Geophysical Research Abstracts
Vol. 17, EGU2015-8845, 2015
EGU General Assembly 2015

Microbial mat mineralization in Great Salt Lake (Utah, USA)

Aurélie PACE (1,2), Anthony Bouton (3), Raphaël Bourillot (1), Emmanuelle Vennin (3), Pieter Visscher (4), Christophe Dupraz (4), Christophe Thomazo (3), Galaup Serge (1), Leleu Sophie (1), Kwasniewski Anna (5), Pigot Léa (1), and Franceschi Michel (1)

(1) EA 4592 Géoressources et Environnement, ENSEGID, 1 allée Daguin 33607 Pessac Cedex, France. aurelie.pace@ensegid.fr, (2) Université Bordeaux 3, Domaine Universitaire, 33607 Pessac, France, (3) Laboratoire Biogéosciences UMR uB/CNRS 6282 Université de Bourgogne, 6 boulevard Gabriel, 21000 Dijon, France., (4) Department of Marine Sciences, Center for Integrative Geosciences, University of Connecticut, 1080 Shennecossett Road, Groton, CT 06340, USA., (5) Total, Avenue Larribau, 64018 Pau, France.

Great Salt Lake is located in the Basin and Range province of Utah (USA). Its average surface is 4480 Km2 and its maximum depth is of about 15m. It is a partly rainfed endorheic hypersaline lake (average salinity: 140g/L). Due to the high salinity, little or no grazing organisms are present, favoring the development of microbialites that cover the margin of the lake.

This work aims to understand the products and processes of mineralization in recent and modern microbialites on the western margin of Antelope Island. The distribution of microbialites and their morphology has been studied along lakeshore to center transects, showing a contrasting spatial distribution in bay versus headland. Fossil microbialites show a great diversity of macro- and microfabrics, some microbialites being essentially built by microbial-mediated carbonate precipitation, while other show the predominance of trapping and binding processes.

The nature and composition of the microbial carbonates have been determined through polarizing, cathodoluminescence, reflected fluorescence microscopy, X-Ray diffractometry and isotope geochemistry (δ 18O and δ13C) in order to investigate the preservation of environmental signals in microbialites. Petrophysics analysis such as permeability and porosimetry, have been done to observe the structure of the microbialite.

Microprobe and silver foils method have been used respectively to characterize oxygen production and sulfate reduction in living microbial mats. Mineralization zones seem to coincide with sulfate reduction hotspots. This mineralization results in mixed clotted-laminated fabric at the macro- and microscale.

Several analysis such as Cryo-SEM, environmental SEM and raman spectroscopy three phases of mineralization allowed us to distinguish three type of minerals inside the mat: (1) a Mg and Si-rich clay developing on the organic matrix; (2) an intracellular Al-rich clay. (3) aragonite clots replacing the organic matrixes and embedding bacteria. The origin these three mineral types will be discussed.

These results shed a new light on the understanding of the Great Salt Lake sedimentary system.