Chemical analysis of rare earth elements used to learn about prehistoric human activity

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Credit: Asociacion RUVID

The research group led by Gianni Gallello, from the Department of Prehistory, Archaeology and Ancient History of the University of Valencia, has used the analysis of rare earth elements for the first time to find human activity in a prehistoric cave. Through the analysis of the

archaeological strata, with chemical methods, it has been possible to interpret the occupation and uses of the Cocina Cave (Dos Aguas). Previously, the ArchaeChemis group tested it in deposits in Ethiopia and Tanzania.

Rare earth elements are common chemical elements in the Earth's crust whose importance as a strategic resource has been growing in recent years, since they are essential for the development of new technologies. Gianni Gallello, the first signatory of the work, specializes in the analysis of the use of rare soils as an indicator of human activity.

A multidisciplinary team led by Gallello, made up of researchers from the Department of Prehistory, Archaeology and Ancient History and the Department of Analytical Chemistry (ArchaeChemis), together with specialists from the British Geological Survey and the University of California (Santa Barbara), has used for the first time the analysis of these elements to study human activity in a prehistoric site.

"To determine these elements, mass spectrometry has been used from samples taken from archaeological sediments, digested with an acid solution, to later be able to study their proportions and concentrations," explains Gallello. This analysis in archaeological deposits has been developed within the framework of the multidisciplinary unit ArchaeChemis during the last 10 years and has been tested in Ethiopia, Tanzania or the Vall del Serpis (Alicante).

The study, published in Boreas, one of the most important international scientific journals in Quaternary research, addresses information from a prehistoric site, Cocina Cave (Dos Aguas), recently excavated by the University of Valencia and the SIP (Museum of Prehistory of València) under the direction of Oreto García Puchol, Sarah McClure and Joaquim Juan Cabanilles. The long sequence of human presence (8,500—4,000 BC) includes mainly evidence of activities related to hunting, gathering

and ranching.

"In this study, rare soil elements and stratigraphic information were used together with other archaeological markers. Thus, the concentrations and proportions of these elements are very consistent with the archaeological interpretation. Our studies show that lands can be very useful in identifying whether the formation of soils or archaeological strata is related to natural processes or anthropic activities," says Gianni Gallello, previously distinguished in the Marie Curie program at the University of York.

More information: Gianni Gallello et al. Analysis of stratigraphical sequences at Cocina Cave (Spain) using rare earth elements geochemistry, *Boreas* (2021). DOI: 10.1111/bor.12530

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