Characterizing CO_2 storage reservoirs and shallow overburden for above-zone monitoring in Texas Gulf Coast EOR fields

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Abstract

Enhanced oil recovery (EOR) through carbon dioxide (CO_2) injection provides an excellent opportunity for commercial sequestration of anthropogenic CO_2. A fluvio-deltaic, deep-seated salt dome and a strand-plain, roll-over anticline from the Gulf Coast region are currently under investigation for the design and implementation of monitoring, verification, and accounting (MVA) plans, in coordination with the commercial surveillance of independent, large-volume (>1 million ton/year) CO_2-EOR operations. Characterization with wireline logs demonstrates the vertical extent and areal continuity of reservoir sands and geometries of faults that offset the reservoir. To develop the monitoring plan, we focused on several elements: (i) characterization of the zones above the confining unit for above-zone pressure monitoring, (ii) collection and development of input data for 'quick-look' dynamic modeling of CO_2 plume extent and pressure elevation, and (iii) identifying intersections of faults with wellbores in intervals above the regional confining unit for thermal monitoring. Other uncertainties addressed during characterization are the upper extent of faults and the juxtaposition of layers to assess the potential for cross-fault fluid migration. Successful use of such techniques for MVA, based on uniting elements of existing regulatory monitoring expectations, would lead to the establishment of commercial best practices for effective and rapid characterization of EOR sites in the Gulf Coast region.