

Cruise Summary

1. Cruise Information

(1) **Cruise ID:** YK20-18S

(2) **Vessel:** S/V YOKOSUKA

(3) **Cruise Title**

Secular variation of oceanic crustal accretionary process revealed by backarc basin transform fault: Mado Megamullion MOWALL

(4) **Chief Scientist**

Yasuhiko Ohara (Hydrographic and Oceanographic Department of Japan)

(5) **Representative of the Science Party**

S20-26 Yasuhiko Ohara (Hydrographic and Oceanographic Department of Japan)

SGS20-03 Yuki Matamura (Tohoku University)

SGS20-07 Mai Kintsu (Kobe University)

(6) **Research Titles**

S20-26 Secular variation of oceanic crustal accretionary process revealed by backarc basin transform fault: Mado Megamullion MOWALL

SGS20-03 Bathymetric clustering using acoustic survey data and physical property of rock

SGS20-07 Acquisition of 3-component- and total-magnetic anomaly data at segment offsets of oceanic crusts

(7) **Cruise Period**

2020/10/24 - 2020/11/05

(8) **Ports of departure/call/arrival**

Ariake - Yokosuka

(9) **Research Area**

Shikoku Basin

2. Overview of the Observation

Oceanic core complexes (OCCs), or megamullions, are domal bathymetric highs with axis-normal corrugations, and with exposure of serpentized peridotites and gabbroic rocks, interpreted as exhumed footwalls of low-angle detachment faults.

OCCs provide a valuable opportunity to directly study the architecture of oceanic lithosphere, together with the tectono-magmatic processes associated with its formation and evolution. 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 sample the lower crust and upper mantle at OCCs formed in backarc basins is therefore important for understanding the formation of a large portion of the ocean basins.

The Shikoku Basin is considered as a typical backarc basin that ceased seafloor spreading at ~ 15 Ma. We noted the presence of OCCs there since early 2000's. Following the first preliminary dredge survey in 2007, we conducted focused research programs as three cruises in 2018 and 2019 (KH-18-2, YK18-07 and YK19-04S) on the Shikoku Basin axial OCCs. These programs successfully confirmed the presence of two OCCs and a non-transform offset (NTO) massif in the southernmost segment of the Shikoku Basin extinct spreading axis. One of the OCCs, named Mado Megamullion, is an ~ 20 km square domed high with axis-normal corrugations, located at an intersection of a short spreading segment (~ 30 km) and short transform fault (~ 45 km). In order to advance our understanding of the lithospheric composition of the Philippine Sea Plate, we decided to utilize Mado Megamullion and the associated OCCs as tectonic windows to sample the lower crust and upper mantle materials. The objective of this cruise was to increase the number of sampling point along the transform fault that is dissecting the Mado Megamullion to understand the secular variation of oceanic crustal accretion in a backarc basin setting. During this cruise, we performed three Shinkai 6500 dives to make in situ observation and sampling, as well as geophysical mapping with R/V Yokosuka. We recovered several fault rocks, mainly gabbro mylonites, suggesting that the observed slope may represent detachment shear zone.