OFFSHORE BASIN ANALYSIS FOR CO2 SEQUESTRATION

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ABSTRACT

Subsurface storage of carbon dioxide is contingent on reservoir and seal performance. This project's objective is to increase confidence in these elements through a unique combination of geologic modeling, flow simulation, and application for prospective offshore reservoirs.

Initially, a novel model of a deltaic system is used to understand fundamental reservoir and seal performance. The model is derived from a well-studied 3D sand pack (XES02) previously created in a controlled tank replicating the formation of a delta. The model was sliced and photographed in dip-oriented inlines and strike-oriented crosslines, and the images were stitched together to form a high-resolution synthetic 3D dataset. The model was populated according to Miocene Gulf of Mexico natural analogues. Using a modified invasion percolation simulator, fluid migration can be visualized to understand the relationship between reservoir architecture, stratigraphy, fluid migration pathways, and resulting saturations. Key stratigraphic heterogeneities affecting migration can be identified, and storage capacity and risk of leakage can be evaluated. Field work conducted in Rangely, CO, will be undertaken to validate the architectural surfaces represented in the model, as well as investigate uncertainties associated with small scale features unaccounted for in the model but recorded in natural analogues. In the second phase, primary observations from the simulation results will be used to conceptualize and anticipate actual subsurface performance, and inform identification and characterization of prospective CO2 storage reservoirs on the inner Texas shelf using existing lower-resolution 3D seismic and well log data. While it is unlikely that the model will represent the prospective reservoirs in detail, the fundamental performance aspects are likely transferrable.

The integrated conclusions will constrain predictions of actual subsurface flow performance and CO2 storage capacity in deltaic systems, while identifying potential leakage risks and primary stratigraphic migration pathways.

AAPG Search and Discovery Article #90298 2016 Grants-in-Aid Projects