Geomechanics of CO_2 Reservoir Seals

Award Number: DE-FE0023316

Project Summary:

The University of Texas developed and validated geomechanical models for subcritical fracture growth in carbon capture and storage top seal lithologies for long-term prediction of reservoir seal integrity beyond the engineering time scale. Specifically, the project performed laboratory fracture testing and validation of results against fractures from natural carbon dioxide (CO_2) seeps. The results were put into numerical simulations to predict top seal integrity. The experiments in this study allowed recognition and quantification of chemo-mechanical interactions during fracture tests. Shale samples were exposed to a wide range of environmental conditions to observe behaviors in different shales.

Prime Performer:
University of Texas at Austin

Principal Investigator:
Peter Eichhubl

Project Duration:
9/1/2014 – 4/30/2018

Performer Location:
Austin, Texas

Program:
Carbon Transport & Storage

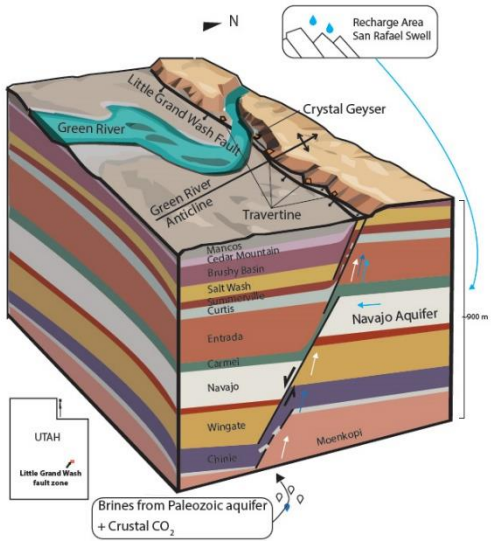

Figure 1: Fractures and faulting noted in potential CO_2 confining layers at the Crystal Geyser site.

Project Outcomes:

Outcomes of the project included the development of predictive models for top seal failure by fracture growth that are calibrated using field observations and experimental data on rock fracture properties under chemically reactive reservoir conditions representative of CO_2 storage reservoirs. Some important outcomes of the project included research on the effect of pH, salinity, ambient air, dry and wet supercritical CO_2, dry CO_2 gas, and deionized water on rock behavior. Understanding long-term seal integrity is important to the Carbon Storage Program goal of ensuring long-term storage of 99% of injected CO_2. The results from this project can also provide tools to aid in risk assessment.

Presentations, Papers, and Publications

Final Report: Geomechanics of CO_2 Reservoir Seals (December 2018) Peter Eichhubl, Thomas Dewers, Xiaofeng Chen, Jonathan Major, Raul Velasco, Owen Callahan, Pania Newell, Mario Martinez