

# Cruise Summary

## 1. Cruise Information

(1) **Cruise ID:** YK21-06S

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

(3) **Cruise Title**

"Understanding variations in mode of backarc basin spreading: a Shinkai dive study at the oceanic core complex in the western Shikoku Basin" and "Possible generation of Izu-Bonin arc within the West Philippine Basin: a Shinkai dive study at an arc-rift junction area"

(4) **Chief Scientist**

Yasuhiko Ohara (Hydrographic and Oceanographic Department of Japan)

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

S21-26 Yasuhiko Ohara (Hydrographic and Oceanographic Department of Japan)

S21-6 Osamu Ishizuka (Geological Survey of Japan)

(6) **Research Titles**

S21-6 Tectonic relation between Izu-Bonin arc and spreading of the West Philippine Basin

S21-26 Revealing variation of backarc basin spreading process: a Shinkai 6500 dive study on oceanic core complex in the Western Shikoku Basin

(7) **Cruise Period**

2021/04/10 - 2021/04/23

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

Yokosuka - Yokosuka

(9) **Research Area**

Shikoku Basin and Kita-Daito Basin

## 2. Overview of the Observation

This cruise was consisted of two different project: those for Ohara and Ishizuka.

The project for Ohara: Oceanic core complexes (OCCs), or megamullions, are domal bathymetric highs with axis-normal corrugations, and with exposure of

serpentinized 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. Sampling 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  $\sim 15$  Ma. We noted the presence of OCCs there based on bathymetric characteristics since early 2000's. Following the first preliminary dredge survey in 2007, we conducted focused research programs as four cruises in 2018, 2019 and 2020 on the Shikoku Basin axial OCCs. These programs successfully confirmed the presence of OCCs in the southernmost segment of the Shikoku Basin extinct spreading axis. Regarding the western Shikoku Basin OCCs, no samplings have been performed so far. The objective of this cruise was to initiate sampling study on an OCC located at  $\sim 25$  N western Shikoku Basin, bordering a syn-rift (named the Sui-Shin Hole) of the Kyushu-Palau Ridge. We named the OCC "Sui-Shin Megamullion" after the adjacent syn-rift. During this cruise, we performed two Shinkai 6500 dives on the Sui-Shin Megamullion to make in situ observation and sampling, as well as geophysical mapping with R/V Yokosuka. We recovered serpentinized mantle peridotite from the Sui-Shin Megamullion, confirming that it is in fact an OCC.

The project for Ishizuka: Robust tectonic reconstruction of the evolving Philippine Sea Plate for the period immediately before and after subduction initiation at  $\sim 52$  Ma to form the Izu-Bonin-Mariana (IBM) arc is prerequisite to understand cause of subduction initiation (SI) and test competing hypotheses for SI such as spontaneous or induced nucleation.

The YK21-06S cruise aimed to investigate origin and age of formation of ocean basins in and around the Daito Ridge group. Especially ocean basins which potentially existed in the period of SI to form the IBM arc were the major targets of this cruise, because ocean crust of these basins might be part of overriding plate when subduction of Pacific plate initiated to form IBM arc.

Two Shinkai dives (6K#1584 and 1585) set out to examine and sample the rocks and structure of the Minami-Amami Escarpment (MAE). The MAE is north-south-

trending escarpment, which separates the Kita-Daito Basin and the Amami Sankaku Basin. The main purpose of these dives is to obtain constraints on the age and origin of the Escarpment. Secondary, we aim to understand crustal section of bathymetric high including the Inokawa Seamount. This information is crucial for understanding age and mode of formation of the intervening basins among the Daito Ridge Group, and hence reconstruction of the Philippine Sea Plate during the period of subduction initiation along the Izu-Bonin-Mariana margin.

These dives revealed for the first time volcanic stratigraphy of bathymetric high at the southwestern corner of the Amami Sankaku Basin. This observation could provide crucial information to understand the formation process of the Amami Sankaku Basin and Kita-Daito Basin, and tectonic relation between these basins and subduction initiation of the Izu-Bonin-Mariana arc.