Flow in porous media

thanks to Rosemary Knight

Flow in Porous Media

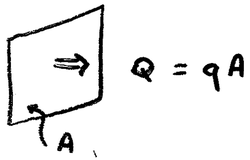
Permeability:

- ease of fluid flow in porous media
- measure of connectivity of pore space

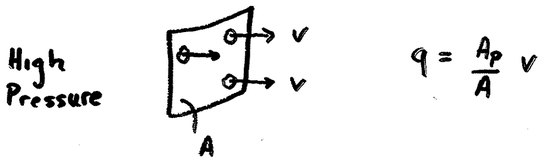
Definitions

Q - rate of volume flow/ unit time (m^3/s)

$q = Q/A$ - rate of volume flow/ unit area and time (m/s)



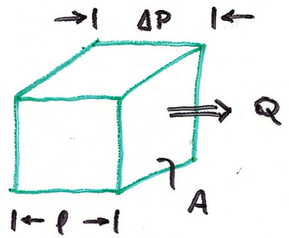
$Q = qA$



$q = \frac{A_p}{A} v$

Flow is usually driven by pressure differences

Experiments



$$Q \propto \frac{A}{\eta}\frac{\Delta P}{l}$$

η is viscosity of fluid

Let

$$Q = -k\frac{A}{\eta}\frac{\Delta P}{l}$$

where k is the permeability (units m^2)

Darcy's Law

$$q = \frac{Q}{A} = -\frac{k}{\eta}\frac{\partial P}{\partial x}$$

1 darcy = 0.97×10^{-12} m^2