Do submarine volcanism in mid-ocean ridges impact global climate change? –Heading toward detection of topographic variation in precisely aged seafloor

*Masakazu Fujii[1,2], Arata Kioka[3], Toshitsugu Yamazaki[4], Kyoko Okino[4], Chiori Tamura[4], Osamu Seki[5], Yoshifumi Nogi[1,2], Jun'ichi Okuno[1,2], Takeshige Ishiwa[1], Ikumi Oyabu[1]

1. National Institute of Polar Research / SOKENDAI, 2. The Graduate University for Advanced Studies (SOKENDAI), 3. Leopold-Franzens-Universität Innsbruck, 4. Atmosphere and Ocean Research Institute, The University of Tokyo, 5. Institute of Low Temperature Science, Hokkaido University

Submarine volcanism in mid-ocean ridge (MOR) systems transports heat and material from solid-Earth to ocean and potentially impacts global climate change. The CO_2 production rate linked to seafloor spreading in MORs is known as 2×10^{12} mol/yr (~0.041 ppmv) in steady state (Resing et al., 2004). However, if episodic magma eruption controlled by sea-level change occurs over thousands years (Tolstoy, 2015, Crowley et al., 2015), the MORs system would theoretically result in ~100 ppmv rise in CO_2. Observational evidence is essentially needed for estimating of the effect of seafloor spreading in the MORs on the climate reconstruction and prediction.

In order to evaluate the impact of the MORs on global climate, our team has submitted a proposal to coming 3-years projects of the R/V *Hakuhomaru*. The aim of this cruise is to estimate magma and CO_2 production rate over 4.3 Myrs based on observed seafloor topography, high-resolution magnetic field, and newly developing model of magma eruption in spreading system. Short-wavelength variation of seafloor topography is detected by shipboard multibeam sonar, and detailed seafloor age is estimated by near-seafloor magnetic field data comparing with global paleo-intensity of the geomagnetic field. The study area is circum-Antarctic ridges, especially the fast-spreading East Pacific Rise and Pacific-Antarctic Ridge, and slow- to intermediate-spreading ridges in the Indian Ocean. In order to investigate “sea-level driven eruption hypothesis”, we aim to catch the signal from the seafloor created 3.4 Myrs ago when amplitude of sea-level change is considered to be small.

Here, we present overview of our geophysical survey plan in the southern ocean and previously obtained knowledge about solid-Earth response to climate. Finally, we discuss a role of the MOR study for understanding global climate change.

Keywords: Submarine volcanism, Mid-ocean ridge, Seafloor bathymetry, Near-seafloor magnetic anomaly, Global climate change

