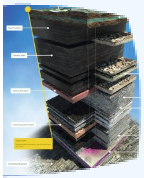
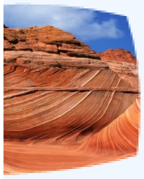




Presented By:
Russ Detwiler, Ph.D.
Associate Professor
University of California, Irvine
Civil & Environmental Engineering

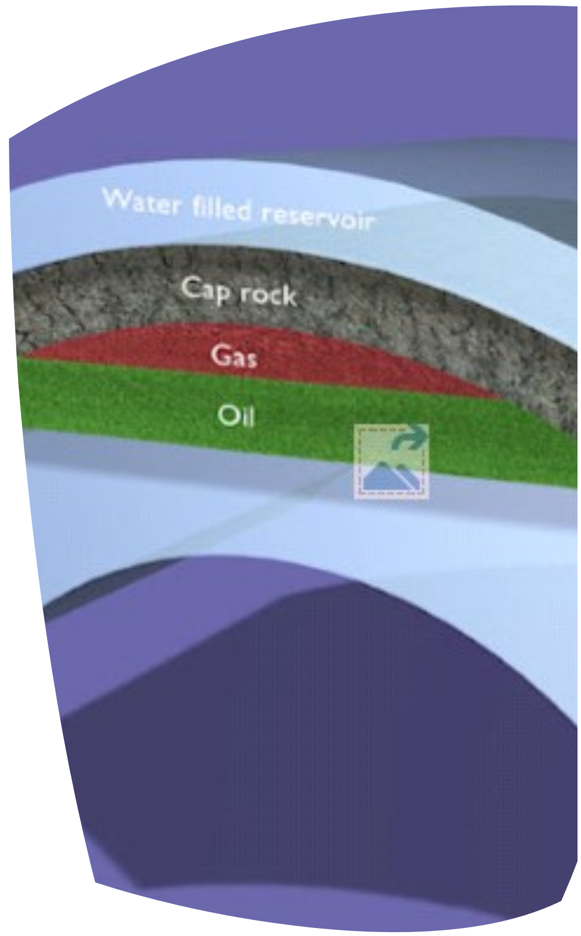
UCI Samueli School of Engineering | Department of Civil and Environmental Engineering

Environmental Engineering *Seminar Series*

Friday, October 30th 2015
MDEA
1:30PM - 2:30PM

Challenges Associated With Geologic CO_2 Sequestration: Can A Fractured Caprock Self-Heal?

The ability of geologic seals (caprocks) to prevent leakage of fluids injected into the deep subsurface is critical for mitigating risks associated with greenhouse-gas sequestration, waste disposal, and natural-gas production. Fractures and faults caused by tectonic or injection-induced stresses create potential leakage pathways. Fluids migrating through leakage pathways react with the host rock leading to mineral dissolution and/or precipitation, which may mitigate or exacerbate migration of injected fluids to shallow aquifers and the atmosphere; predicting which outcome is more likely requires improved understanding of the coupled hydrologic, geochemical, and geomechanical processes that control the evolution of fracture permeability. I present results from laboratory experiments aimed at quantifying these coupled processes in a fractured dolomitic anhydrite caprock. Two experiments at different flow rates led to dramatically different observations, from a two-order-of-magnitude permeability decrease at high flow rate to a negligible change in permeability at low flow rate. These laboratory-scale observations demonstrate a potential sealing mechanism for fractured caprocks. However, associated scaling analyses suggest that at larger length scales the self-sealing process may be offset by the formation of distinct channels as we observed at low flow rate at the laboratory scale.



Speaker Bio

Dr. Detwiler is interested in fluid flow processes in porous and fractured media, including multiphase flow and transport, and the chemical/biological/mechanical alteration of subsurface properties. Understanding the scaling behavior of these often-coupled processes is critical to a broad range of current challenges including: remediation of groundwater contaminants; subsurface CO2 sequestration; geothermal energy production; and nuclear waste isolation.Dr. Detwiler's current research integrates detailed laboratory measurements of pore-scale to core-scale processes with the development and evaluation of mechanistic computational models. Ongoing efforts to scale these computational models to parallel computing architectures provides a robust approach for quantitatively extrapolating laboratory-scale observations to field-scale systems.

Questions? - cee@uci.edu - (949) 824-7548