SUBSEAFLOOR HABITATS AS ANALOGUES FOR POSSIBLE LIFE ON MARS : CASE OF THE CANTERBURY BASIN. F. Gaboyer[1], M.C. Ciobanu, G. Burgaud, K. Alain[2]. [1] Centre de Biophysique Moléculaire - UPR4301 - Exobiology team - CNRS - 45000 Orléans France, frederic.gaboyer@cnrs-orleans.fr, [2] Laboratoire de Microbiologie des Environnements Extrêmes - UMR6197 - Institut Universitaire Européen de la Mer - 29280 Plouzané France, karine.alain@univ-brest.fr

Introduction:

On Earth, most of the biosphere is located in deep environments isolated from solar energy (the so-called « Deep Biosphere »). The presence of abundant, diverse and active microbial communities in the subseafloor contrasts with the hostile conditions associated to these habitats (pressure, temperature, energy sources, water activity …).

Considering the extreme conditions present at the surface of most of solar system bodies of astrobiological interest (Mars, Europa…), the Terrestrial subsurface can serve as a relevant analogue in the search for extra-terrestrial life.

In 2009-2010, the IODP 317 expedition drilled marine sediments up to 1927 mbsf in the Canterbury Basin (New-Zealand), enabling thus to investigate for the first time the subseafloor microbiology in a 2 km-long sediment core (Clay and Marl).

To better understand what physiological and metabolical properties may explain the persistence of microorganisms at this site, we employed complementary approaches (cultural, molecular, metagenomics).

Our results extended the presence of living cells in the subseafloor up to 1922 mbsf and enabled us to speculate about their lifestyle (metabolism, adaptations).

Canterbury basin microbial communities are diverse (mostly represented by *Chloroflexi* and *Proteobacteria* for *Bacteria* and by the uncultured MCG and MBG-B groups for *Archaea*) **[1],** and have the genetic potential for autotrophy (methanogenesis, carbon fixation) and also for heterotrophy (fermentation, hydrocarbons or halogens degradation…). Genes related to sporulation or chemical stress resistance were also highly represented in our metagenomes and could reveal possible strategies deployed by buried microorganisms to persist in the subsurface **[2]**.

This data strengthens the possibility of lithoautotrophy, but also of heterotrophy, on extraterrestrial bodies, maybe based on “cannibalism” of cells and on organic matter cycling.

Both microbial heterotrophy and autotrophy should thus be considered when selecting environmental or microbial analogues of astrobiological interests, notably for the MASE project (Mars Analogue for Space Expmoration).

References:

[1] Ciobanu, M.-C., Burgaud, G., Dufresne, A., Breuker, A., Rédou, V., Ben Maamar, S., Gaboyer, F., Vandenabeele-Trambouze, O., Lipp, J. S., & other authors (2014). *ISME J*, 8, 1370-1380. [2] Gaboyer, F., Burgaud, G., Alain, K. *FEMS Microbiol Ecol*. In Revision.