

## **Nutrients limitation of microbial abundance & activity at North Pond crustal biosphere, western flank of Mid-Atlantic Ridge**

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The metabolic pathways and extent of microbial mediated biogeochemical cycling of important earth elements including carbon and nitrogen is poorly understood in deep sub-seafloor environments. Here, microbial diversity and their mediated C/N cycling in the rocks of North Pond, western flank of Mid-Atlantic Ridge, were investigated. A series of incubations with variable carbon and nitrogen substrates including sodium carbonate, sodium acetate, methane, ammonium chloride and sodium nitrate, have been set up on shipboard. Significant cell growth was observed only when nitrogen substrates were supplemented, either alone, or in combination with one carbon substrate. This data suggests that nitrogen is a limiting nutrient source for cell growth in the North Pond crustal biosphere. The Microorganisms and their utilized pathways in the assimilation and transformation of C, N are identified by metagenomic study. In addition, barcoded MiSeq 16S rRNA sequencing of host rock and enrichment samples indicated that Gammaproteobacteria dominate the bacterial community. Further isolation of a bacterial strain from site U1383C showed its ability to oxidize reduced iron at neutral pH. These integrated studies would give clues to fully understand the subsurface microbial groups, key metabolic pathways and their roles in ocean crust weathering.