

## Exploring the Arctic deep biosphere and its linkage to carbon cycling and climate variation with Chikyu

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As the profound impacts and implications of the on-going climate change are becoming increasingly apparent, so too is the urgency to understand the complex feedback processes that regulate the Earth systems. Jointly, the scientific community agrees that the Arctic is a critically important region since it is responding to climate change more strongly than any other region in the world. Especially relevant is to understand the fluxes of carbon, from and within these remote regions. Great efforts are currently being made to advance our knowledge of carbon cycling in the Arctic –including terrestrial, marine, and cryospheric realms. However, one significant province is still left unexplored—the Arctic subseafloor. Knowledge of this environment is still comparatively poor, despite the Arctic subseafloor containing a significant proportion of the global carbon stock –its’ short and long-term fate is tightly linked to both global climate change and the activity of microbial life inhabiting the deep marine biosphere. Further, the subsurface sedimentary sequence represents an invaluable archive of the past Arctic climatic variability, and has recorded some of the environmental consequences, and hence is key to understand and constrain future trajectories for our planet’ s evolution. For example, during the early-to-middle Eocene, it has been discovered that fresh-to-brackish water conditions must have been strongly stratified, creating a freshwater lid and growth of freshwater algae for nearly a million years along the Arctic continental margin. However, as of today, the nature and extent of deep-biosphere microbial communities and their correlations to the past climate and environmental changes and carbon cycling are almost completely unexplored in the Arctic Ocean margin. As the subseafloor sediment contains invaluable information about the past oceanographic, climatic and depositional conditions, the scientific deep drilling expedition will allow us to look more detail millions of years back into previous global warming periods and learn how past variability in climate, ice-coverage, ocean water circulations, and continental input of organic matter have systematically influenced the past and current biospheres and carbon cycles in the Arctic Ocean margin. To address these issues, a scientific ocean drilling project to explore a 3,300 meter-deep, ~50 million-year-old subseafloor environment with riser drilling of the Chikyu at the Hinlopen Margin, southern Nansen Basin in the Arctic Ocean is proposed.

Keywords: Scientific Ocean Drilling, Arctic Ocean, Deep Biosphere, Nansen Basin, Biogeochemical Carbon Cycling, Chikyu