Exploring the deep subseafloor biosphere and biogeochemical carbon cycling beneath the Arctic ocean

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Despite the Arctic cryosphere is the most sensitive and vulnerable to the global environmental change, the nature of deep subseafloor arctic environments remains largely unknown. Active processes on the drastic climate change, including the anthropogenic global warming and subsequent ice melt, are presumably similar to those mechanisms that formed some of the major hydrocarbon resources we presently use, deeply buried in the subseafloor sediment over millions of years at high atmospheric CO_2 and global warm conditions. Continuing to advance understanding of the natural analogues beneath the Arctic ocean through scientific drilling is a powerful approach for the discoveries and understanding of life and Earth co-operating systems, and consequently will illuminate the possible resilience and sustainable strategies adopted by human society towards the future. Here, we are keenly interested in the Arctic deep biosphere and biogeochemical carbon cycling, which presumably be tightly associated with tectonics and biotic/abiotic processes through paleoceanographic events of seawater stagnations, perturbations and fertilizations in the Paleogene to Cretaceous period, and perhaps still continuing in situ over geologic time. How is diagenetic activity and microbial diversity linked to variability in Cenozoic climate and environmental changes? To what degree is carbon diagenesis linked to biotic/abiotic and tectonic processes? What fluid flow and energy transformation processes support microbial activity in situ and govern carbon sink in the Arctic sedimentary basin? How does alternation of deep oceanic crust contribute to microbial life and biogeochemical carbon cycling in the shallower habitat? In addition, what is the nature of the Arctic basement? These important scientific issues on the most climate-sensitive place on Earth remain to be explored, but using the *Chikyu*' s riser-drilling and onboard facilities, it can be addressed by the state-of-the-art interdisciplinary analyses of core samples and the long-term borehole observatory.

Keywords: Arctic ocean, scientific ocean drilling, deep subseafloor biosphere, biogeochemical carbon cycle

