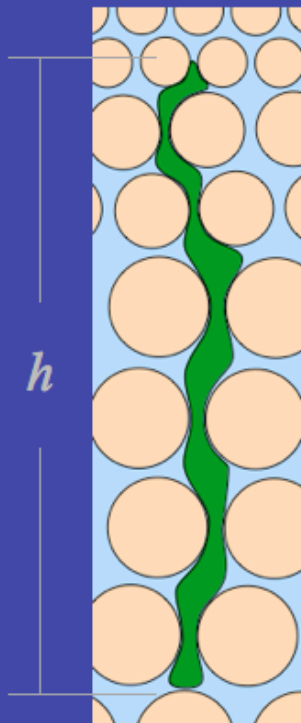


Buoyancy, seals, and the upward migration of petroleum, Part I

Petroleum is commonly found in porous sedimentary rocks to which it appears to have migrated through Earth's subsurface regions. Its migration upward has been stopped by less porous and/or permeable rocks that act as a "seal" trapping the petroleum. The upward migration of petroleum through the water-filled pores of sedimentary rocks is driven by its buoyancy, because most petroleum is less dense than water. Its upward migration is

limited by the resistance of pores into which it would flow, or in other words by the capillary pressure needed for it to enter those pores. Part I of this series considers controls on buoyancy, Part II considers controls on capillary resistance, and Part III portrays the resulting behavior of migrating or trapped petroleum.

Upward migration of petroleum through water-filled pores of sedimentary rocks is driven by the "Buoyancy Force":



ρ_w = density of water (~1.01-1.10)

ρ_p = density of petroleum
(~0.7-0.8 for oil)

$$\text{Buoyancy Force} = h \cdot g \cdot (\rho_w - \rho_p)$$

h = vertical extent (height)
of the petroleum column

$h = H = z_o = Y$ in other presentations

~ 0.3 for oil (see above)

g = gravitational acceleration