



Stress dependence of permeability of intact and fractured shale cores.

Reinier van Noort and Viktoriya Yarushina

Institutt for Energiteknikk, Kjeller, Norway (reinier@ife.no)

Whether a shale acts as a caprock, source rock, or reservoir, understanding fluid flow through shale is of major importance for understanding fluid flow in geological systems. Because of the low permeability of shale, flow is thought to be largely confined to fractures and similar features. In fracking operations, fractures are induced specifically to allow for hydrocarbon exploration.

We have constructed an experimental setup to measure core permeabilities, using constant flow or a transient pulse. In this setup, we have measured the permeability of intact and fractured shale core samples, using either water or supercritical CO₂ as the transporting fluid. Our measurements show decreasing permeability with increasing confining pressure, mainly due to time-dependent creep. Furthermore, our measurements show that for a simple splitting fracture, time-dependent creep will also eliminate any significant effect of this fracture on permeability. This effect of confinement on fracture permeability can have important implications regarding the effects of fracturing on shale permeability, and hence for operations depending on that.