

AGU 2019 Abstract

Crustal accretion in a backarc spreading ridge: the oceanic core complexes in the Shikoku Basin and their tectonic implications

Yasuhiko Ohara (Hydrographic and Oceanographic Department of Japan/JAMSTEC)

Kyoko Okino (Atmosphere and Ocean Research Institute, University of Tokyo)

Norikatsu Akizawa (Atmosphere and Ocean Research Institute, University of Tokyo)

Masakazu Fujii (National Institute of Polar Research)

Yumiko Harigane (Geological Survey of Japan)

Ken-ichi Hirauchi (Shizuoka University)

Osamu Ishizuka (Geological Survey of Japan)

Shiki Machida (Chiba Institute of Technology)

Katsuyoshi Michibayashi (Nagoya University)

Alessio Sanfilippo (University of Pavia)

Camilla Sani (University of Pavia)

Jonathan E. Snow (University of Houston)

Hiroyuki Yamashita (Kanagawa Prefectural Museum of Natural History)

Oceanic core complexes (OCCs) are domal bathymetric highs with axis-normal corrugations, and with exposure of serpentinized peridotite and gabbroic rocks, interpreted as exhumed footwalls of low-angle detachment faults. OCCs are often inferred to represent periods of reduced magmatism at a given section of the spreading segment, providing opportunities of understanding the oceanic lithosphere as tectonic windows. A significant fraction of the ocean floor is created in backarc basins where water plays a major role in generating backarc basin basalts, strikingly contrasting to magmatic process at mid-ocean ridges. The opportunity to explore the formation of backarc basin lower crust and upper mantle is, therefore, an important contribution to understanding the ocean basins.

The recent three cruises (R/V Hakuho KH-18-2, and R/V Yokosuka YK18-07 and YK19-04S) investigated the southernmost segment of the Shikoku Basin extinct spreading ridge, the Philippine Sea, confirming the presence of two OCCs and a non-transform offset (NTO) massif there. During these cruises, we performed geophysical mapping, dredging, as well as in situ observation and sampling with the DSV Shinkai 6500. We also performed microbathymetric survey with a multibeam sonar installed on the Shinkai. One of the OCCs, termed Mado Megamullion, is an ~20 km square domed high with axis-normal corrugations. Mado megamullion and the NTO massif are associated with high mantle Bouguer anomaly, ~20 mGal higher than the surroundings. This observation is consistent with the exposure of deep-seated gabbroic rocks and peridotites sampled with dredge as well as the Shinkai.

The Shikoku Basin is believed as a typical backarc basin that ceased seafloor spreading at ~15 Ma. The basin locates between 23°N and 32°N of the northern Philippine Sea, the latitudinal extent is comparable to the Mid-Atlantic Ridge between the 15°20'N Fracture Zone and the Kane Fracture Zone. A prominent tectonic contrast within a basin exists along the spreading axes of the Shikoku Basin. A series of seamounts known as the Kinan Seamount Chain generated by the post-spreading robust volcanism develop in the northern basin, whereas OCCs including Mado Megamullion in the southernmost basin. Our study on the Shikoku Basin OCCs provides the information on the Shikoku Basin lower crust and upper mantle for the first time, giving a clue to understand the tectonics of this large backarc basin.