



Induced Seismicity Consortium (ISC)

Semi- Annual Project Review Meeting

Effect of the Earth Characteristics on Induced Seismicity Potential

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Los Angeles, CA
July 23, 2015



Problem Statement



Statement: Sensitivity analysis on the effect of injection site parameters on induced seismicity

Method: Pressure modeling using focus parameters

Focus Parameters:

Injection and production volume

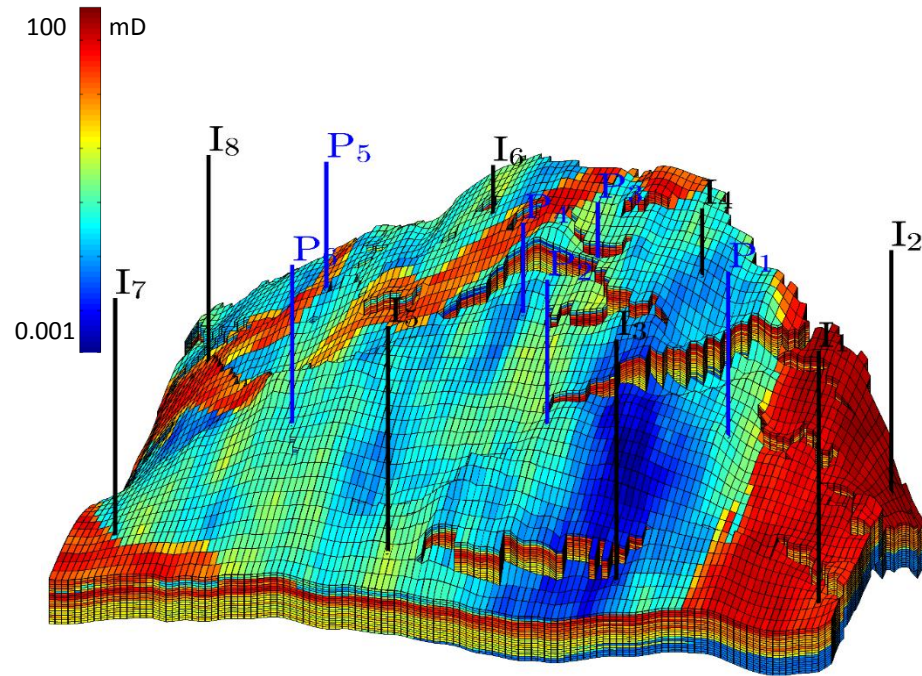
Hydrogeological characteristics of injection site

Structural characteristics of injection site

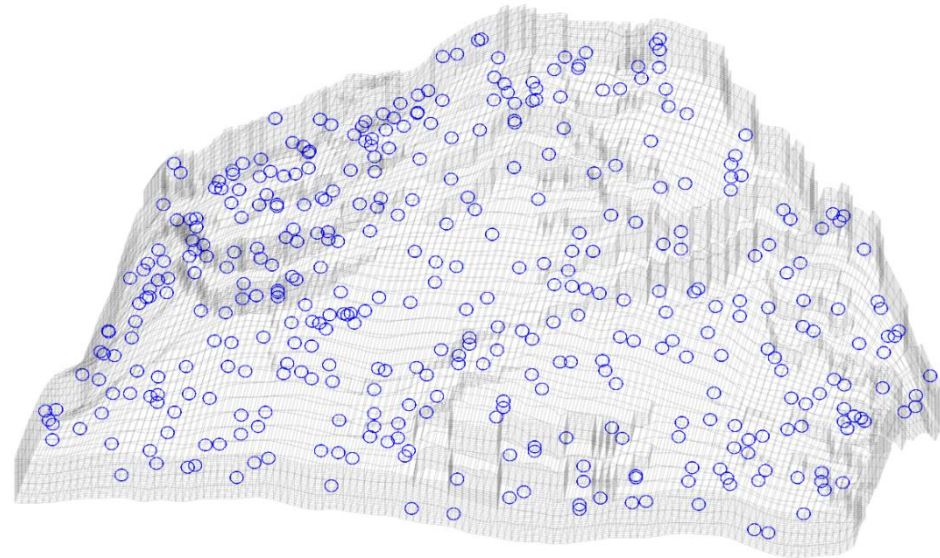
Field Studies: SAIGUP, Illinois Basin and study in CA



Effect of Net Volume



Permeability Structure

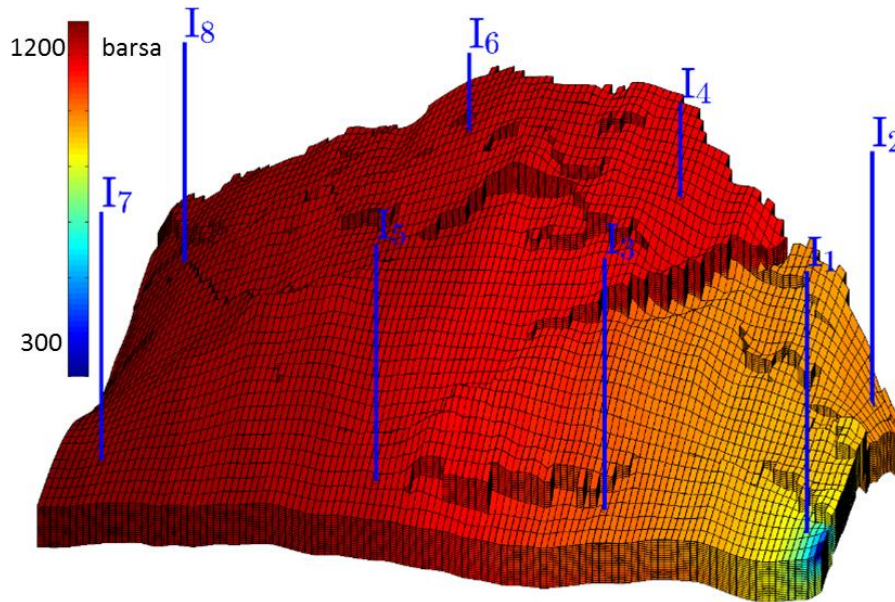


Critically Stressed Faults

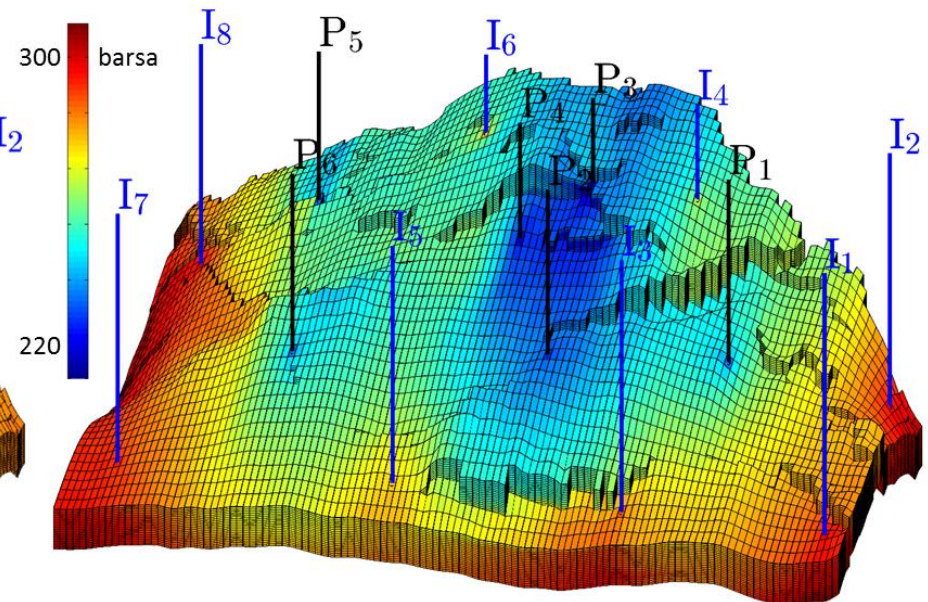
•K.-A. Lie. An Introduction to Reservoir Simulation Using MATLAB: User guide
for the Matlab Reservoir Simulation Toolbox (MRST). SINTEF ICT, May 2014. •



Pressure Maintenance versus Waste Water Disposal: Net Volume Effect



ΔP Waste Water Disposal



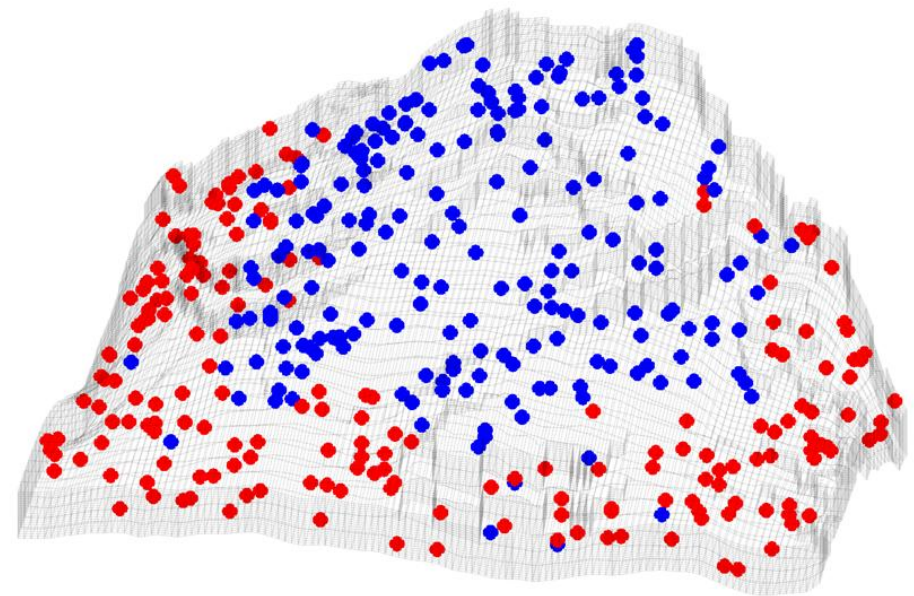
ΔP Simultaneous Injection
and Production



Failed Faults



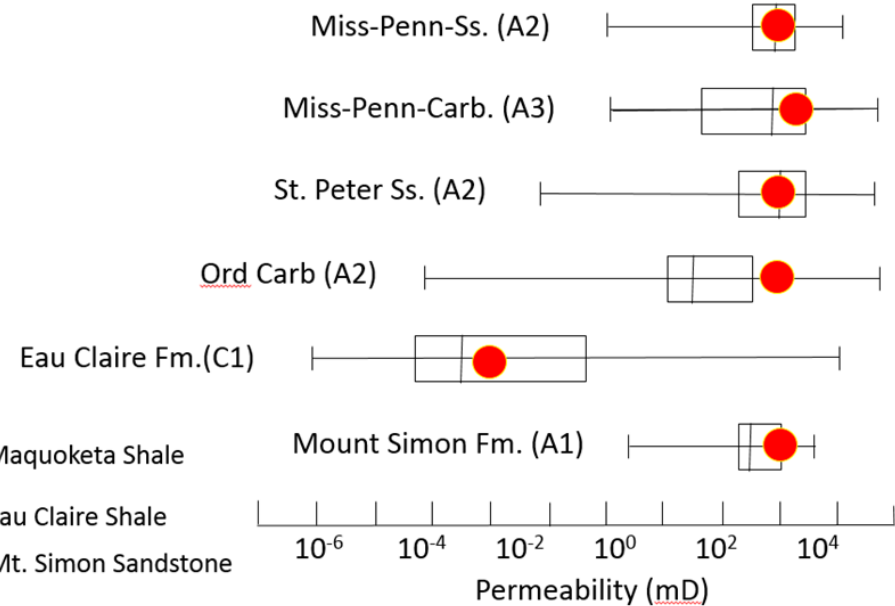
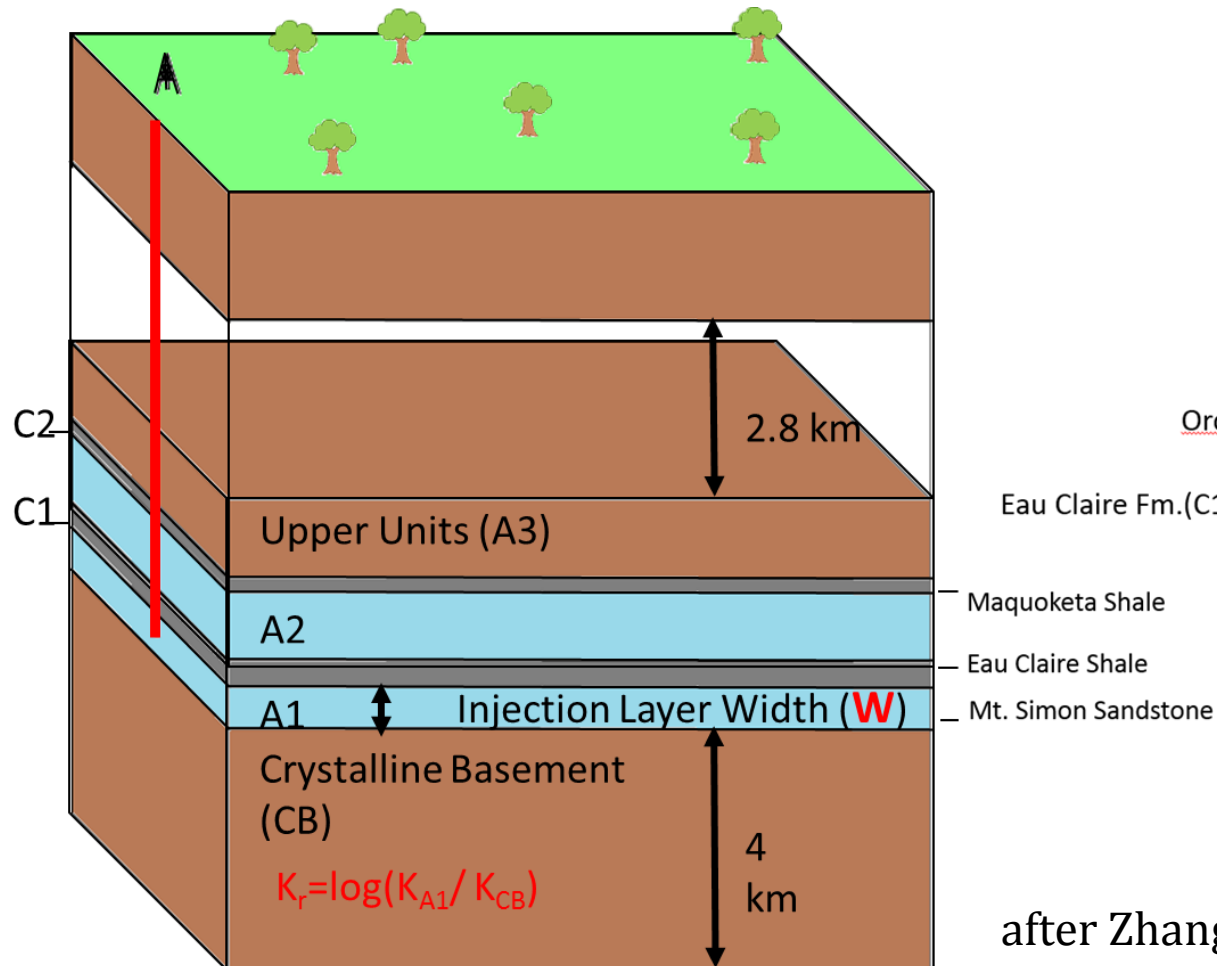
Waste Water Disposal
Failed Faults



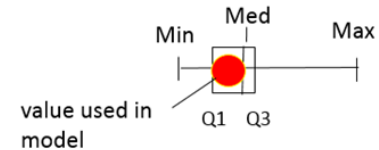
Simultaneous Injection and
Production Failed Faults



Illinois Basin Structure



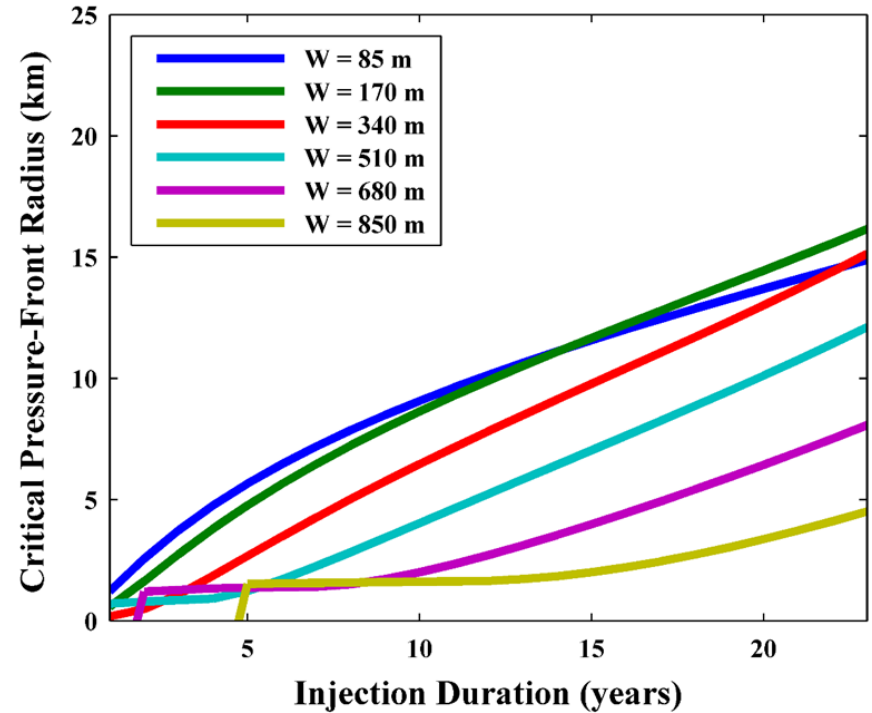
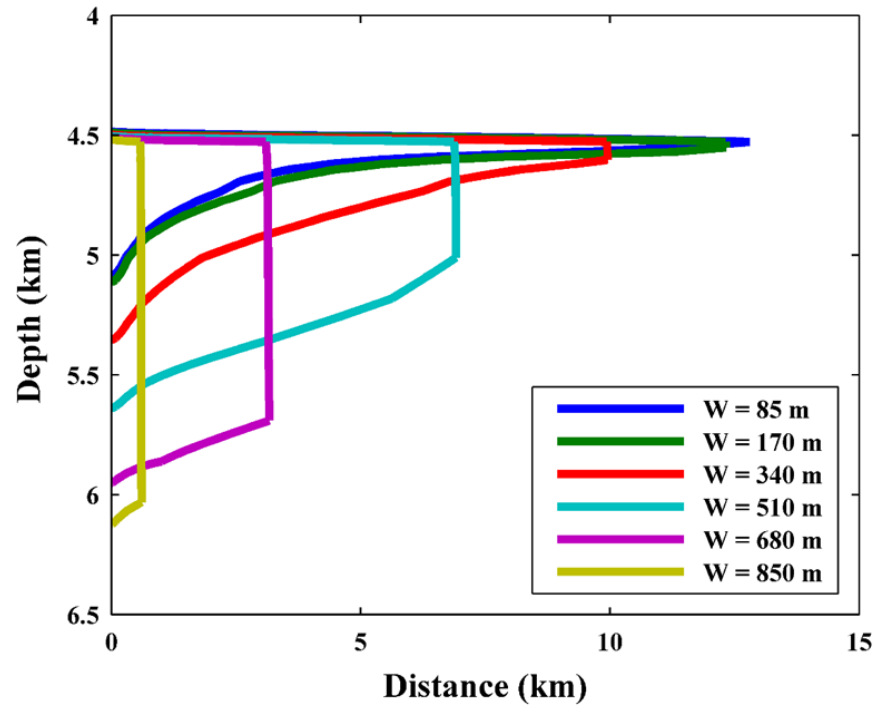
$$1 \text{ mD} = 10^{-15} \text{ m}^2$$



after Zhang et al. 2013

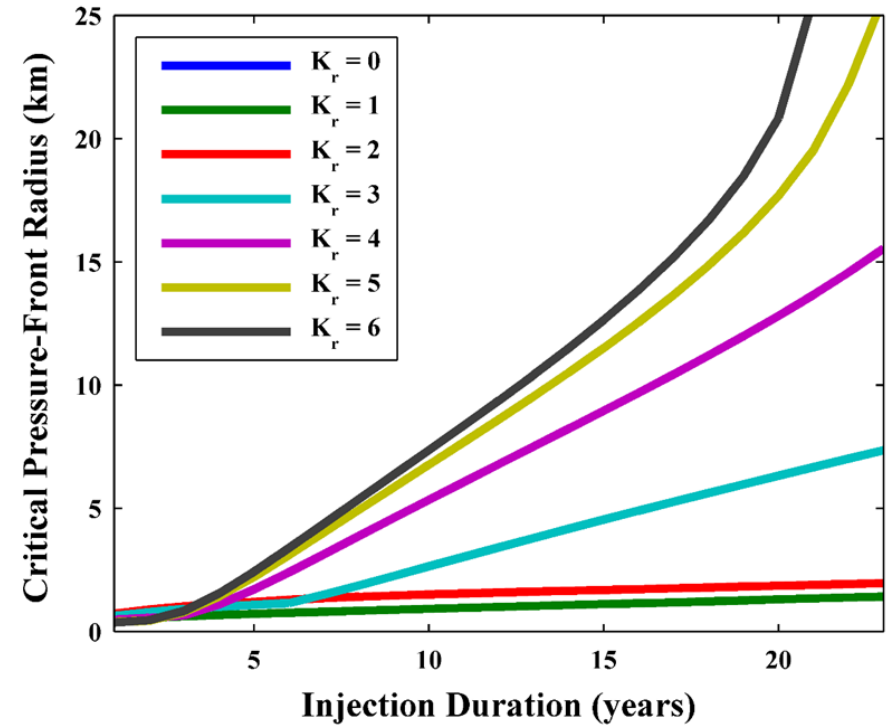
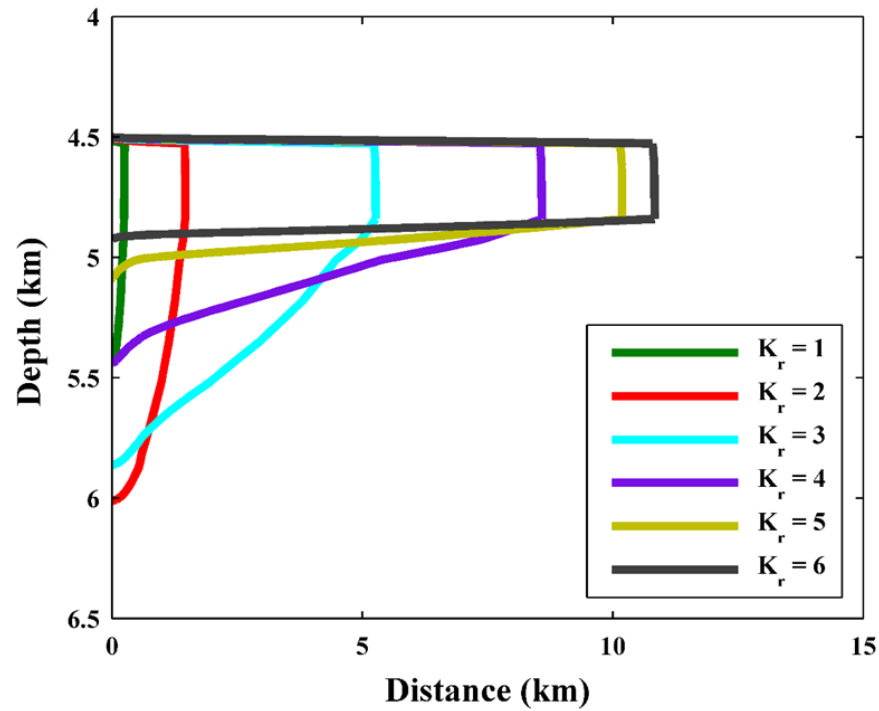


Critical Pressure Front: Different Injection Zone Width Scenario



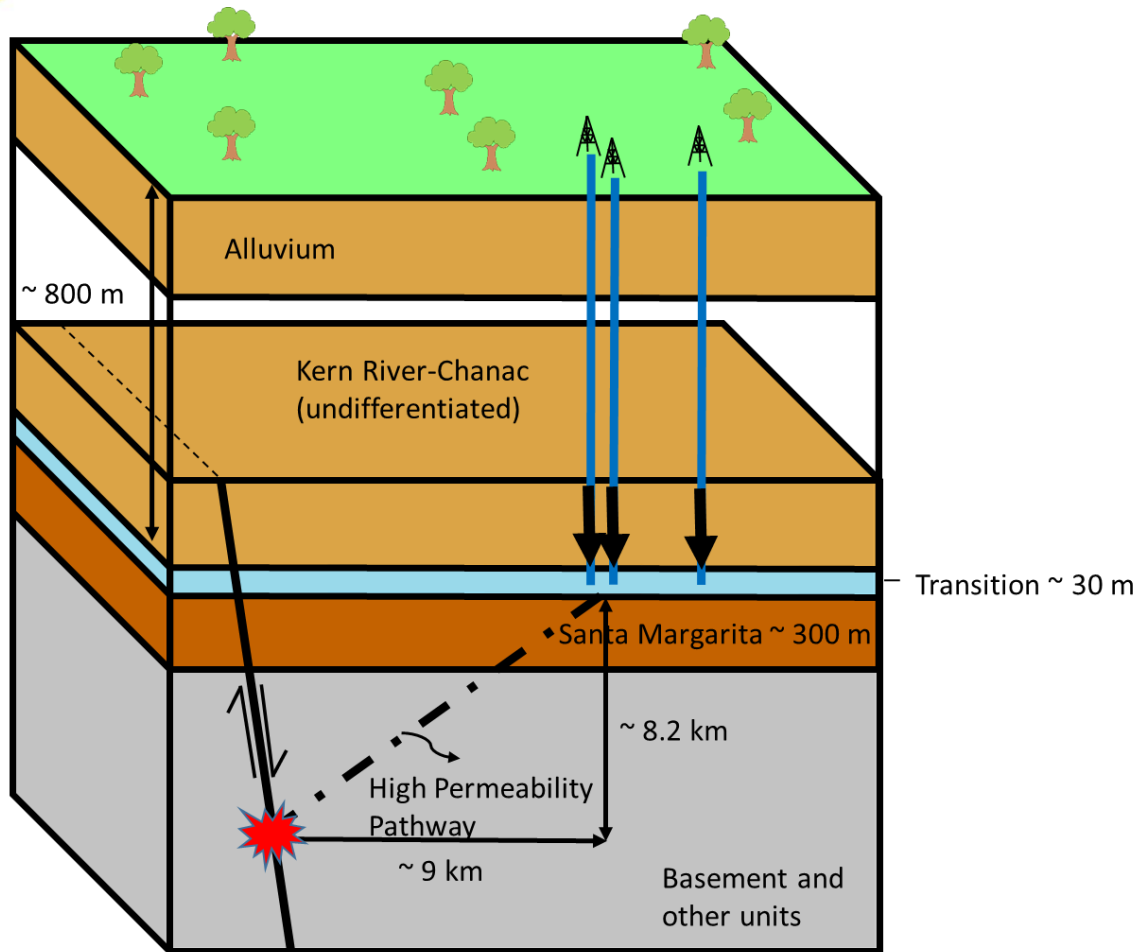


Critical Pressure Front: Different Permeability Contrast



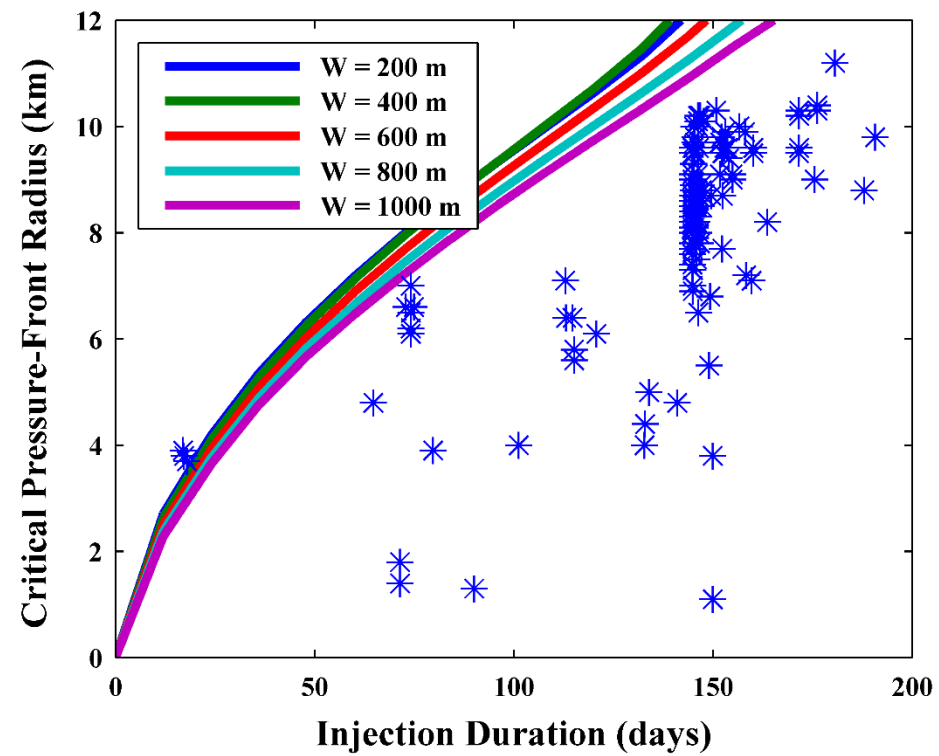
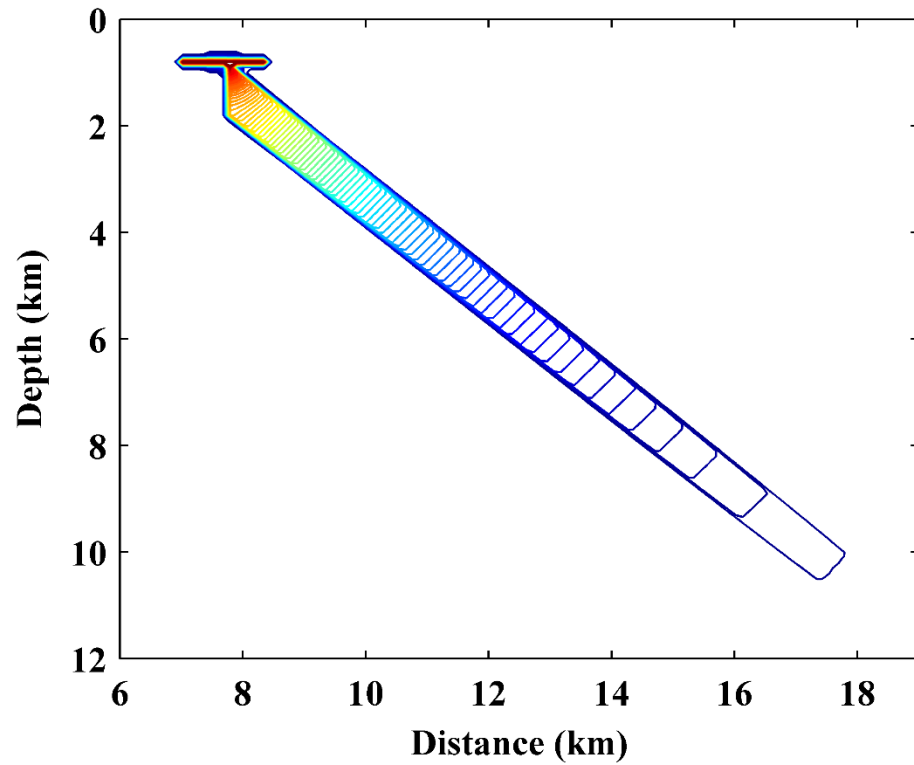


California Structure



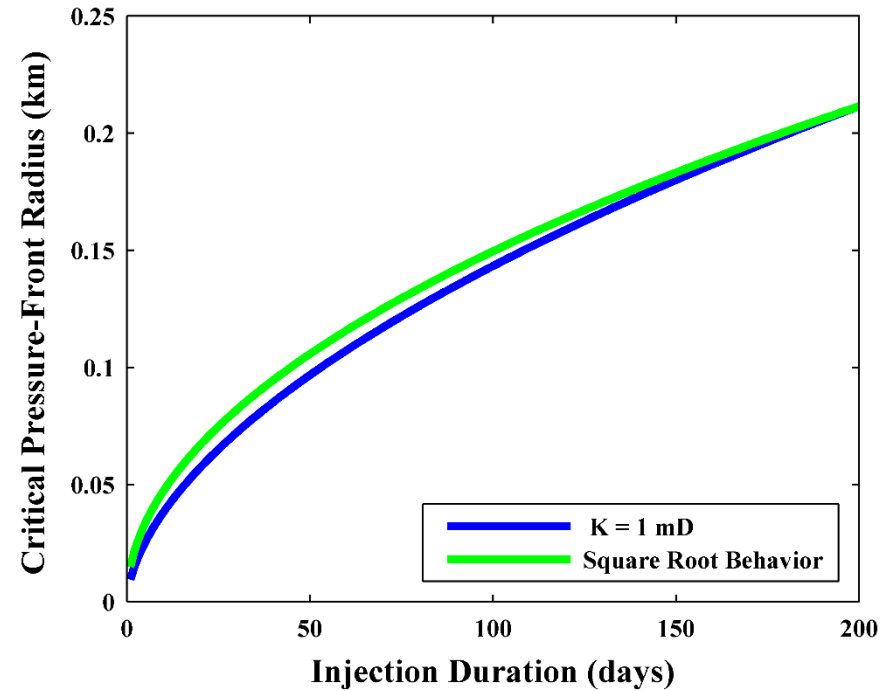
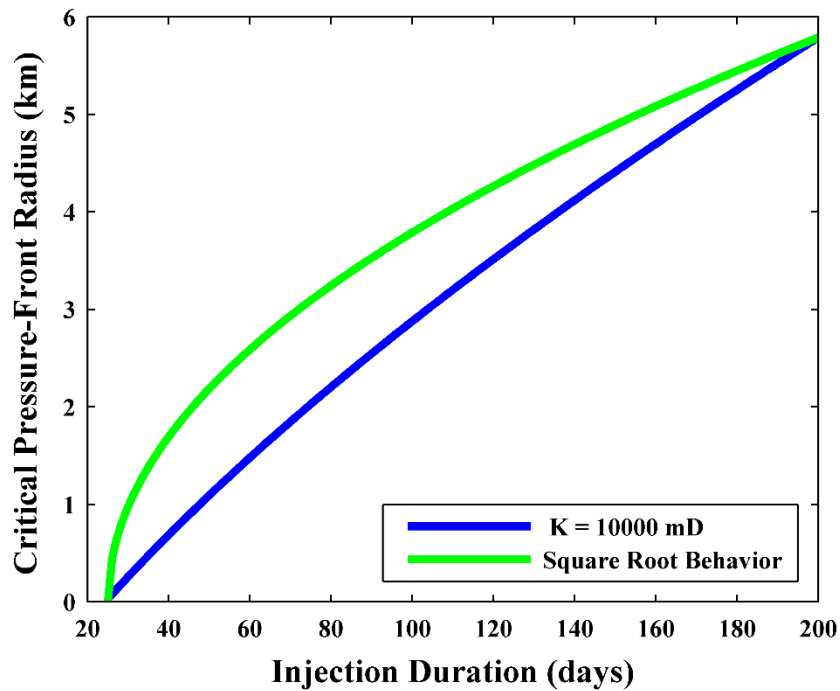


Pressure Front





Radial vs Channel pressure front





Findings and Future Work



- Net Volume
- Reservoir Structure
- Pore-pressure simulation studies
- Poro-Elastic Modeling



Thank You!
Questions?