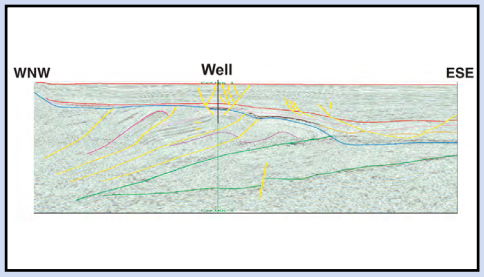
The Geosciences and Engineering Division at Southwest Research Institute® (SwRI®), a center of excellence in earth sciences and engineering, applies its extensive field and modeling expertise to provide innovative solutions to exploration and production problems in geologically complex settings.

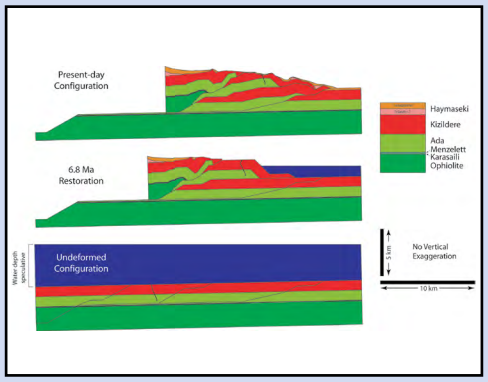
SwRI scientists and engineers use state-of-the-art computer modeling and visualization technologies to provide integrated, multidisciplinary solutions to a broad range of oil and gas industry problems. SwRI has the staff, expertise and facilities to offer complete independent services or to augment in-house corporate capabilities.

Structural Geology

- Field investigations of faulting in carbonate and clastic sedimentary strata
  - Fault system evolution
  - Fault zone deformation
  - Scaling relationships
  - Permeability architecture
- 2D and 3D geometric and kinematic modeling, balancing and restoration, along with seismic interpretation
- Prediction of effective reservoir properties based on sub-seismic-scale fault and fracture analyses
- Field and short courses in extensional and contractional tectonic regimes in the U.S. and abroad



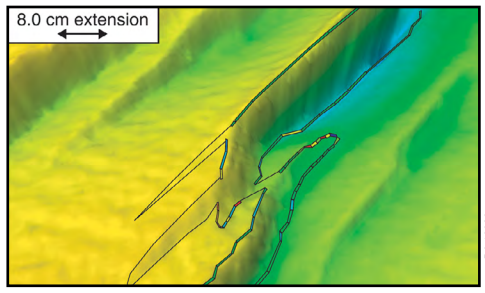
Interpreted seismic line from a fold-thrust belt helps constrain subsurface geometry.



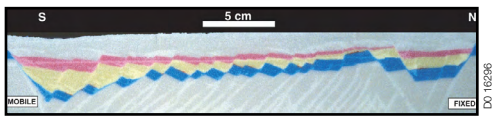
Sequence of restored geologic cross-sections shows evolution of the fold-thrust structures.

Physical Analog Modeling

Physical analog modeling of extensional, contractional and salt-related geologic structures, including the application of dynamic structured light for digital terrain analysis of developing models



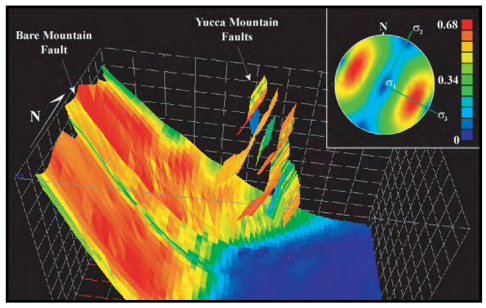
Digital elevation model of the top surface of an analog clay model constructed from dynamic structured light data used to evaluate geometry of fault interactions and potential for compartmentalization.



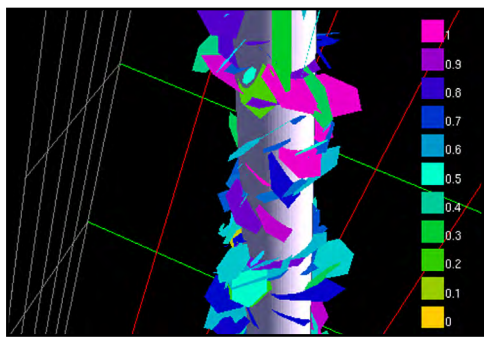
Analog model simulating deformation in an extensional tectonic setting increases understanding of the roles of major and minor faulting in reservoir deformation.

3DStress®

Stress analysis using 3DStress®, an SwRI-developed program that calculates slip tendency and direction, dilation tendency, and leakage potential of faults and fractures



Slip tendency analysis (3DStress®) of Bare Mountain fault and Yucca Mountain faults, southern Nevada. Hot colors indicate areas of likely fault slip.



Dilation tendency analysis of synthetic fractures cutting through a simulated well. Pink, purple and dark blue indicate fractures that are likely to dilate in the current stress state.

Details of fault zone and dilational fault zone segment filling material along southwest-dipping normal fault near Balmorhea, Texas.

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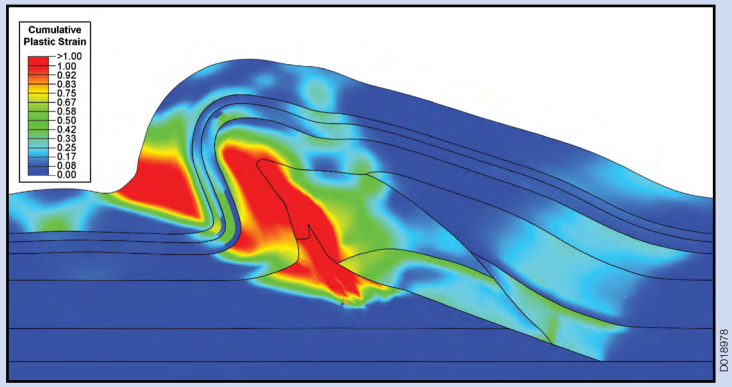
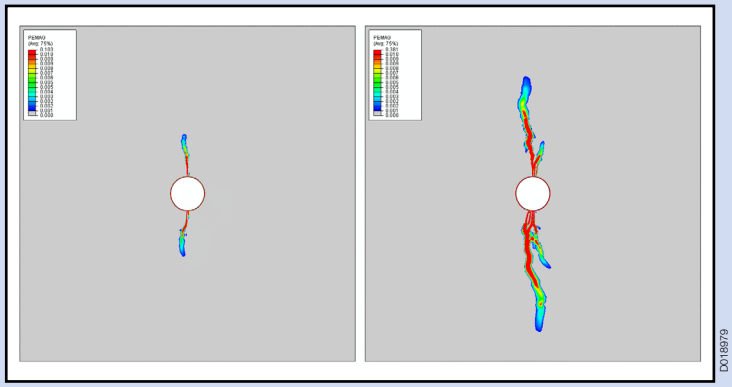
Geomechanics

- 2D and 3D numerical modeling using finite-element and discrete element techniques that incorporate realistic mechanical stratigraphy and inelastic material models
- Reservoir- to field-scale analyses of stress and strain evolution as a guide to exploration, drilling, and production
- Borehole- to reservoir-scale simulations of hydraulic fracturing



2D finite-element model of a reservoir-scale contractional fault-related fold. Contours of cumulative plastic strain are superimposed on deformed geometry.



2D finite element model of induced hydraulic fracturing using a continuum damage mechanics material model in a coupled stress-pore pressure analysis. Contours of cumulative plastic strain show intermediate (left) and final (right) stages of the simulation.

We welcome your inquiries. For additional information, please contact:

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