U/TH AND ^{14}C CROSSDATING OF PARIETAL CALCITE DEPOSITS: APPLICATION TO NERJA CAVE (ANDALUSIA, SPAIN) AND FUTURE PERSPECTIVES

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ABSTRACT. [14]C and U/Th methods were used to date three thin carbonate layers deposited on decorated walls of Nerja Cave (Malaga, southern Spain) in order to constrain the age of the parietal non-figurative marks situated under these carbonate layers. Modern formations were also dated to estimate the detritic contribution for the U/Th method and the dead carbon proportion for ^{14}C dating. We sampled two locations with ocher painting marks. In one case (mark 1), the good agreement between the ages obtained by the two methods suggests that the sample was not subjected to post-deposition alteration and that the results are reliable. In the other case (mark 2), the age discrepancy between the two methods reached 30,000 yr, indicating that geochemical alteration had affected the sample and that one or both results were inaccurate. The ages for mark 1 indicate that this type of non-figurative representation is older than 25,000 cal BP and that it can be associated with the oldest attested Paleolithic occupation of Nerja Cave.

INTRODUCTION

Nerja Cave (Nerja, Malaga, southern Spain), discovered in 1959, is a large cavity (surface of ca. 35,484 m^2 and length of ca. 4843 m) located in the southern part of the Iberian Peninsula. Between 1960 and 1987 excavations in the outer galleries revealed a long Upper Palaeolithic sequence including layers attributed to the Gravettian, the Solutrean, and the Magdalenian cultures. Numerous archaeological materials such as flints, bones, ocher fragments, and charred plant remains were found on the floor of the inner galleries. These galleries contain many examples of parietal art: 32 figurative motifs (horses, deer, ibex, and undefined quadrupeds), 254 signs and 263 stained speleothems (Sanchidrián 1994, 1997, 2001). Radiocarbon (^{14}C) analyses were done on archaeological samples found during excavations to establish the periods of human occupation within the cave (Jordá and Aura 2008, 2009) but in the absence of direct dating, the chronology of the parietal art still remains problematic since the majority of Palaeolithic paintings were made with red pigment, especially the graphics located in the inner galleries.

Scientific investigations have been carried out since 2008 by Sanchidrián and his team to study the periods of Palaeolithic occupation of the inner galleries and to connect them with the chronology of the parietal art and the geomorphological evolution of the cave. In 2012, a research program was run by Cordoba University and the *Fundación Cueva de Nerja*, in collaboration with the Laboratoire des Sciences du Climat et de l'Environnement, to develop protocols to date the parietal representations (Quilès et al. 2014). At present, a thin

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