

Geochemical study of the alteration processes affecting carbonate materials at the Nerja cave site (Malaga, S. Spain)

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RIASSUNTO – Col fine d'identificare e valutare i processi d'alterazione che hanno interessato i materiali carbonatici della grotta di Nerja è stato realizzato uno studio geochimico (isotopico, mineralogico, chimico: elementi principali, minori od in traccia) dei suddetti materiali. I risultati geochimici indicano un basso grado di alterazione, che si mostra, occasionalmente, come croste di alterazione nelle quali si rilevano arricchimenti di Fe e Mn e perdite di Sr. Per altro in queste croste appaiono minerali secondari (gesso, ankerite, mica e idromagnesite) che possono essere considerati come prodotti della alterazione. I valori isotopici $\delta^{14}\text{C}$, $\delta^{18}\text{O}$ ottenuti concordano col differente grado d'alterazione, mineralogia e composizione chimica dei materiali studiati.

Termini chiave: processi d'alterazione, carbonate, geochimica isotopica.

ABSTRACT – A geochemical study (mineralogy, main and trace elements, isotope analysis) of the carbonate materials forming the Nerja cave was carried out in order to determine and evaluate the alteration processes affecting these materials. The geochemical data obtained indicate that the degree of alteration is slight, manifesting itself in some of the samples studied by the presence of alteration crusts; some of which have a dusty appearance. An increase in Fe and Mn and a decrease in Sr was detected in these crusts, as were secondary minerals (gypsum, ankerite, mica and hydromagnesite), which are probably a result of alteration processes identified in the surface parts of the samples studied. The isotope values of $\delta^{14}\text{C}$ and $\delta^{18}\text{O}$ obtained are in agreement with the different degrees of alteration, mineralogy and chemical composition of the materials studied.

Key Words: alteration, carbonates, isotopic geochemistry processes.

1. Introduction

Chemical degradation processes in karst cavities are difficult to observe and quantify when time intervals are relatively short. However, study of the geochemical variation of cave-forming materials, together with the relevant physical and chemical parameters, enables the degree of alteration of these materials to be determined.

Chemical degradation processes of carbonate rocks are usually associated with an increase in the insoluble residue and the content in anions from environmental pollution. However, the insoluble residue is only evident in the samples that have undergone alteration processes significant enough to dissolve the carbonates, leaving the clay fraction, quartz grains, etc. unaltered.

Study of the alteration of such materials from a mineralogical viewpoint is