High-spatial resolution imaging of the distribution and inter-element correlation of metals in modern and ancient stromatolites

M.C. SFORNA[1]*, P. PHILIPPOT[1], M. VAN ZUILEN[1], A. SOMOGYI[2], K. MEDJOUBI[2], P.T. VISSCHER[3] AND C. DUPRAZ[3]

[1] Institut de Physique du Globe de Paris, Sorbonne Paris Cité, Paris, France (*correspondence : sforna@ipgp.fr)
[2] Synchrotron Soleil, Saint-Aubin, Gif-sur-Yvette, France
[3] Department of Marine Sciences, University of Connecticut, Groton, Connecticut, USA

Metals, which are widely used by all microorganisms, could act as indicators in the rock record of past microbial activity if we are able to distinguish between biological uptake and late stage contamination associated with diagenesis. Here we present the results of the study of the distribution, inter-element correlation and speciation of trace metals in modern and ancient stromatolites from Big Pond, a hypersaline lake in the Bahamas and the 2.7 Ga-old Tumbiana formation in Western Australia. Results were obtained using synchrotron-based techniques.

In a cm-scale drill core of an extant stromatolite from the Bahamas, the Fe, Ti, Zn, Cu and As contents in the organic fraction of the stromatolite structure increase with depth. We attributed this to metal uptake during early diagenesis. Both in the Bahamas and in the Tumbiana stromatolites, high-spatial resolution imaging at different scales (from the cm- to the nm-scale) reveals different types of metal distribution and inter-element correlations. Although most of the metal enrichments are of diagenetic origin, the occurrence of specific species in isolated organic structures that are preserved in the core of the stromatolite domes most likely reflects remains of past biological activity.

Insights of the Mt. Etna volcanic activity through multiparametric data recorded by the NEMO-SN1 seafloor observatory

T. SGROI*, M. DE CARO, N. LO BUE AND P. FAVALI

Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy

In the last years the use of seafloor observatories improves the possibility to perform long-term monitoring in abyssal area as far not easily accessible, interested by geophysical processes like volcanism, seismicity or fluid emissions. Presently many programmes to establish permanent underwater networks are launched at global scale (e.g., EMSO in Europe, OOI in USA, NEPTUNE in Canada and DONET in Japan). Recently, a multidisciplinary approach has proven to be a very important tool in the monitoring of volcanic areas. In fact, the different instruments hosted in the seafloor observatory permit to perform multidisciplinary analyses, better focusing on the dynamics of volcanic system.

In the Italian territory, the NEMO-SN1 seafloor cabled observatory is running in the Western Ionian Sea at a depth of 2100 m, about 25 km off-shore Eastern Sicily, as node of EMSO infrastructure (http://www.emso-eu.org). Eastern Sicily is of great scientific interest, due to the proximity to seismogenic structures which originated the most destructive earthquakes of the area and to Mt. Etna. The underwater observatory fills the gap in the off-shore sector of the Mt. Etna, focusing on its deeper feeding system. SN1 was able to record also the low-frequency seismic signals linked to Etna volcanic activity, as the volcanic tremor associated to the 2002-2003 eruptive activity. In this work, the joint analyses of seismological, gravimetric and oceanographic data are used to highlight the dynamics of Mt. Etna. The inferences of background noise from volcanic activity and ocean processes are investigated through the cross-analyses of different kind of geophysical data to improve the confidence of volcanic hazard assessment.

www.minersoc.org
DOI:10.1180/minmag.2013.077.5.19