Abstract

Optimization of CO_2 Storage Capacity, Injectivity, and Storage Costs for Large-Scale CCS Deployment & Carbon Dioxide Removal Goals

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Large-scale deployment (i.e. US-wide) of Carbon Capture and Storage (CCS) technology will play a key role in carbon storage removal (CDR) and overall climate mitigation efforts. The economic feasibility of large-scale CCS deployments largely depends on the CO_2 storage costs per project, including capture, transport, and storage. However, the suitability of regional storage and injectivity per project, particularly for large-scale purposes, is not well understood.

This study focuses on two concepts that enhance our understanding of regional storage and injectivity throughout the U.S. The first concept focuses on identifying all potential areas for CO_2 storage within the sedimentary rocks throughout the U.S. based on a novel concept we call the CO_2 Storage Window. The second concept focuses on optimizing CO_2 storage costs by considering the area extent from the pressure built-up caused by CO_2 injection. This area extent is a novel concept we call Pressure Space. Understanding the pressure space of a project helps delineate the area of review for a project and the extent of the pore space required for the project.

The results of this study include a spatial geodatabase and a series of U.S. cohesive, spatial distribution maps showcasing 1) CO_2 storage potential in areas not explored before, 2) cumulative storage capacity per unit area (km^2), 3) injectivity and number of injection wells needed to inject 1 million tons (MMT) of CO_2 a year, 4) Storage costs per CCS project and storage costs per ton of CO_2, assuming a constant maximum storage capacity of 20 MMT per project over a 20 year timeframe. The number of wells per project range from 1 to 19, while storage costs per ton of CO2 range from \$4.7 to \$51.7 per ton of CO_2 (P10 to P90 range)

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