PLUME MIGRATION AND PRESSURE EVOLUTION ANALYSES FOR RECOMMENDATIONS IN OFFSHORE CO_2 STORAGE ACREAGE LEASING POLICY

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ABSTRACT

This study inputs extensive geological and petrophysical data into a reservoir simulation to model the CO_2 migration, analyze the plume and pressure distribution and evolution, and link the results to policy recommendations. I built a reservoir model, based on 3-D seismic interpretation of Middle Miocene strata, offshore Galveston, Texas and utilized well logs to characterize key intervals. The modeling investigated how far the CO_2 plume would migrate under two scenarios: injecting CO_2 at the base of the salt withdrawal basin (syncline scenario) and injecting CO_2 at the base of the structural closure (base scenario).

The simulation shows that by injecting the CO_2 into the syncline, we need more acreage to be leased rather than injecting CO_2 at the base of the structural closure for the same amount of CO_2. The reason why syncline mechanism takes more acreage is because the geological layer around the injection point is more heterogeneous than the base scenario, thus making the CO_2 tends to migrate laterally. On the positive side, such mechanism also limits the vertical migration of CO_2, thus making syncline mechanism much less prone for the CO_2 to escape to the upper geological layers. Moreover, the simulation also shows that with syncline scenario, the times needed for the reservoir to reach its stabilized pressure after the end of injections are faster.

Integrating the simulation results and existing policies for offshore CO_2 storage, this study culminates several recommendations for the General Land Office regarding the acreage leasing policies. The main recommendation is to classify of the acreage valuation according to either the heterogeneity degree of the storage geology or the type of the structural closure targeted by the operator. Additionally, it is recommended for the GLO to closely evaluate and if necessary, limit the number of wells and operators for CO_2 storage project operating in one elevated pressure area.

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