



New perspectives for ^{14}C dating of parietal markings using CaCO_3 thin layers: An example in Nerja cave (Spain)



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ABSTRACT

For the first time direct ^{14}C dating was undertaken on two black parietal marks in Nerja cave (Malaga province, Southern Spain). Analyses were conducted on charcoal splinters (conifer wood) from the marks but also on the carbonate deposits underlying and overlying one of them.

The satisfactory correlation between the ages of the black marks and those of the carbonate deposits validates the use of ^{14}C to date these two materials in Nerja and other decorated caves. The ages of the two marks fall in the same time range, between 20,000 and 18,000 years cal BP, evidencing human presence during the Early Magdalenian period in the upper galleries of Nerja cave.

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1. Introduction

Nerja cave, located in the district of Maro (Nerja, Málaga), is one of the largest decorated caves in Southern Spain. The opening of the cave is 940 m from the current coastline and 158 m above sea level on the south-western flank of the Sierra Almijara. The cave is situated in dolomitic marble from the Triassic belonging to the Alpujarra Complex of the Baetic Ranges. The cave's surface area is approximately 35,484 m² and its length reaches 4843 m. Its UTM coordinates are 30S VF26, x = 424.695, y = 4.069.025 (Carrasco et al., 1998) (Fig. 1).

The outermost chambers where systematic excavations were undertaken from 1960 and 1987 contain a wide range of quaternary clastic deposits with various sedimentary sequences, encompassing several human occupations dated to the Upper Palaeolithic (from the Gravettian and Solutrean to the Upper Magdalenian periods). The top of the sequence includes Neolithic and Chalcolithic layers (4830–3600 cal BP) (Jordá and Aura, 2009; Jordá et al., 2011; Sanchidrián and Márquez, 2005).

The interior galleries, on which this study focuses, were also repeatedly used by prehistoric societies and manifold indications of human activity have been recorded, consisting of >500 graphic manifestations including animals, signs and other remains of painting. Numerous archaeological materials such as flint tools, bone fragments, nodules of

ochre and, above all, charred plant remains are present in the soil. Some anthropic modifications of the karstic morphology can also be observed. According to C14-AMS analyses of charcoal fragments sampled on the soil, human occupation in these galleries spanned a lengthy period, from 40,695 to 5970 cal BP (Medina-Alcaide and Sanchidrián, 2014; Medina-Alcaide et al., 2015). The parietal representations located both in the lower and the upper parts of the galleries include mainly drawings and marks made with red, yellow and black pigment. First listed and carefully described by Sanchidrián (1994), these representations and their archaeological and geomorphological contexts are currently being intensively studied by Sanchidrián and his team.

In order to obtain chronological information on the periods when the parietal art was produced, a General project for Interdisciplinary Research on Nerja Cave (Proyecto General de Investigación Interdisciplinar de la Cueva de Nerja) was launched in 2012, in collaboration with the Laboratoire des Sciences du Climat et de l'Environnement (LSCE/IPSL, France). The objective of this project was to use ^{14}C and uranium/thorium dating to assign a chronological time frame to the wall markings and to relate it to the periods of Palaeolithic occupation in the inner and outermost galleries.

In this article focusing on the upper galleries, we used the radiocarbon method to date black marks, which are encompassed between two secondary carbonate layers. One layer is located on the limestone wall below the marks and the second is deposited above them. The radiocarbon method was used to date both the charcoal splinters sampled on the marks and the two calcite layers situated above and below the

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