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Deep crustal CO_2 fluxes in Jordan and their various geological manifestations

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Extensive recent investigations by the author of surfical vein deposits, apparent caliche, crusts and other secondary carbonate materials as well as groundwater have been conducted. These studies show that the seepage has a profound effect on surface features, geomorphology and groundwater quality. Moreover, a better understanding of global CO_2 fluxes can be achieved through the quantification of deep sourced carbon which is possible through the study of the Jordanian case.

In the Precambrian basement of southern Jordan, veins of carbonate are growing within an alteration zone of rhyolite. The alteration and the carbonate has been attributed to near surface geochemical processes under ambient atmospheric conditions.

In the area of Petra in southern Jordan, extensive veins, near-surface crusts, and pedogenic growths in loose surficial deposits within the Palaeozoic sandstones have been linked to interaction of the same deep sourced carbonate with entrapped water in near-surface sediments and soils. Similar veins and crusts, in addition to other alteration products have been studied in the Lower Cretaceous sandstones of Wadi Kaniseh in central Jordan as well.

In the Upper Cretaceous limestone terrain of northern Jordan, surfical deposits previously described as caliche are ubiquitous. Preliminary investigations of their field relationships, petrography and stable isotopic compositions suggest that these too may have been deposited as a result of deep sourced carbon.

The deep groundwater aquifers in southern and central Jordan have been highly influenced by carbon dioxide fluxes that have greatly influenced the chemical quality of the water. The implications of this discovery in terms of carbon capture and sequestration (CCS), water quality, and geoarchaeology will be discussed.