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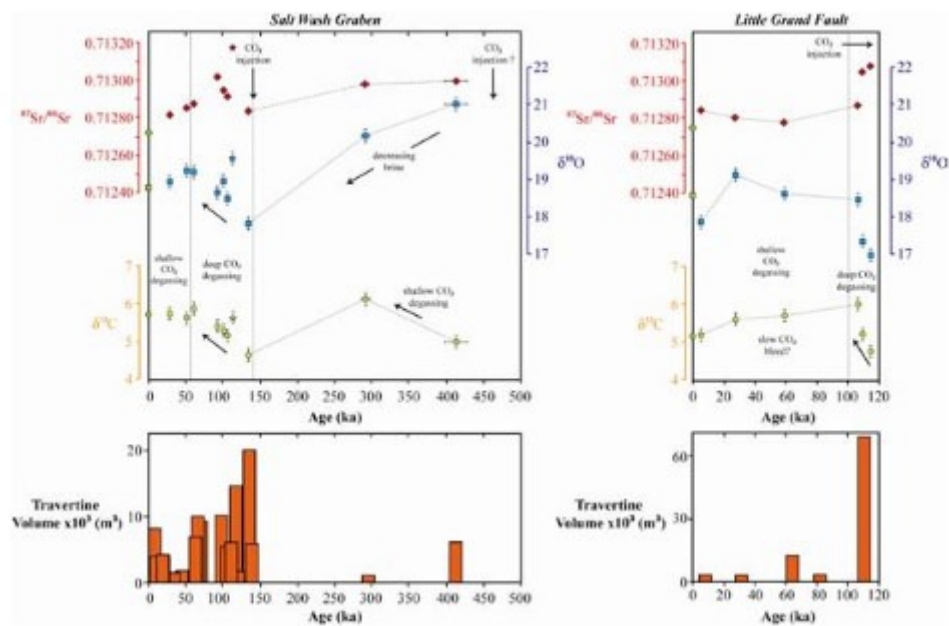
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# Coupled CO<sub>2</sub>-leakage and in situ fluid-mineral reactions in a natural CO<sub>2</sub> reservoir, Green River, Utah

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Surface travertine deposits and carbonate veining within the footwall of Little Grand Fault and Salt Wash Graben, Utah, record a 413 ka history [1] of CO<sub>2</sub> leakage [2]. Isotopic analysis of U-series dated carbonate veins reveals a coupling between CO<sub>2</sub> injection into the host aquifer and the rates of surface leakage, CO<sub>2</sub>-promoted silicate mineral hydrolysis reactions within the reservoir [3] and carbonate deposition within fracture conduits through which CO<sub>2</sub>-charge fluids ascend to the surface (Fig. 1). Rapid carbonate precipitation rates, recorded in the kinetic fractionation of  $\delta^{13}\text{C}$  HCO<sub>3</sub> and  $\delta^{18}\text{O}$  HCO<sub>3</sub>, reflect an increase in in situ p CO<sub>2</sub> which elevates concentrations of Ca<sup>2+</sup> and HCO<sub>3</sub><sup>-</sup>, lowering the point at which the ascending fluid reaches carbonate supersaturation due to CO<sub>2</sub> degassing. The spatial and temporal relationship of travertine deposition to CO<sub>2</sub> injection, suggests that rapid rates of carbonate deposition initially plug easily exploited leakage pathways causing leakage sites to propagate laterally, but that this blocking rate decreases with dissipation of the CO<sub>2</sub> charge. This has important implications for the prediction of leakage behaviour in storage sites and for modeling the coupling of subsurface geochemical processes to the evolution of surface leakage.



[1] Burnside et al. (2009) in *Faults & Top seals*, EAGE. Montpellier, France.

[2] Dockrill et al. (2010) *J. Struc. Geol.* in press

[3] Kampman et al. (2009) *Earth Planet. Sci. Lett.* 284, 473–488.

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