohr Coulomb Yield Surface 3Da. Licensed under CC BY-SA 3.0 via Wikipedia

π-plane



Mohr Coulomb Yield Surface 3Db. Licensed under CC BY-SA 3.0 via Wikipedia