

# LANL – Sequestration Activities FY15

Award Number: FWP-FE-452-14-FY15

## Project Summary:

This award consisted of multiple tasks focusing on enabling science that supports large-scale deployment of geologic carbon dioxide (CO<sub>2</sub>) storage technology as part of the U.S. Department of Energy's program to mitigate anthropogenic emission of CO<sub>2</sub>. This effort was divided into three tasks focused on specific areas of research in the near-surface and subsurface:

Task 1 – Wellbore and Seal Integrity: Develop long-term predictive models for use in risk-based analyses of carbon storage systems.

Task 2 – Development and Deployment of Measurement, Verification and Accounting (MVA) Tools: Demonstrate the deployment of frequency modulated spectroscopy and to advance seismic imaging.

Task 3 – Systems Modeling and Science for Geologic Sequestration: (1) Characterize multi-phase CO<sub>2</sub> flow in groundwater aquifers through an integrated experimental-simulation approach; (2) characterize multi-phase CO<sub>2</sub>-brine flow through faults; and (3) characterize CO<sub>2</sub> storage potential in residual oil zones (ROZs).

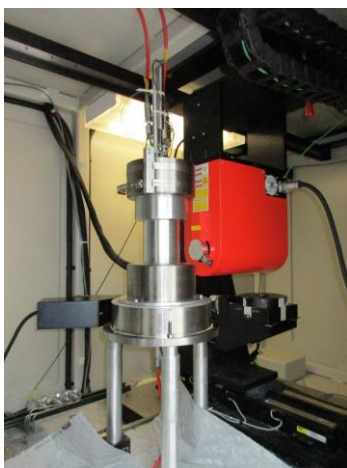


Figure 1: The triaxial coreholder sitting on a rotational stage in front of an x-ray source for collecting computed tomography data. The coreholder can be rotated while at temperature and pressure to allow in situ collection of x-ray radiographs, sample deformation data, and permeability values.

## Project Outcomes:

In task 1, researchers carried out laboratory permeability measurements on fractures produced from shear failure of caprocks. The laboratory experiments evaluated the fracture-permeability relations as a function of stress using specimens of caprock from Marcellus Shale, Opalinus Shale, and Duperow Dolomite formations.

Task 2 focused on near-surface MVA and deep seismic imaging. Researchers developed new methods to improve velocity models for microseismic imaging and location precision of microseismic events and applied it to field data.

In task 3, intermediate scale experiments were used to understand the process of gas exsolution, gas phase expansion and CO<sub>2</sub> migration to characterize the impacts of CO<sub>2</sub> and CO<sub>2</sub>-dissolved water leakage in groundwater aquifers. Numerical simulations were used to characterize CO<sub>2</sub> storage potential and long-term fate of CO<sub>2</sub> in ROZs.

**Prime Performer:**  
*Los Alamos National Laboratory (LANL)*

**Principal Investigator:**  
*George Guthrie*

**Project Duration:**  
*10/1/2014 – 9/30/2016*

**Performer Location:**  
*Los Alamos, New Mexico*

**Field Sites:**  
*Mammoth Springs, California*  
*Valles Caldera, New Mexico*  
*Sevilleta Long Term Ecological Research, New Mexico*  
*Farmington, New Mexico*  
*Soda Springs, Utah*  
*LANL Juniper-Pinon Field Site*  
*ZERT, MSU, Bozeman, Montana*  
*Southwest Regional Partnership, Kansas*

**Program:**  
*Carbon Storage*