Tectonics, magmatism, and hydrothermalism in Arctic Ocean floor

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Understanding the evolution of ocean basins is critical for understanding global tectonics, mantle dynamics, and ocean environment as well as heat and material cycle through time. The Arctic Ocean basin consists two major basins of the Eurasia and Amerasia basins, which are separated by the Lomonosov Ridge continental sliver. The present day seafloor spreading center is located in the Gakkel Ridge within the Eurasia Basin, which is floored by 57–0 Ma old oceanic crust, and is considered as the slowest mid-ocean ridge on Earth [e.g., Nikishin et al., 2018]. The Gakkel ridge is characterized by unique modes of crustal accretion and tectonic extension without no significant transform offsets [e.g., Dick et al., 2003; Jokat et al., 2003; Michael et al., 2003]. Although growing number of researchers have been fascinated by this ideal setting to study mantle heterogeneity and melting dynamics at ultraslow spreading rates, systematic geophysical/petrological dataset is still limited only in the western side, and interdisciplinary study of seafloor hydrothermal activity has not been completed yet [e.g., Sohn et al., 2008]. Considering older geological edifices, the Amerasia Basin remains largely unsettled due to widespread overprint by the Cretaceous High-Arctic Large Igneous Province, which are recognized as the Alpha–Mendeleev ridge complex [e.g., Døssing et al., 2020]. In addition, traces of an extinct spreading center are deeply buried by sediments, and the Mesozoic tectonic configurations and geodynamic processes cannot be addressed due to lack of accurate magnetic data in the ice-covered basin. Distribution and modification processes of continental fragments such as the Chukchi Borderland and Northwind Ridge is also essential to be solved for understanding an initial stage of Arctic Ocean formation. Considering the future feasibility of the Japanese research vessel expeditions in the Arctic Ocean, we aim to provide an opportunity to simulate potential of geoscientific observation proposal in 1) eastern Gakkel Ridge, 2) Chukchi Borderland and Northwind Ridge, and 3) Alpha–Mendeleev ridge complex. In this presentation, we summarize recent geophysical and geological studies in these regions, including our observation results of a near-seafloor magnetometer operation during the Arctic Gakkel Vents (AGAVE) expedition aboard the icebreaker *Oden* in July 2007. By using existing data of Japanese R/V *Mirai*, our strategy of rock sampling and underwater geophysical observations, and our hypothesis of ultramafic-hosted hydrothermal system in other ocean floors [e.g., Fujii et al., 2016], we further investigate the feasibility and expected outcomes of solid-earth geoscience observations in the Arctic Ocean.

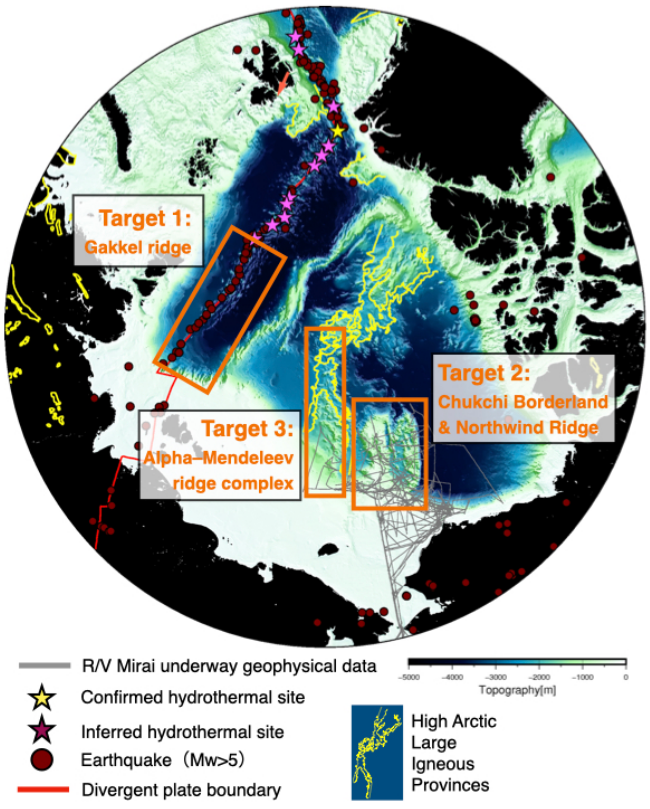

Figure. Planned study area of Arctic ocean floor.

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