

Geologic Sequestration as a Mechanism for Mitigating Climate Change

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Combustion of fossil fuel releases carbon in the form of carbon dioxide to the atmosphere at a rate much higher than has occurred in the recent past. The impact of these releases is to modify the long-term global heat budget, sometimes referred to as the greenhouse effect. Possible effects of increased retention of solar input into the atmosphere include higher temperatures, increased desertification, increased severity of storms, sea-level rise, change to ecosystems, and broadening the ranges of tropical diseases.

Our team is testing the effectiveness of geologic sequestration, one of the widely accepted options for reducing the release of carbon dioxide to the atmosphere. We are designing and implementing an experiment to inject a small volume of carbon dioxide into a high permeability but nonproductive Frio sandstone for the purpose of closely monitoring performance of the subsurface for accepting and retaining the carbon dioxide. We have completed reservoir characterization of a small compartment and are proceeding to the second phase of modeling. Monitoring will use the injection well and one monitoring well in the injection and monitoring intervals and will include pressure and temperature, cross-well seismic and VSP, geochemistry using natural and introduced tracers, and surface monitoring for CO₂. Monitoring results will be matched to model predictions to demonstrate reliability of these techniques and correctness of the conceptual models.

Ultimately, this experiment will support larger scale projects with potential for cumulative significant reduction in emitted carbon. In the near term, this might include more widespread coupled enhanced oil recovery with sequestration. Eventually, carbon from fossil fuels could be extracted precombustion and sequestered, simultaneously removing all atmospheric emissions.

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