

New Results for CCS Monitoring from GCCC

A long-standing effort of the GCCC is to develop robust methods of monitoring carbon sequestration sites. Two journal articles authored by GCCC staff have recently been accepted for publication, both of which have novel and significant results for monitoring of CO₂ at injection sites.

The paper, "Sensitivity of groundwater systems to CO₂; application of a site-specific analysis of carbonate monitoring parameters at the SACROC CO₂-enhanced oil field" is in press in the International Journal of Greenhouse Gas Control. The GCCC authors are Katherine Romanak, and Rebecca Smyth, Changbing Yang, Susan Hovorka, and Jiemin Lu.

The researchers study a long-running injection site in west Texas called SACROC oil field, which has been subjected to CO₂-EOR for more than 35 years. They carefully characterize the geochemistry of the overlying Dockum freshwater aquifer, and then model a hypothetical CO₂ leak.

Complex natural geochemical process driven by mixing result in dedolomitization (dolomite dissolution with concurrent calcite precipitation) as the dominant geochemical process in the aquifer and produces trends which must be correctly interpreted to avoid false conclusions about CO₂-driven reactions. Dedolomitization is common in many hydrologic systems.

A sensitivity analysis indicates that the concentration of DIC (dissolved inorganic carbon) is a strong indicator of a CO₂ in the modeled environments. The authors suggest that site-specific characterization of an aquifer may not be necessary if DIC is used as the primary monitoring parameter.

Jiemin Lu is lead author on the paper, "CO₂-rock-brine interactions in Lower Tuscaloosa Formation at Cranfield CO₂ sequestration site, Mississippi, U.S.A," published in the Journal of Chemical Geology, which can be accessed online: <http://www.sciencedirect.com/science/article/pii/S0009254111004293#af0025>.

Lu et al. summarize findings from the highly-integrated geochemical experiment at the Cranfield CO₂-EOR (enhanced oil recovery) and sequestration study site in Mississippi. Geochemical results show that mineral reactions in the CO₂ reservoir were minor during the first year of injection of over 1 million tons of CO₂. In contrast to similar field tests, the chemistry of the brine in the reservoir was largely unchanged. This result was consistent with laboratory experiments on fluids removed from the reservoir.

The authors conclude that the rock in the reservoir at Cranfield is composed of minerals that are relatively unreactive to CO₂. Importance of geochemistry is shown to be site-specific, and at this site it not particularly important to prediction of the fate of injected CO₂.