Center for Frontiers of Subsurface Energy Security (CFSES)

**Mission**
To pursue the scientific understanding of multiscale, multiphysics processes to ensure safe and economically feasible storage of carbon dioxide and other byproducts of energy production without harming the environment.

**Achievements**
CFSES integrates experimental data with multi-scale modeling to create and validate new models to understand the geological complexity, variability and uncertainty of processes involved in the underground storage of CO\(_2\). Researchers measured the rate of CO\(_2\) dissolving inside a pore, the impact of mineral surfaces on bacterial survival, and the influence of biofilm formation on the movement of CO\(_2\). In addition, they collected field data that demonstrated carbonate cementation obstructs permeability at the pore scale but not leakage pathways at the field scale. While building scientific leadership through the active involvement of students and post-docs, CFSES developed more accurate and quick modeling tools that incorporate detailed pore-scale information into multi-scale simulations, forecast fracture growth by coupling hydrological and mechanical processes in fractures, and predict large-scale CO\(_2\) storage.