



Decoding the climatic signal recorded in speleothems from La Cova del Drac in Mallorca

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Cova del Drac, situated on Mallorca Island, is one of the most frequented caves in Europe. During the late 19th century, pioneering explorers developed initial naturalistic expeditions and topographic studies. Nevertheless, it was not until the period between 1922 and 1935 that adaptation work was developed, leading to the establishment of permanent pathways, including the installation of the first lighting system. The two speleothems presented in this study were growing beyond these anthropogenic structures allowing a geochronological control into their initial growth.

The examination of confocal laser scanning microscopy images of these two speleothems revealed distinct fluorescence banding, pointing to seasonal growth patterns. Additionally, high-resolution trace element profiles, acquired using LA-ICP-MS, reveal geochemical cycles reflecting the impact of seasonal cave ventilation on the trace element signatures within the speleothems. Through the combination of annual fluorescence layer counting, analysis of trace element cycles, and the adjustment with the ¹⁴C bomb peak as a tie point, well-resolved age models spanning certainly the past century have been achieved.

This study establishes a robust framework by correlating the speleothem geochemistry results with cave monitoring and meteorological data. This exercise discerns the influence of the cave atmosphere seasonality from the hydrological and regional climatic signal across longer time scales. Consequently, this study validates the geochemical signal recorded in Mallorca cave speleothems as a reliable indicator of climatic variability in the western Mediterranean region.