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_2) storage technology as part of the U.S. Department of Energy's program to mitigate anthropogenic emission of CO_2. 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_2 flow in groundwater aquifers through an integrated experimental-simulation approach; (2) characterize multi-phase CO_2-brine flow through faults; and (3) characterize CO_2 storage potential in residual oil zones (ROZs).

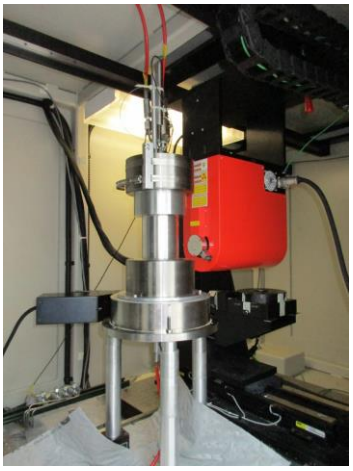

Figure 1: The triaxial coreholder sitting on a rotational stage in front of an x-ray source for collecting computed tomography data. The coreholder can be rotated while at temperature and pressure to allow in situ collection of x-ray radiographs, sample deformation data, and permeability values.

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-Pinion Field Site
ZERT, MSU, Bozeman, Montana
Southwest Regional Partnership, Kansas

Program:
Carbon Transport & Storage

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_2 migration to characterize the impacts of CO_2 and CO_2-dissolved water leakage in groundwater aquifers. Numerical simulations were used to characterize CO_2 storage potential and long-term fate of CO_2 in ROZs.