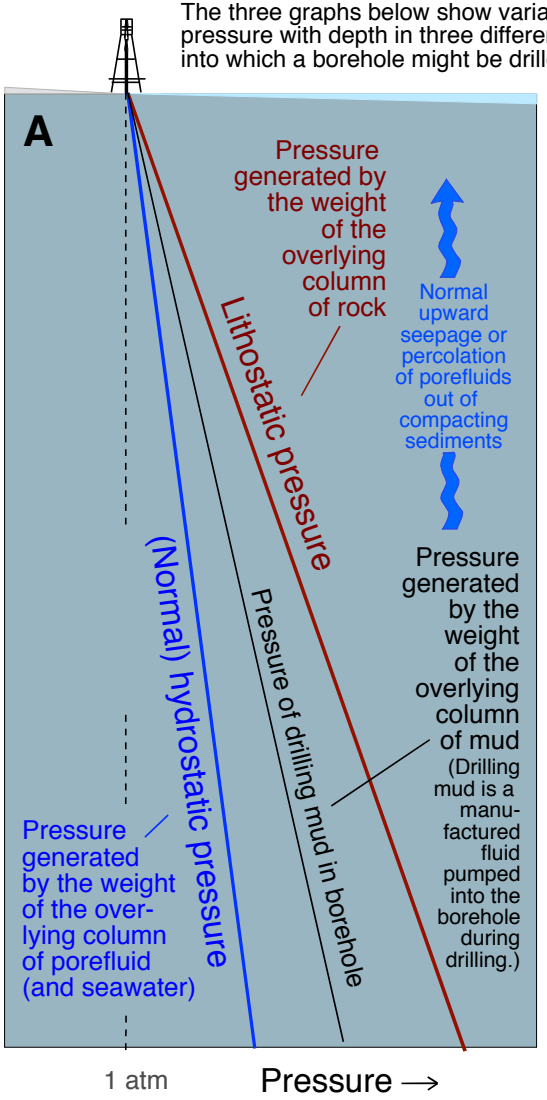
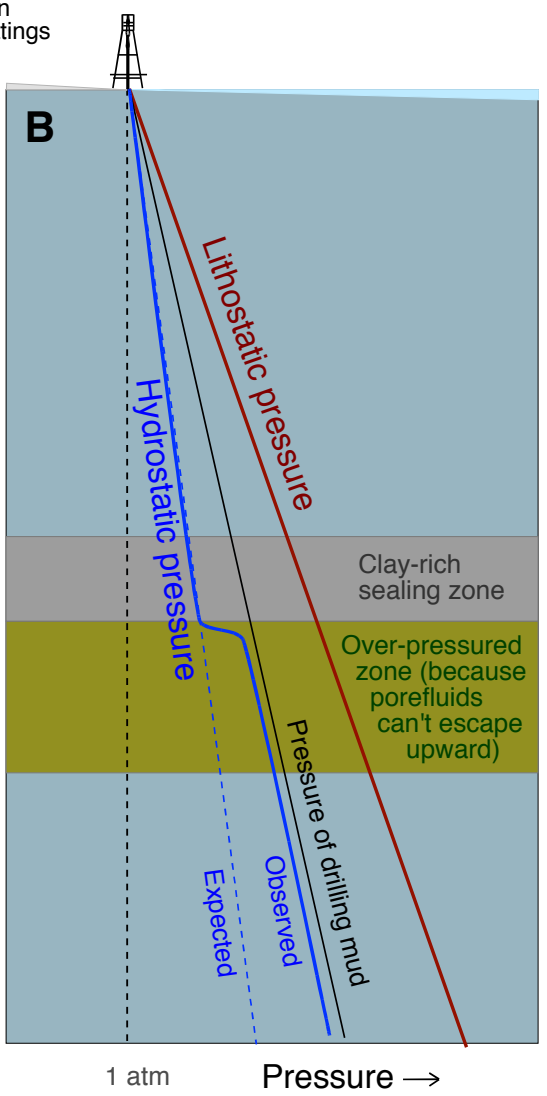
Subsurface pressure and overpressure

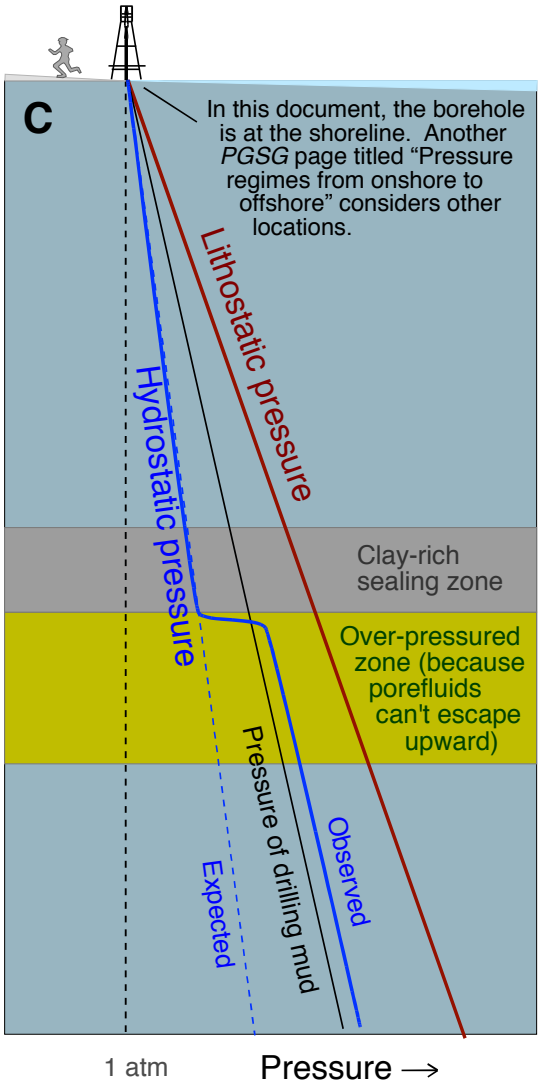
The three graphs below show variation in pressure with depth in three different settings into which a borehole might be drilled.



In Case A, hopefully the normal condition, the density of the drilling mud causes pressure of the mud sufficient to keep subsurface pore-fluids from entering the borehole, but not so large as to fracture the surrounding rock.



In Case B, pore-fluid pressure in the overpressured zone exceeds that predicted simply from the weight of the porewater column, but it does not exceed the pressure of the drilling mud in the borehole. Thus subsurface fluids do not enter the borehole.



In Case C, subsurface pressure exceeds that predicted simply from the weight of the porewater column *and* exceeds the pressure of the drilling mud. Thus subsurface fluids can enter the borehole, can displace the drilling mud, and can begin a kick or blowout in which methane-rich gas may rapidly rise to the surface and ignite. A driller with uncommon fore-sight would increase the density of the drilling mud, and thus increase the pressure that it exerts, before drilling into the overpressured zone.