

Comparative study of Messinian fossil stromatolites and modern analogs from Sardinia: deciphering paleogeobiological archives

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The unexpected discovery of stromatolites, ie macroscopically laminated carbonate rocks formed by diverse microbial communities, in small coastal ponds in Western Sardinia [1] provides new keys to understand the formation of modern microbialites in a lagoon environment. This kind of environment is extreme since it seasonally experiences severe evaporation and hence broad variations of salinity from seawater-like to hypersaline conditions. Some authors have suggested that fossil stromatolites of the Messinian period (~ 6 Ma ago), a time when the Mediterranean Sea extensively evaporated, experienced similar environmental conditions [2]. However, this remains debated. We believe that information about paleoenvironmental conditions typical of this kind of environment can be recorded by these rocks. Therefore, our objective is to compare the chemical and mineralogical composition of stromatolites formed in the Messinian with modern stromatolites from Sardinia.

I will present my PhD research project aiming at studying the mineralogy, chemistry, and microstructures of modern and fossil stromatolites from the macro- to the nano-scale. Several analyses have already been carried out: bulk X-ray diffraction (XRD), optical microscopy, confocal laser scanning microscopy (CLSM) and scanning electron microscopy (SEM) coupled with elemental analysis by energy dispersive X-ray spectrometry (EDXS). Some auto-fluorescence has been detected in the modern stromatolites with spatial variations in its spectral properties. The origin of this fluorescence could be organic and/or mineral. More in-depth analyses, including fluorescence lifetime microscopy (FLIM), will be used in correlation with other micro-analyses to better understand what paleoenvironmental and/or paleobiological information is carried by these fluorescence properties.

References

[1] - J.P. Saint Martin and S. Saint Martin, *Saint Martin S. GeoEcoMarina* **21**, 35-53 (2015a)

[2] - E. Perri, L. G. Chanu, A. Caruso, M. Cefal, G. Copelliti, M. Tucker, *Marine and Petroleum Geology* **88** 235-250 (2017)