

## **Structure and dynamics of a basalt hosted subsurface microbial consortium facing CO<sub>2</sub>-rich groundwater in an analogous flow-through experiment**

A. LECOEUVRE<sup>1</sup>, R. L. MOORE<sup>1</sup>, L. LECOURT<sup>1</sup>, B. MÉNEZ<sup>1\*</sup>,  
A. RANCHOU-PEYRUSE<sup>2</sup>, M. RANCHOU-PEYRUSE<sup>2</sup>, S.  
DUPRAZ<sup>3</sup>, S. STÉPHANT<sup>3</sup> AND E. GÉRARD<sup>1\*</sup>

<sup>1</sup>IPGP, 1 rue Jussieu, 75238 Paris cedex 05, France  
(lecoeuvre@ipgp.fr, moore@ipgp.fr, lecourt@ipgp.fr)

(\*correspondences: menez@ipgp.fr, emgerard@ipgp.fr)

<sup>2</sup>EEM – IBEAS, campus universitaire, 64013 Pau cedex, France  
(anthony.ranchou-peyruse@univ-pau.fr, magali.ranchou-peyruse@univ-pau.fr)

<sup>3</sup>BRGM, 3 avenue Claude Guillemin, 45060 Orléans, France  
(s.dupraz@brgm.fr, S.Stephant@brgm.fr)

Study of microbial communities inhabiting hard rocks has gained momentum as they may represent up to 19% of Earth's biomass [1]. In these environments, microorganisms participate to inorganic and organic compound transformations and thereby are relevant contributors in biogeochemical processes. At this time, relationships between geochemical and mineralogical changes in the subsurface and the reactivity of microbial community remain widely unknown.

In order to investigate interplays between hard rocks and their inhabitants, a microbial consortium from a deep basaltic aquifer in Iceland was enriched. This aquifer experienced recent anthropogenic CO<sub>2</sub> injections [2] and was subsequently cored to study reactions at depth (i.e. 400-600 mbs) (DOE award number DE-FE0004847, PI: J. Matter, Columbia Univ.). The microbial consortium grown in various media served as inoculum for an analogous flow-through experiment. The aim of the latter was to mimic CO<sub>2</sub> circulation within the basaltic crust and assess the resulting changes in mineralogy and rock properties. Inoculated basaltic sub-cores were injected with CO<sub>2</sub>-charged artificial groundwater at 35°C and 30 bars (p(CO<sub>2</sub>) = 6 bars) for 21 days under anaerobic conditions. We characterized, using culture-independent tools, the microbial community diversity hosted in the cores before and after experiments by considering either the bulk colonized rock, the solid particles-aggregating biofilm, and the planktonic fraction. Experimental results are compared to the community retrieved from the natural basaltic core.

This unique experimental design may hence provide a new insight into ecosystem functions and diversity evolution in the basaltic crust experiencing CO<sub>2</sub> circulations.

[1] McMahon & Parnell (2014), *FEMS Microbiol. Ecol.* **87**, 113-120. [2] Alfredson *et al.* (2013), *Int. J. Greenh. Gas Control* **12**, 399-418.