Geomechanical Monitoring for CO_2 HUB Storage: Production and Injection at Kevin Dome

Award Number: DE-FE0023152

Project Summary:

The goal of this project was to develop and validate an integrated framework for coupled monitoring and modeling data to analyze the geomechanical impacts caused by carbon dioxide (CO_2) injection. Specifically, this project planned to use cost-effective microseismic monitoring and interferometric synthetic aperture radar (InSAR) surface deformation measurements at the Big Sky Carbon Sequestration Partnership's Kevin Dome large-scale injection site to evaluate these technologies' effectiveness. Researchers planned to analyze this data and put it into state-of-the-art coupled modeling and inverse modeling to investigate pore-pressure perturbations and coupled geochemical/geomechanical processes. The framework was expected to provide a cost-effective approach for monitoring surface deformation coupled to injection and the associated microseismic activity, thus providing a mechanism for evaluating reservoir integrity.

Prime Performer:
Montana State University

Principal Investigator:
Lee Spangler

Project Duration:
10/1/2014 – 9/30/2017

Performer Location:
Bozeman, Montana

Field Sites:
Kevin Dome, Montana

Program:
Carbon Storage

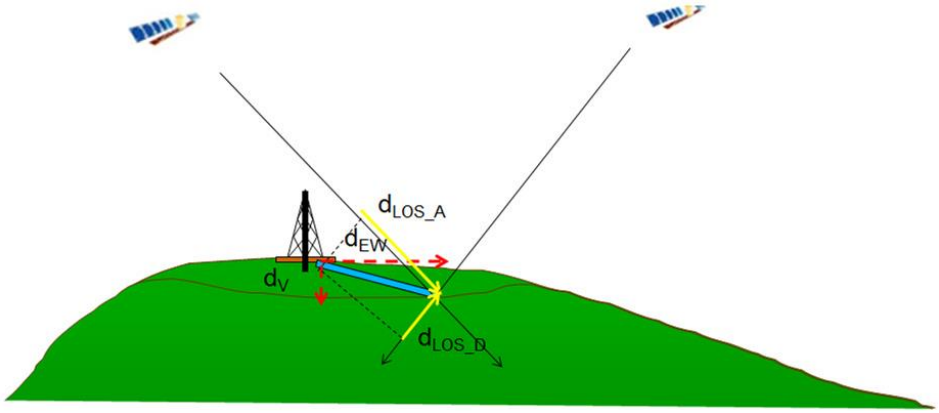

Figure 1: The project used satellite-acquired InSAR from various orbital geometries to determine the surface displacement from CO_2 injection as part of the effort to monitor the CO_2 plume at Kevin Dome.

Project Outcomes:

Researchers performed a historical analysis of InSAR data in the study area that showed subsidence likely related to shallow gas production activities. Pressure perturbation results from a Kevin Dome TOUGH-2 model were coupled into a simplified elastic model to provide predictions of surface deformation after two years of injection from a single well. The model showed radial uplift at measurable levels around the well. Ultimately, this project was cancelled due to the lack of CO_2 injection at the targeted field site.

Presentations, Papers, and Publications

Final Report: ***Geomechanical Monitoring for CO_2 Hub Storage: Production and Injection at Kevin Dome*** (June 2017) Thomas M. Daley, Don Vasco, Jonathan Ajo-Franklin, Laura Dobeck, Lee Spangler, Michelle Leonti