Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

MIS23-P04 Room:Convention Hall Time:May 24 16:15-17:30

Genetic Signatures from the Aging Oceanic Crust: Evidence for Ancient Subvent Biosphere?

Yohey Suzuki[1*], Satoshi Mitsunobu[2], Katsuaki Watanabe[1]

[1]Dept Earth & Planet Sci, Univ Tokyo, [2]Institute for Environmental Sciences, University of Shizuoka

Several lines of evidence strongly suggest that microbial communities exist within young ocean crust on the flank of mid-ocean ridge systems where fluid circulation is vigorous. Aging of ocean crust is accompanied with significant decreases in porosity due to secondary mineral formation and oxidative alteration within the first 10-15 million years. After thermally driven fluid circulation ceases at ˜65 Ma, basalt weathering appears to be a sole energy source in the aging ocean crust, the habitability of which remains to be largely unknown. Basaltic cores obtained during Expedition 329 (U1365: >100 Ma; U1367: ˜33.5 Ma; U1368: ˜13.5 Ma) provide a systematic opportunity to determine age variations in habitability and microbial community within the basalt basement thinly covered with oxic and organic-poor sediment. In this study, flame sterilization of the core exterior (Lever et al., 2006) and a newly developed technique for DNA extraction (Kouduka et al. 2012) were applied to minimize contamination and to maximize DNA recovery from low biomass habitat, respectively.

Although the numbers of microbial cells were below a minimum detection limit of ˜105 cells/cm3, 16S rRNA gene sequences were successfully obtained from all core samples associated with fracture-filling assemblages of oxidized or reduced secondary minerals. Contamination sources including drilling mud and surface and bottom seawater were thoroughly inspected, and it was found microbial communities in the basalt cores were clearly distinct from those from contaminant ones (<97% similarity). Phylum- or class-level distributions of microbial communities also suggested that neither formation age, depth nor chemical alteration is clearly correlated with the community structure. Many phylotypes belonging to Deltaproteobacteria and Fimicutes were closely related to strictly anaerobic metal and/or sulfate reducers (>95% similarity), despite the oxygenated bottom sediment. As overall community structures resemble previously reported ones from seafloor and subseafloor basalt with young age (< 1Ma) (Lysnes et al., 2004; Santelli et al., 2008) and low-temperature vent fluids (Huber et al., 2009), there is the possibility that genetic material originated from the subvent biosphere has been preserved owing to extremely low habitability and/or irreversible biding of DNA to rock matrix in the aged oceanic crust.