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Structural Controls on Leakage from a Carbon Dioxide Reservoir in Southeastern Utah, U.S.A

Natural carbon dioxide reservoirs in the Colorado Plateau provide analogues for studying factors that influence CO₂ sequestration systems. The risk of significant leakage along faults is a potential concern for CO₂ sequestration. A regional scale study of a presently leaking reservoir is underway in the northwestern Paradox Basin, southeastern Utah. The reservoir contains a west-north-west trending set of clay-rich normal faults that cut siliclastic sediments folded into an open, gently north plunging salt-cored anticline. A CO₂-charged geyser and springs, hydrocarbon seeps and travertine deposits localised along the fault traces indicate active fluid flow along these faults from at least the Pleistocene onwards. Leakage is confined either to the immediate footwall where the fault cuts the anticline crest, or to locations where uncapped wells have penetrated the reservoir. Three-dimensional modelling is being employed to understand the effects of faults on fluid migration in the regional system. The models are constructed using interpreted well logs and field maps. Preliminary results indicate that CO₂-rich fluids migrated up-dip towards the crest of the anticlines and pooled in structural highs where top seals were provided by overlying shales and a lateral barrier provided by clay-rich fault zones. Leakage is focussed around zones of structural complexity and at favourable sedimentary juxtapositions created by the faulting. This work aims to quantify the size of the reservoir source and estimate the proportion of fluids that continue to leak from this system.