

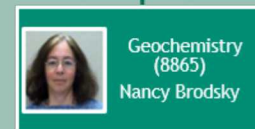
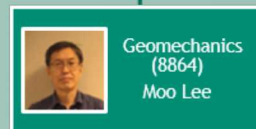
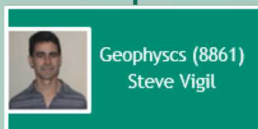
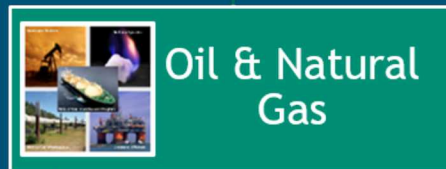
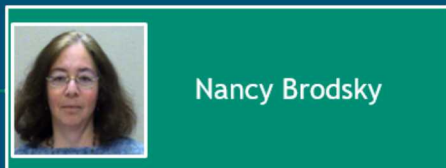
Sandia National Laboratories Oil & Gas Upstream Program Overview

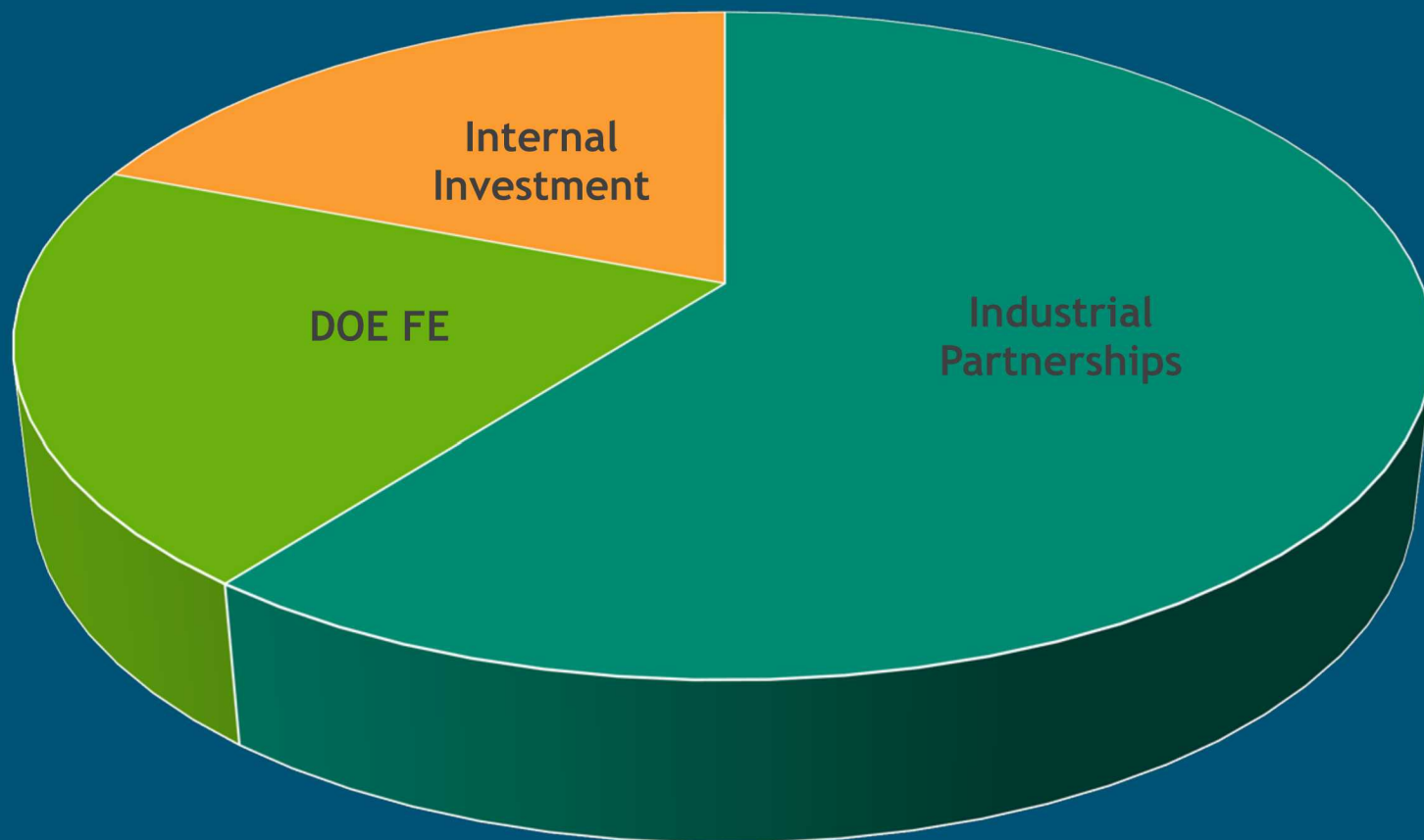
Steve Vigil

Sandia Oil & Gas Upstream Program Manager

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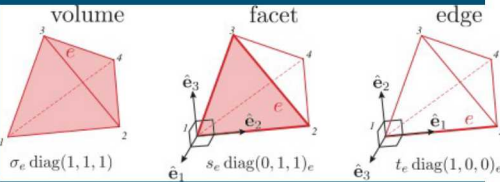
Sandia Fossil Energy Program Structure and Earth Science Research and Applications Group



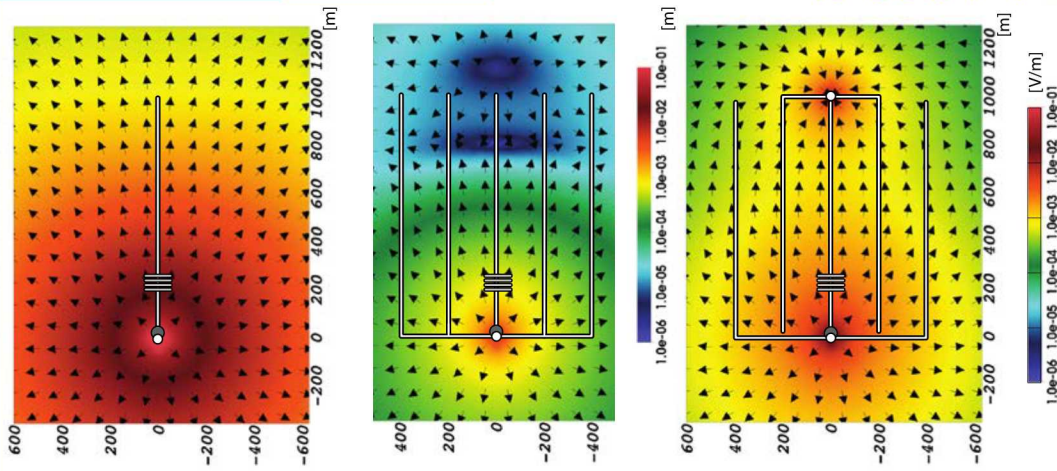
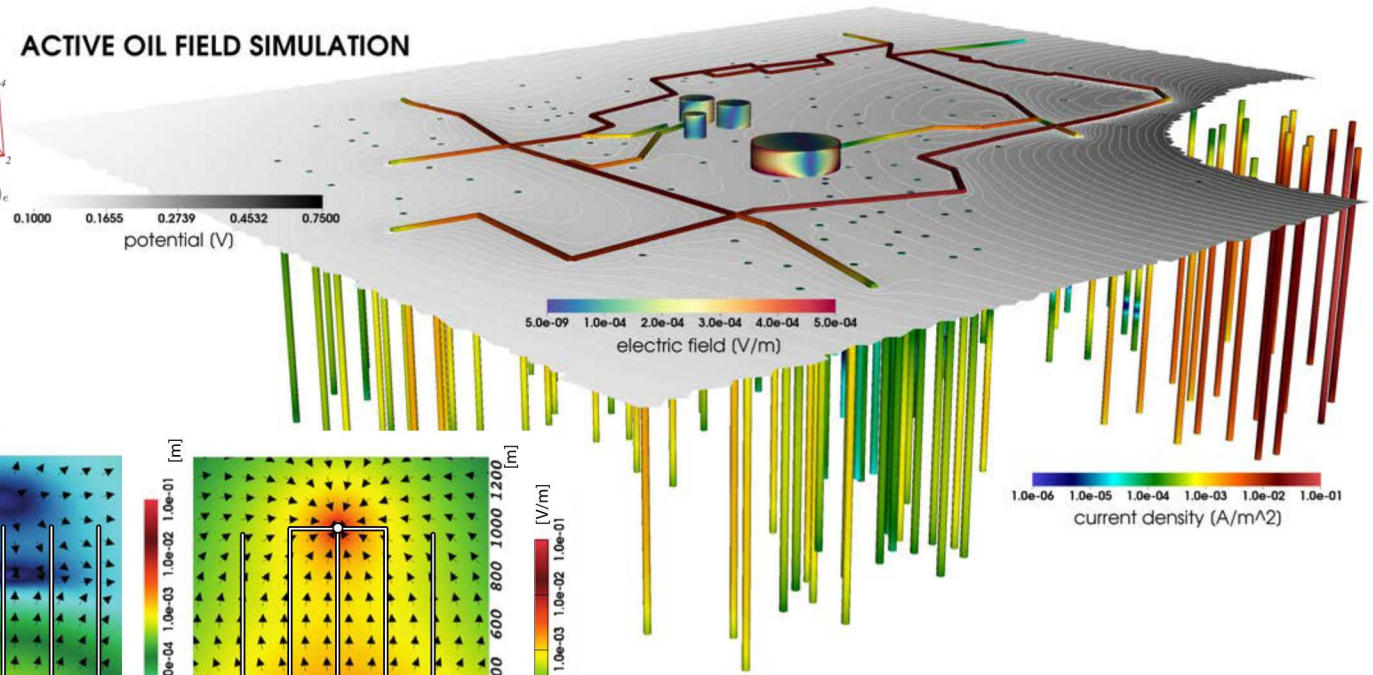




Prediction and Inference of Multi-scale Electrical Properties of Geomaterials



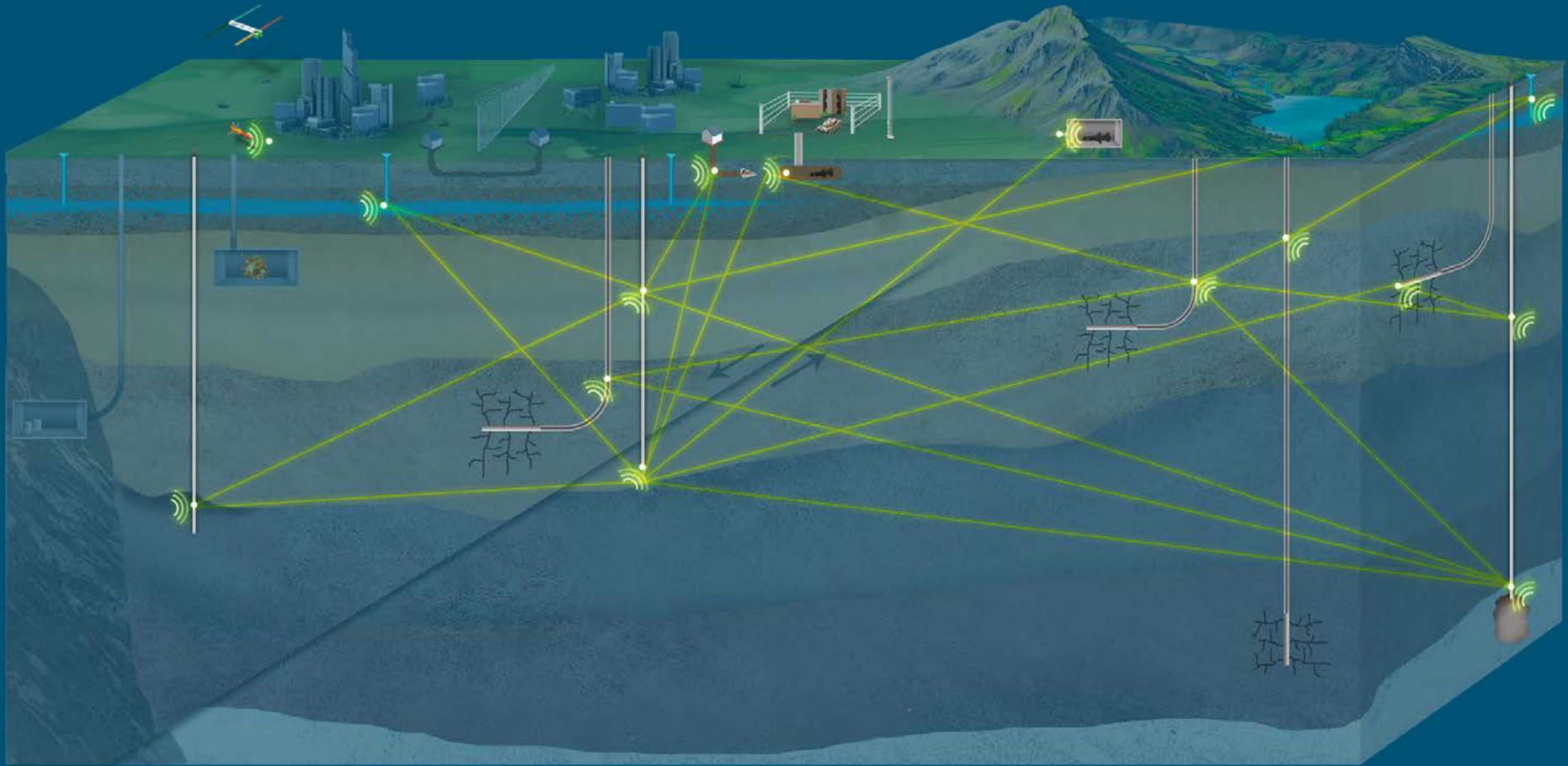
ACTIVE OIL FIELD SIMULATION



Successful algorithmic implementation of a conceptual breakthrough has opened a new world of fast, high-fidelity oil field modeling for electromagnetic detection methods.



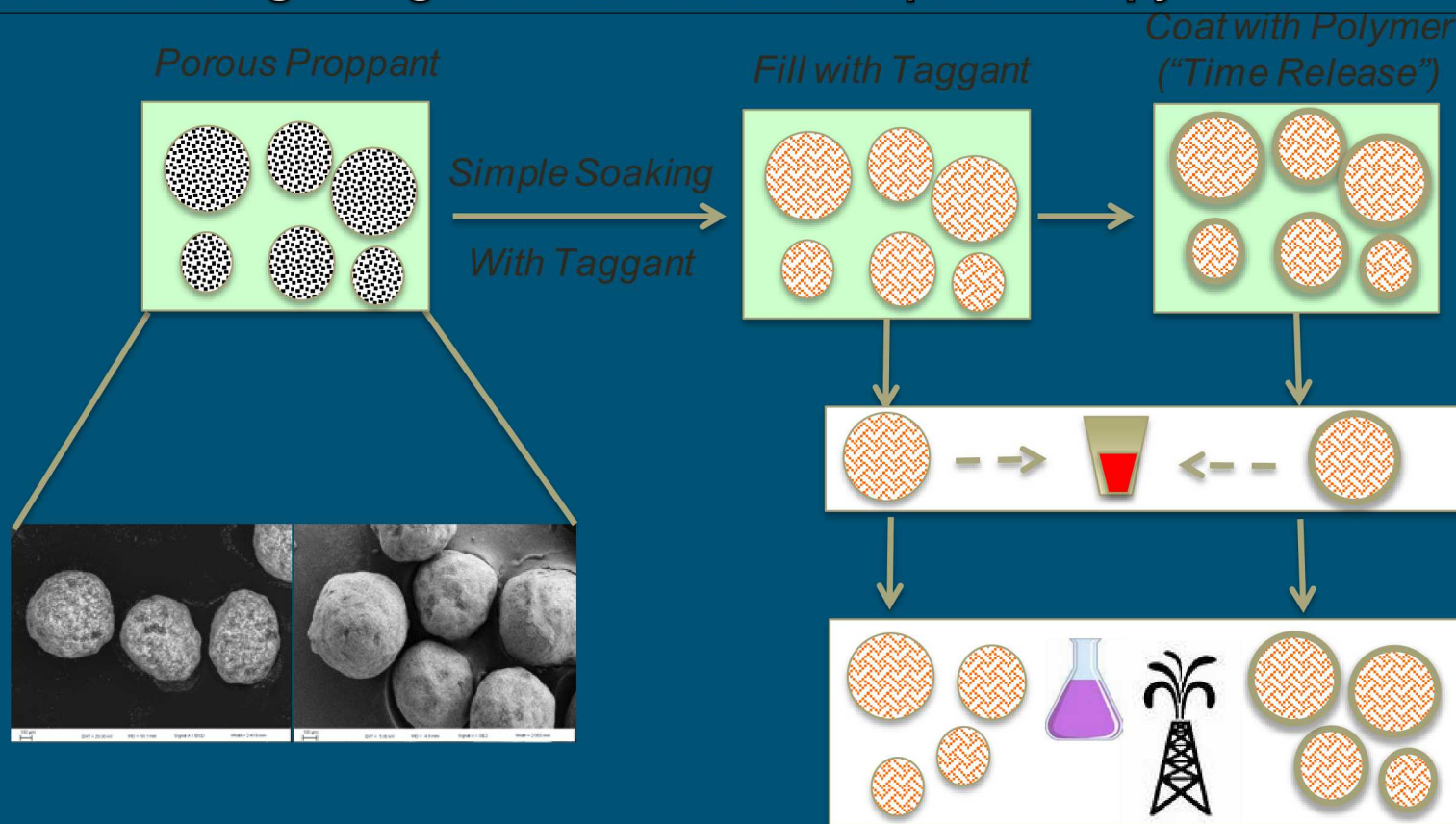
ReSeaD : Real-time Subsurface event assessment and Detection



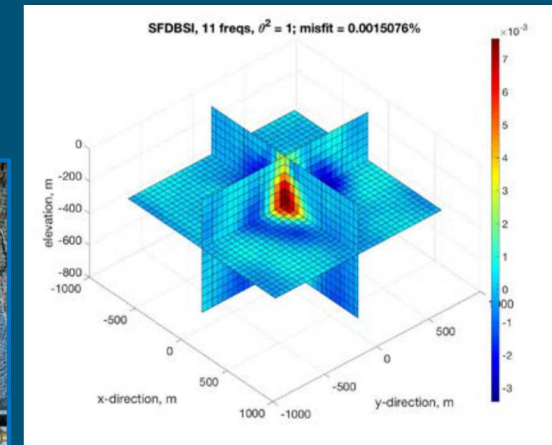
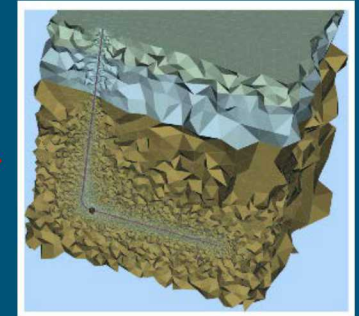
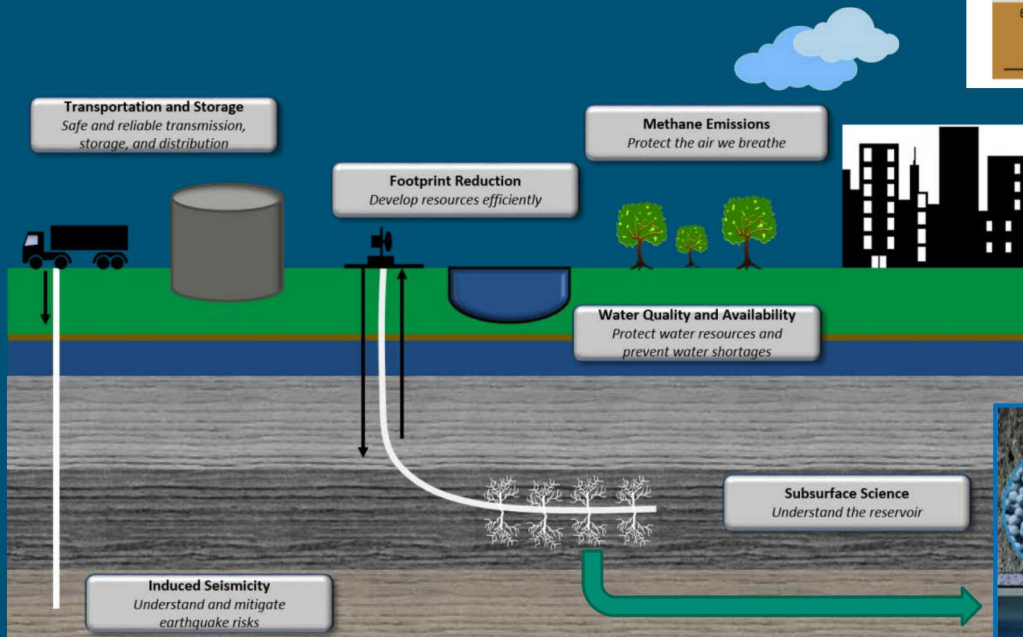
Improved production field realtime situational awareness via novel subsurface sensors and signal processing.



Detection of Soluble Ligand-Tuned Molecular Tags for Subterranean Fluid Flow Monitoring Using Resonance Raman Spectroscopy

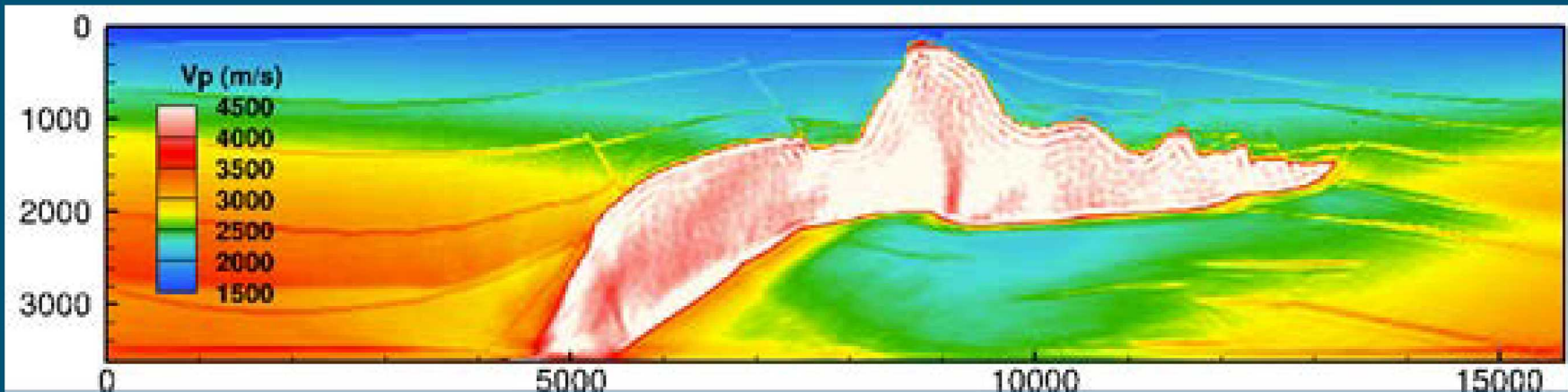
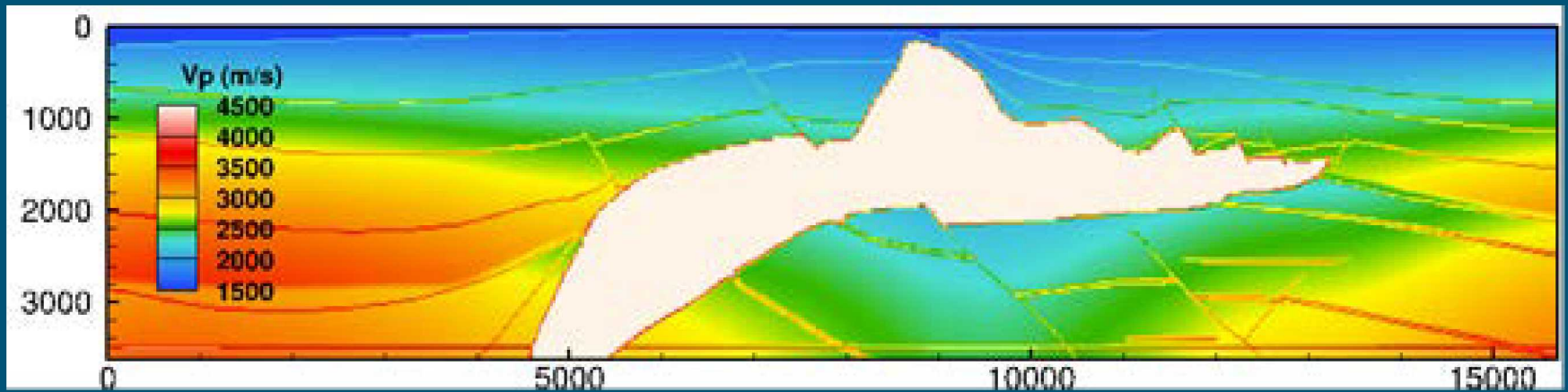


Library of uniquely identifiable molecular tags; timed release from porous proppants can extend monitoring of injected fluid flows from 1-2 months to 1+ years.



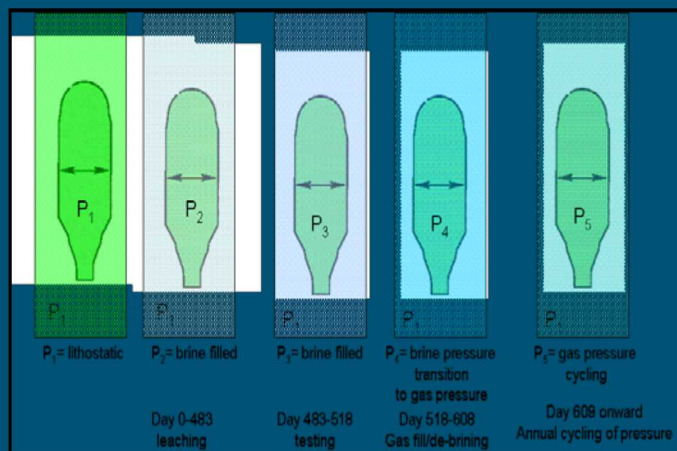
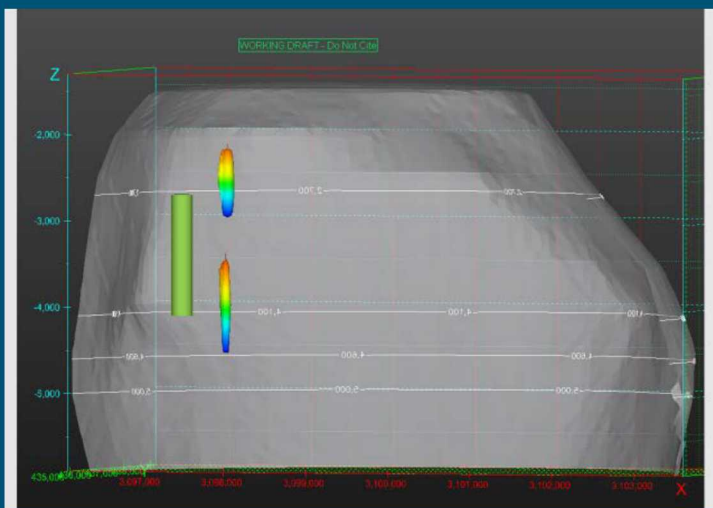
Sandia modeling and simulation expertise is helping an industrial partner develop products to locate proppant using EM methods.

Upstream Portfolio Overview *Industrial Partnerships*

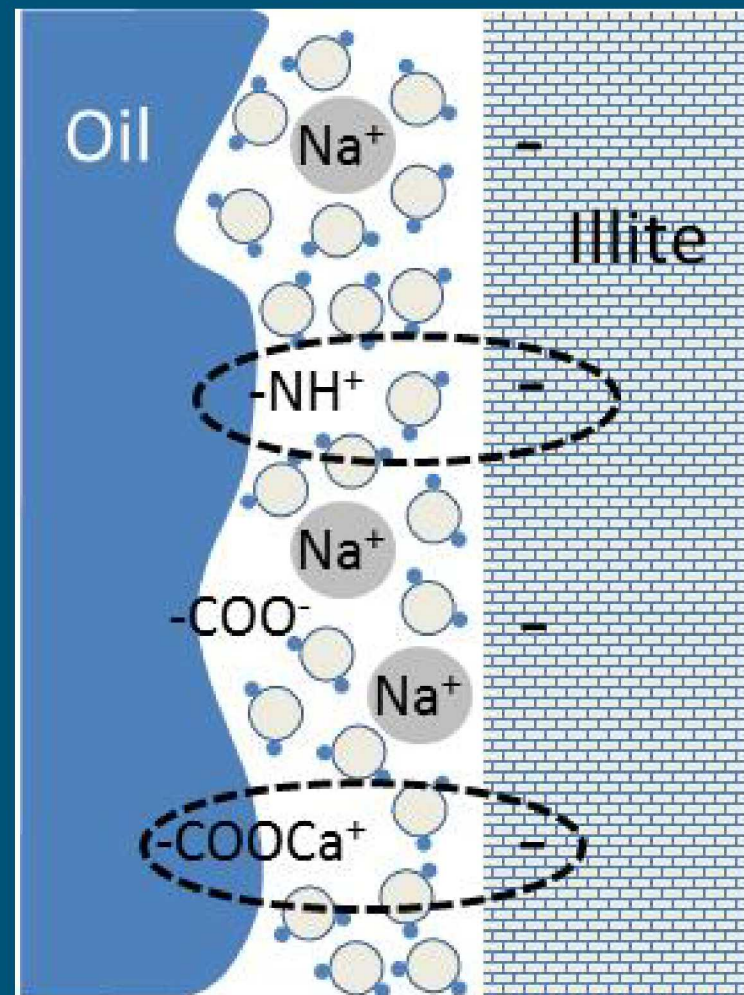


Sandia high-performance computing capabilities and advanced seismic wave propagation modeling are helping reduce exploration risk by producing more accurate earth models.

Upstream Portfolio Overview Industrial Partnerships



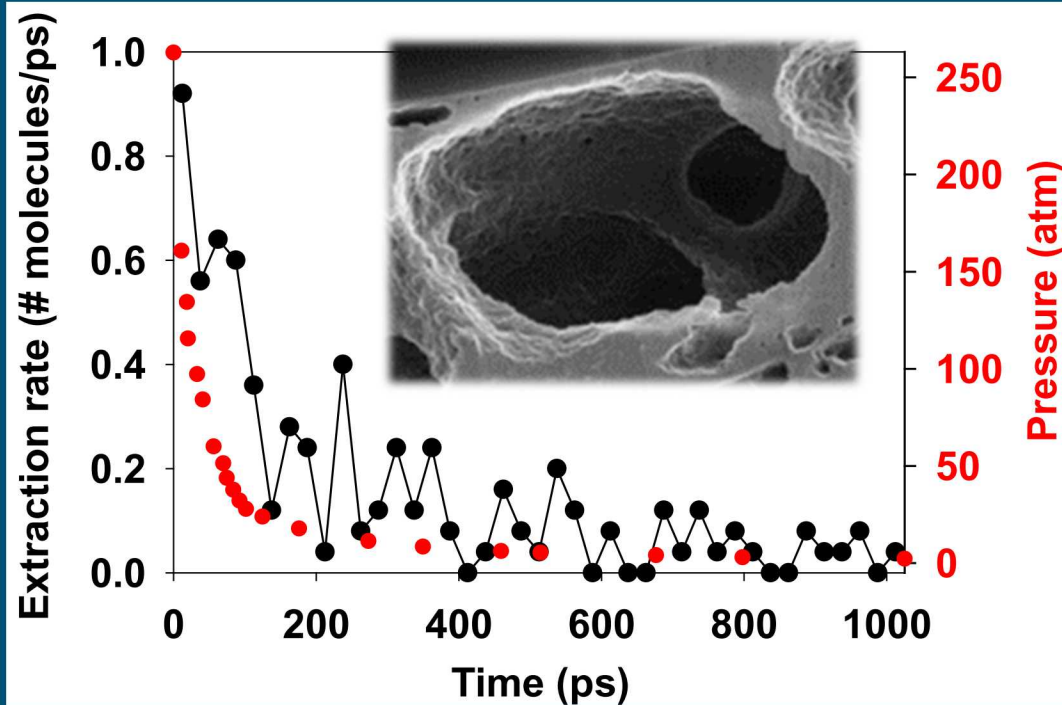
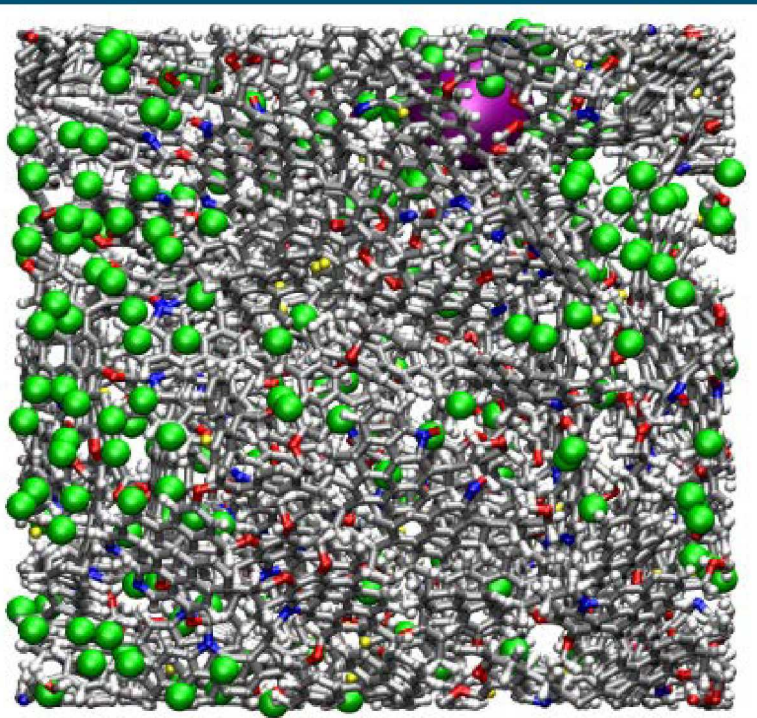
Sandia's Sierra software and salt geomechanics expertise is helping with high-volume hydrogen storage.



Sandia geochemistry expertise is pioneering EOR from tight formations by optimizing the composition of fracking fluids



Fundamental Understanding of CH₄-CO₂-H₂O Interactions in Shale Nanopores under Reservoir Conditions



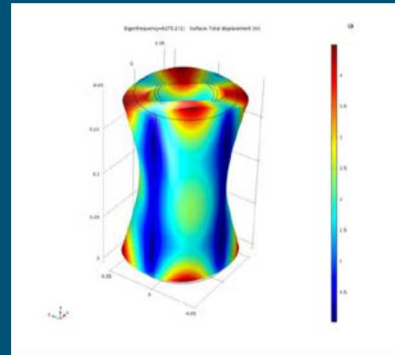
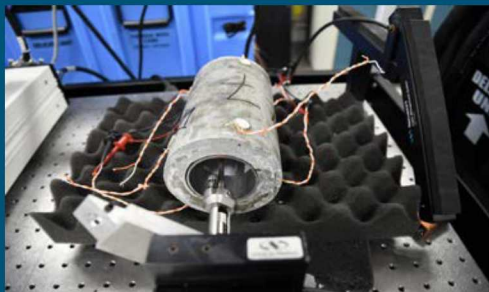
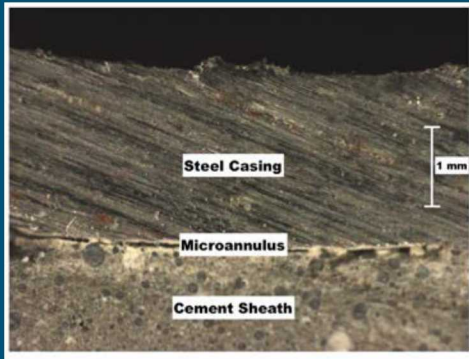
Sandia computational modeling results and lab measurements are elucidating potential mechanisms for shale well production decline and indicate that existing kerogen models are inadequate and need further refinement.

Upstream Portfolio Overview

Wellbore Integrity and EOR CO₂ sequestration

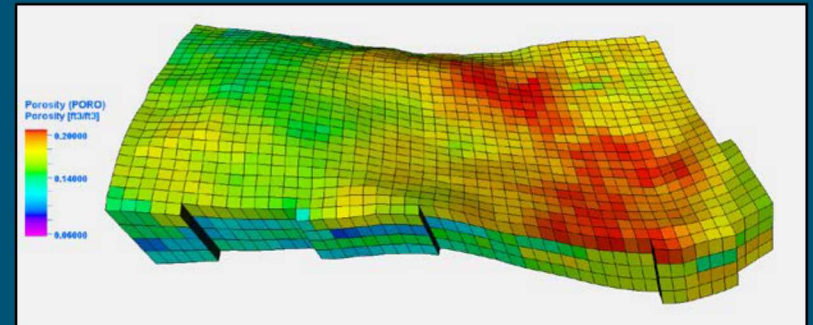
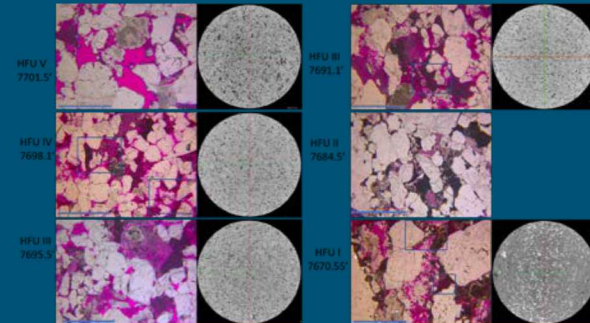


Nonlinear Acoustic Methods for Characterizing Wellbore Integrity



Development of a novel method for behind-casing flaw detection.

EOR CO₂ Sequestration

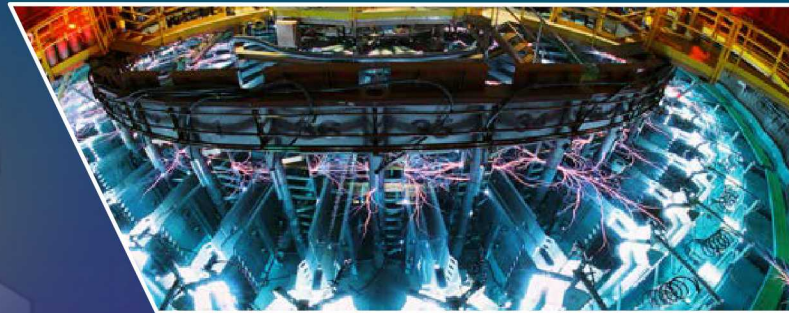
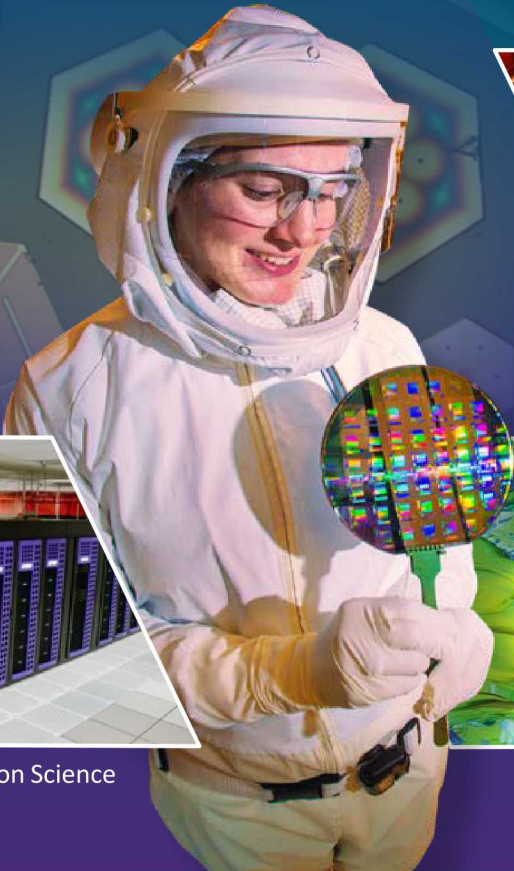


Construction of geo-models that use laboratory pore-scale and relative permeability data results in better match to field scale production behavior.

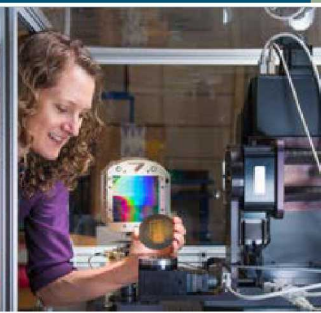


Research Foundations play an integral role in mission delivery

Nanodevices &
Microsystems



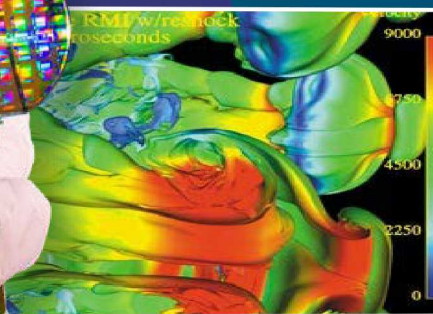
Radiation Effects & High Energy Density Science



Materials Science



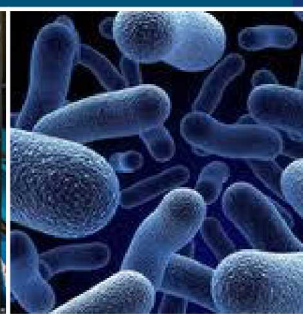
Computing & Information Science



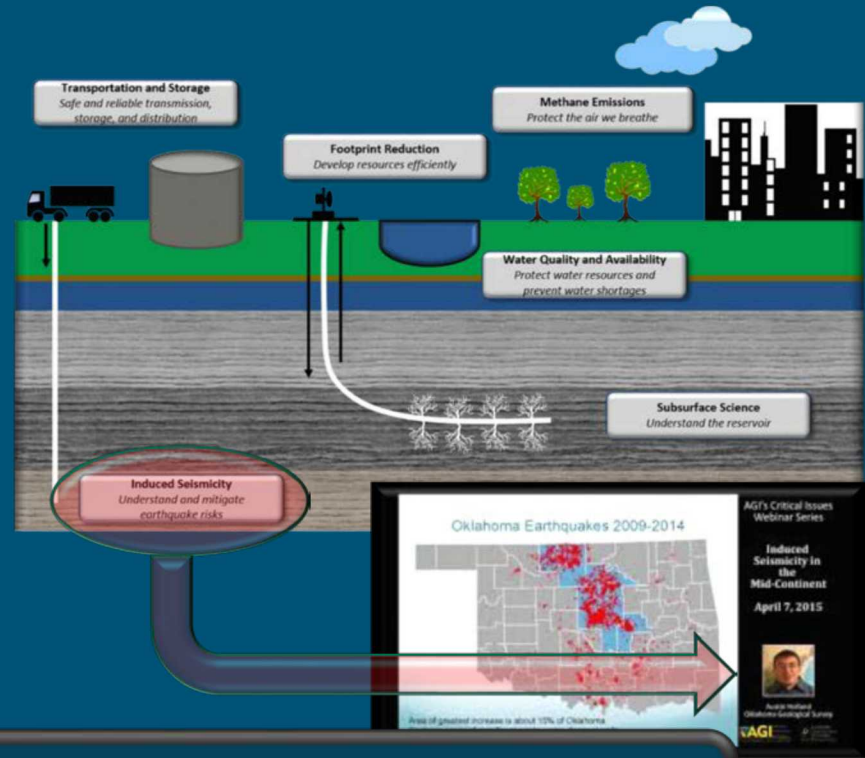
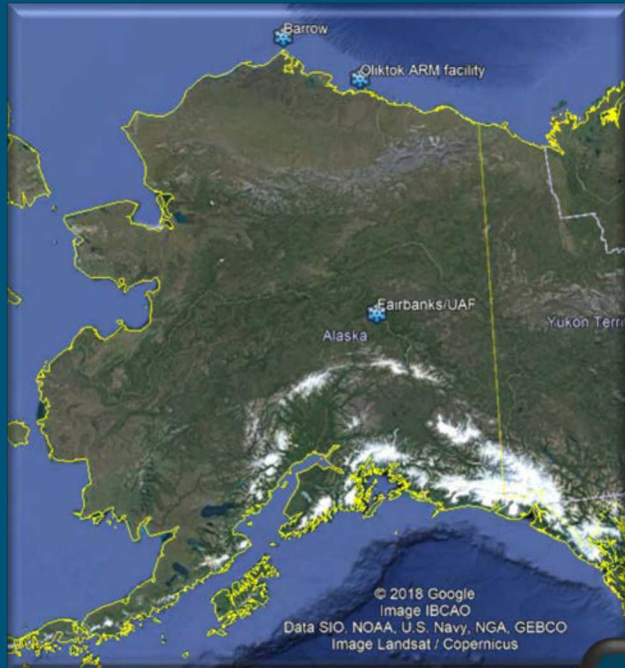
Engineering Science



Geoscience



Bioscience



- Goal:** match production history, forecast and optimize
- Method:** link pore scale to fracture networks and flow dynamics
- Targets:** increase generalization by enforced multiscale physics

