euro karst 2022

IACT INSTITUTO ANDALUZ DE CIENCIAS DE LA TIERRA

MICROSTRATIGRAPHIC ANALYSIS OF A SPELEOTHEM FROM THE NERJA CAVE (MÁLAGA, SOUTHERN SPAIN)

C. Jiménez de Cisneros [1], G. Loncomilla [1], A. González-Ramón [2] and C. Liñán-Baena [3,4]

1 Instituto Andaluz de Ciencias de la Tierra (CSIC-UGR), Avd. de las Palmeras 4, 18100 Armilla, Spain

2 Instituto Geológico y Minero de España, (CSIC) Urb. Alcázar del Genil, 4. Edf. Zulema bajo, 18006 Granada, Spain

3 Fundación Cueva de Nerja, Instituto de Investigación, Carretera de Maro, s/n, Nerja, 29787 Malaga, Spain

4 Departamento de Ecología y Geología, Facultad de Ciencias, Universidad de Málaga, Campus de Teatinos s/n, 29071 Malaga, Spain

Abstract

A microstratigraphic-petrographic characterization of the carbonate fabrics and textures is presented, as well as the type of fluid inclusions of a calcitic-aragonitic stalagmite from the Cueva de Nerja (Málaga, southern Spain). The microstratigraphic analysis allows to identify and characterize the stratigraphic elements and limiting surfaces. Primary fluid inclusions recognized contain the drip water that fed stalagmite at the time of crystal growth and are intercrystalline and intracrystalline.

GEOGRAPHIC AND GEOLOGICAL CONTEXT

The study was carried out on a fragment of a speleothem (NE) from the Nerja Cave (Málaga), of the Columns of Hércules hall, in the High Galleries (Fig.1). The Nerja Cave is developed on dolomitic marbles (Middle Triassic), very diaclastic and with a saccharoidal aspect in some areas.

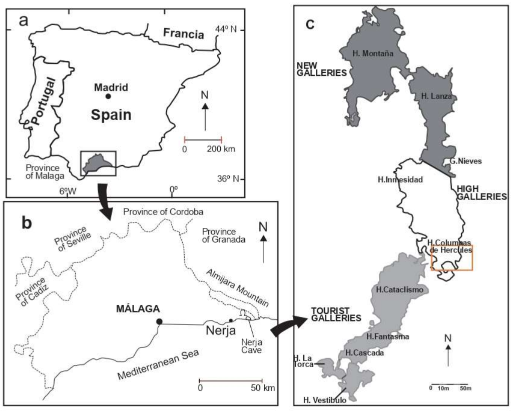

Fig.1 Geographical location of the Nerja Cave.

Fig.2 Stalagmite NE of the Nerja Cave (Columns of Hércules hall, high galleries).

The analyzed speleothem (stalagmite NE, length 17.9 cm and diameter of ~5 cm), presents a blackened crust that partially covers it (Fig. 2). Seven thin slides were made covering the entire growth of the speleothem, to carry out the petrographic study.

RESULTS AND DISCUSSION

The stalagmite is formed mainly by aragonite and calcite. In general, the lamination is continuous and of small thickness. The blackened crust corresponds to an irregular contact and consists of a thin film with brown minerals (iron oxides and clay, Fig. 3A). There is a replacement of aragonite by calcite (Fig. 3B). The aragonite occurs as acicular crystals (Fig. 3C). The columnar, compact and fibrous textures are been recognized (Fig. 3D, 3E and 3F). The fluid inclusions observed are mainly associated with columnar textures and were formed during the speleothem growth phases, so they are considered primary and the water they contain comes from the original dripping Elongated and spherical primary inclusions have been distinguished (Fig.4A) and boudin, pyriform, thorn shaped and down (Fig.4B, 4C an 4D).

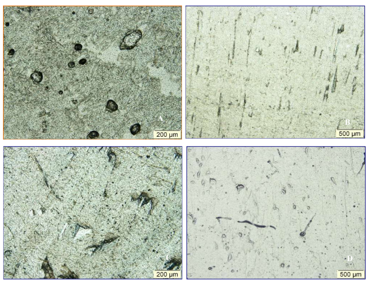

Fig.4 Fluid inclusions.

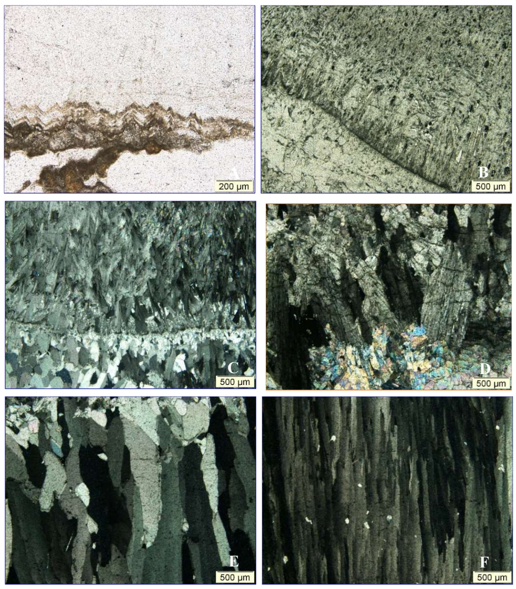

Fig. 3 Stalagmite NE thin sections photomicrographs.

Conclusions

Microstratigraphic characterization of speleothems allows better planning of geochemical sampling to obtain better paleoclimatic results. The textural analysis of the stalagmite provides information on the possible dripping conditions that existed during the stages of its formation, and allows us to recognize the most favorable zones to obtain more reliable paleoclimatic data since they are related to equilibrium conditions.

It can be deduced that the formation of this stalagmite took place in changing environmental conditions, with alternating warm and humid episodes, reflected in the columnar calcite fabrics, and other colder and drier episodes related to the presence of micritic fabrics.

Acknowledgements

This work has been carried out within the project Contract Technological Support between the CSIC (IACT) and the Nerja Cave Foundation *"Speleothems and archaeological records of the Nerja Cave as indicators of paleoclimatic and paleoenvironmental change"* (2018-2021).

GOBIERNO DE ESPAÑA MINISTERIO DE CIENCIA E INNOVACIÓN FECYT INNOVACIÓN CSIC CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS UNIVERSIDAD DE GRANADA