



## **High-resolution petrographic and synchrotron XRF investigation of Late Pleistocene to Holocene calcite coralloid speleothems**

Valentina Vanghi (1), Andrea Borsato (1), Silvia Frisia (1), Daryl Howard (2), Gertruida Gloy (3), John Hellstrom (4), and Petra Bajo (4)

(1) The University of Newcastle, Earth Sciences, Australia (valentina.vanghi@uon.edu.au), (2) Australian Synchrotron, Clayton, VIC 3168, Australia, (3) Bruker Nano Analytics, Darra, QLD 4076, Australia, (4) School of Earth Sciences, The University of Melbourne, Parkville, Victoria, 3010, Australia

Coralloids are speleothems characterized by botryoidal morphology and curved internal structure. Due to their small dimensions (usually < 2 cm), they have been rarely considered for paleoclimate reconstructions, although their ubiquitous presence in caves. However, the recent availability of high-resolution petrographic and analytical techniques unlocks their potential use in paleoclimate studies, with enormous advantage for the cave environmental preservation when compared to the conventional stalagmite sampling.

Here we present a high resolution petrographic and Synchrotron Radiation based micro X-ray fluorescence (SR- $\mu$ XRF) study of calcite coralloids from Lamalunga cave in Southern Italy. (40°52'N 16°34'E, 508 m a.s.l.). The cave opens near the town of Altamura at ca. 50 km from the Adriatic Sea, where the climate is Mediterranean with mean annual precipitation between 500 to 800 mm.

The SR- $\mu$ XRF elemental mapping of Late Pleistocene and Holocene coralloids revealed an exceptionally high concentration of Mg, Sr and Si, especially in correspondence of the curved surfaces. Evaporation, that is especially intense at the tips of the coralloids, is likely responsible for Sr concentration, which is in average 70 times greater than commonly expected for spelean calcite. Similarly, Mg is 8 to 15 times more concentrated.

In Lamalunga coralloids, two predominant types of calcite fabric have been recognized: elongated columnar, and fiber-like columnar. These two fabrics and their elemental concentration are indicative of different hydroclimatic conditions. Elongated columnar is characterised by low Sr and Mg and forms clean, translucent, isopachous bands during wetter periods, when evaporation is reduced and water supply in form of hydro-aerosols is predominant. Fiber-like columnar is characterised by high Sr and Mg and forms opaque, porous and laminated lenticular bands rich in impurities (Si, organic compounds, bacteria, detrital particles etc.) during drier periods, when evapo-concentration is enhanced.

### References:

Vanghi, V., Frisia, S., Borsato, A., (2017). Genesis and microstratigraphy of calcite coralloids analysed by high resolution imaging and petrography. *Sedimentary Geology*, 359: 16-28.