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Carbonate Crusts in Jordan: Records of Groundwater Flow, Carbon Fluxes, Tectonic Movement and Climate Change

Authors : Nizar Abu-Jaber

Abstract : Late Pleistocene and Holocene carbonate crusts in the south of Jordan were studied using a combination of field documentation, petrography, geochemical and isotopic techniques. These surficial crusts and vein deposits appear to have formed as a result of interaction between near-surface groundwater, surficial soil and sediments and rising carbon dioxide. Rising mantle CO2 dissolves in the water to create carbonic acid, which in turn dissolves the calcite in the soil in the sediments. When the pH rises later due to degassing, the carbonate crusts are left in the places where the water was flowing in veins, channels and interfaces between high and low permeability materials. The crusts have the potential for being important records of natural and human agencies on the landscape of the area. They reflect the isotopic composition of the waters in which they precipitated in, and also contain isotopic information about the aeolian calcium fluxes affecting the area (using strontium isotopes). Moreover, changing stream valley base levels can be identified and measured, which can help quantify the rates of tectonic movement. Finally, human activities such and channel construction and terrace building can be identified and traced temporally and spatially using these deposits.

Keywords : anthropogenic change, carbonate crusts, environmental change, Jordan
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