

R/V Yokosuka – Shinkai6500 Cruise Report

YK18-07



MOWALL-PVB(SB): Moho Observation along transform
fault WALLs in the Parece Vela (Shikoku) backarc
spreading center

Southern Shikoku Basin

Jun.14, 2018 - Jun.24, 2018

Yokosuka - Futami

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

Acknowledgements

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This cruise report is a preliminary documentation as of the end of the cruise. Chapters II-V and Appendix are confidential among onboard and onshore scientific team.

This report may not be corrected even if changes on contents will be found after its publication. The report includes raw or unprocessed data. If you are going to use or refer to the data written on this report, please ask the Chief Scientist for latest information.

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I. Cruise Summary

I-1. Cruise Information

Cruise ID	YK18-07
Name of vessel	<i>Yokosuka</i>
Title of the cruise/Proposal	MOWALL-PVB: Moho Observation along transform fault WALLs in the Parece Vela backarc spreading center
Cruise period	14 June 2018 – 24 June 2018
Ports of departure / arrival	Yokosuka - Futami
Research area	Southern Shikoku Basin

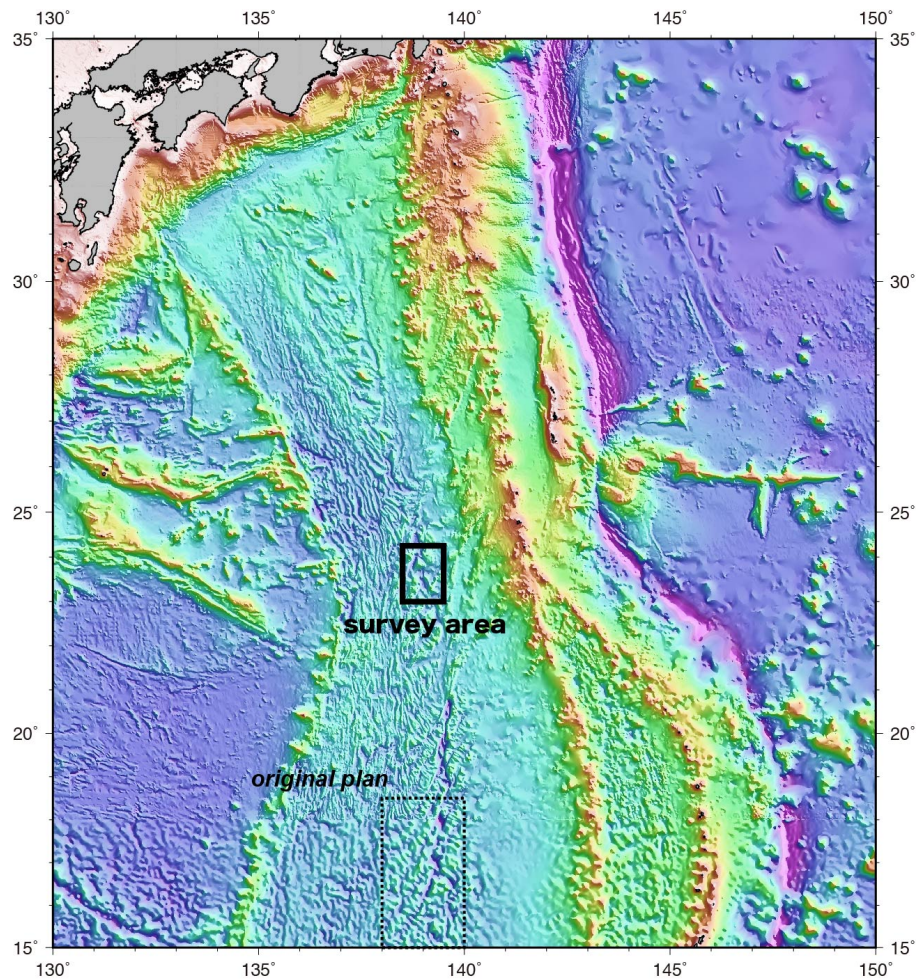


Fig. I-1 Black box shows the survey area of YK18-07 in the southern Shikoku Basin. Dotted box in the Parece Vela Basin is the area originally planned. Bathymetry from JTOPO30[MIRC].

TOKUNAGA, Takuma	Sailor
YAMAGUCHI, Yukihiro	No.1 Oiler
WATANABE, Takuya	Oiler
KAITO, Hiroki	Oiler
SATO, Daiki	Oiler
HIDAKA, Toru	Oiler
NAKAMURA, Kensuke	Assistant Oiler
ONOE, Tatsunari	Steward
FUKUMURA, Hideo	Steward
OHBA, Hiroyuki	Steward
MURAKAMI, Kanjuro	Steward
ABE, Kina	Steward
SHIRASAKI, Yuki	Steward

SHINKAI 6500 Operation Team

SAKURAI, Toshiaki	Submersible Op. Manager
CHIBA, Kazuhiro	Deputy Submersible Op. Manager
UEKI, Mitsuhiro	1st Submersible Staff
MATSUMOTO, Keita	1st Submersible Staff
SAITO, Fumitaka	1st Submersible Staff
CHIDA, Yousuke	2nd Submersible Staff
SUZUKI, Keigo	2nd Submersible Staff
ONISHI, Takuma	2nd Submersible Staff
KURAMOTO, Yoshikazu	2nd Submersible Staff
IJIMA, Satsuki	3rd Submersible Staff
MINAMINO, Naoto	3rd Submersible Staff

Onshore scientists

MORISHITA, Tomoaki	Kanazawa University
ISHIZUKA Osamu	Geological Survey of Japan /AIST
TANI, Kenichiro	National Science Museum
NAKAMURA, Kentaro	The University of Tokyo
HIRANO, Naoto	Tohoku University
YAMASHITA, Hiroyuki	Kanagawa Prefectural Museum of Natural History
HIRAUCHI, Kenichi	Shizuoka University
SNOW, Honathan E.	University of Houston
SANFILIPPO, Alessio	University of Pavia
HANYU, Tomoko	The University of Tokyo

I-3 Background and objectives

This cruise was planned as a part of project MOWALL (Moho Observation along transform fault WALLs). The objective of MOWALL is to reveal million-year order temporal variation of oceanic crust formation and its relationship with underlying mantle heterogeneity. To tackle this theme, a long-offset transform fault is best location, where whole crust section is chronologically exposed along the fault wall. We plan to collect rock samples from upper and lower slopes systematically along the fault and to conduct bathymetry and gravity survey.

The relict spreading axis of the Parece Vela backarc basin, named the Parece Vela Rift, is highly segmented by transform faults. Although the offset length is not so long enough to investigate the long-term temporal variation of ridge process, large variation of melt supply rate in relatively short time interval is expected here, for some oceanic core complexes (OCC) and smooth seafloors (SS) are distributed along the rift. We planned to investigate the transform fault wall along a smooth seafloor (SS) and an oceanic core complex (OCC) located along PVR as MOWALL-PVR.

Initial plan of YK18-07 includes four submersible dives in the central Parece Vela Rift, 15°-17°N. But we were forced to stay in Tateyama port for 4 days due to bad weather. Then we had no choice but to go closer, back-up study area, southernmost Shikoku Basin. In southernmost Shikoku Basin, a couple of oceanic core complex-like structures are recognized near the relict spreading axis. So, we planned to investigate these OCC-like structures. To make matters worse, our survey was further restricted at the request of Japan Self-Defense Force. We could conduct only one dive at the OCC, and were forced to change the dive sites to small volcanic knoll and a fault escarpment in the area. We made our best under this terrible situation, in order to understand the variation of oceanic crust in backarc basin.

I-4 Summary of operation

Y18-07 Cruise started at 9:00(JST), 14 June 2018. We run toward the Parece Vela Rift survey area, but we changed the course back to north due to bad sea condition. We were forced to anchor at Tateyama Bay for 4 days and finally left Tateyama on 8:00, 19 June 2018(JST). We had to abandon the survey in Pareve Vela Rift (~1050 miles from Tateyama), then aimed to a back-up survey area of the southern Shikoku Basin. We successfully conducted three dives of *DSV Shinkai 6500* (6K#1515, #1516, #1517) in this area. Geological observation, rock sampling and deep sea magnetic survey were done in each dive. Geophysical mapping was also done during night time. After three dives, we left the survey area for Chichijima Island on 18:30, 23 June 2018. We arrived at Futami port at Chichijima Island and got off the ship. Daily schedule is as follows. Track chart is shown in Fig I-2.

June 14 2018	Leave Yokosuka
8:00 (JST:-9)	Scientists onboard
9:00	Leave JAMSTEC pier at Yokosuka, bound for the PVR survey area
10:00	Lecture by C/O Sanmori and R/O Komaki
11:00	Meeting with 6K operation team
17:45	Change course to north
18:20	Science Meeting: Schedule
June 15 2018	Stay Tateyama due to bad weather condition
7:00	Anchored at off Tateyama Bay
13:00	Deep sea magnetometer Miniko test
15:00	Science Seminar "Overview of MOWALL project" by K. Okino "Oceanic core complexes in the Philippine Sea" by Y. Ohara
June 16 2018	Stay Tateyama due to bad weather condition
13:00	Tour for DSV Shinkai 6500
15:00	Science Seminar "Geochemical Characteristics of amphiboles in gabbro mylonite at the Godzilla Mullion" by Y. Harigane Special movie "Inside Shinkai" by K. Michibayashi
June 17 2018	Stay Tateyama due to bad weather condition
14:30	Science Seminar "Structural development in mantle associated with hydration during transform faulting" by Y. Kakiyama "Petit spots in the world" by S. Machida
17:45	Y. Ohara caught a big sea bream
June 18 2018	Stay Tateyama due to bad weather condition
7:58	<i>M6.1 Earthquake along Arima-Takatsuki Fault in northern Osaka</i>
10:00	Science Seminar "Felsic veins at U1473 Hole" by K. D. Nguen "An evolution processes of Pacific plate constrained from a mantle xenolith of super deep origin in Aitutaki Island" by N. Akizawa
June 19 2018	Leave for southern Shikoku Basin area
8:00	Weighed anchor, bound for southern Shikoku Basin
June 20 2018	Transit for southern Shikoku Basin area
14:00	Observer briefing (Ohara, Fujii, Michibayashi)
18:00	Science Meeting
June 21 2018	Dive 6K#1515 : OCC in southern Shikoku Basin area
6:40	XBT observation for MBES survey
9:45	Shinkai 6500 Dive#1515 Obs. Ohara Plt. Saito, Chiba
12:10	On bottom, D=5700m
15:26	Off bottom
18:45	Deploy proton magnetometer and start geophysical mapping
20:00	Science Meeting

June 22 2018	Dive 6K#1516 : Small volcanic knoll in southern Shikoku Basin area
6:30	recover proton magnetometer
9:45	Shinkai 6500 Dive#1516 Obs. Fujii Plt. Onishi, Matsumoto
11:08	On bottom, D=4512m
14:31	Off botom
18:11	Deploy proton magnetometer
18:24	Figure eight turn for shipboard vector magnetometer
19:15	Science Meeting
June 23 2018	Dive 6K#1517 : Steep escarpment in southern Shikoku Basin area
6:30	recover proton magnetometer
9:45	Shinkai 6500 Dive#1517 Obs. Michibayashi Plt. Suzuki, Saito
11:08	On bottom, D=4512m
15:21	Off botom
18:00	Start transit for Chichijima Island
19:00	Science Meeting
22:00	Farewell Party
June 24 2018	Transit to and Arrive at Chichijima Island
8:30	Writing reports, cleaning up laboratories ...
10:00	Science Meeting "Geological feature of Chichijima Island" by K. Ando Group photo
10:30	Figure eight turn for shipboard vector magnetometer
14:00	Scientists go ashore

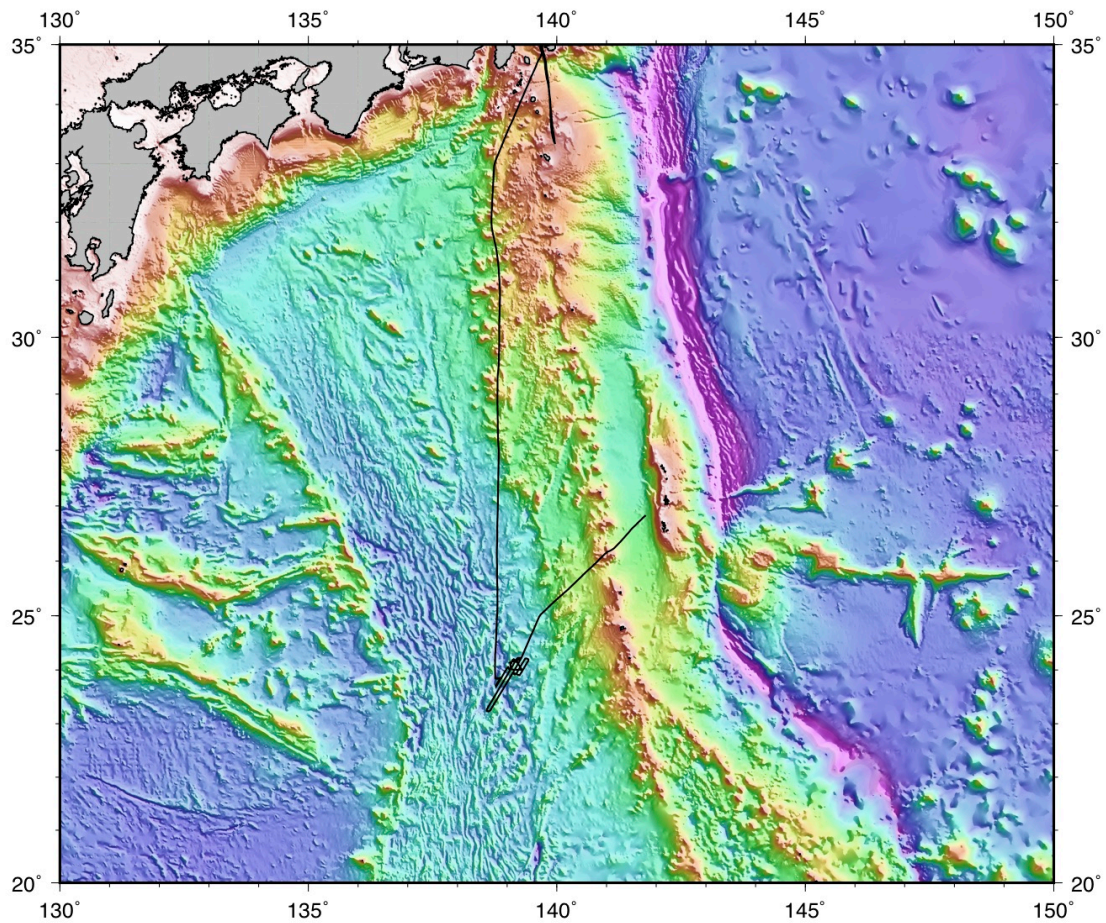


Fig. I-2 Track line of YK18-07. Bathymetry from JTOPO30[MIRC].

I-5 Preliminary Results

Total three Shinkai dives were done. Dive 6K-1515 observed the northwestern slope of a bathymetric dome-like feature at $\sim 23^{\circ}50'N$ in the Shikoku Basin and collected 21 rock samples, and one scoop. The most part of the observed slope, from ~ 5700 m to ~ 4800 m, yielded serpentinized peridotite, gabbro and dolerite, confirming that this bathymetric dome-like feature is in fact an OCC. Dive 6K-1516 observed an enigmatic hill at the southernmost Shikoku Basin. The dive track covered 4512 to 4020 m deep of southern slope and 4250 to 4110 m of northern slope, and collected fourteen rock samples and a scoop sample including vesicular basaltic rocks, pumices, and manganese crusts. Dive 6K-1517 aimed to investigate the oceanic crust in the southernmost Shikoku Basin. The dive started at 4765m and climbed a steep wall and collected 21 rock samples. The dive location and summary are shown in Table I-1 and Figure I-3.

Three component magnetic field data were successfully recorded during three dives.

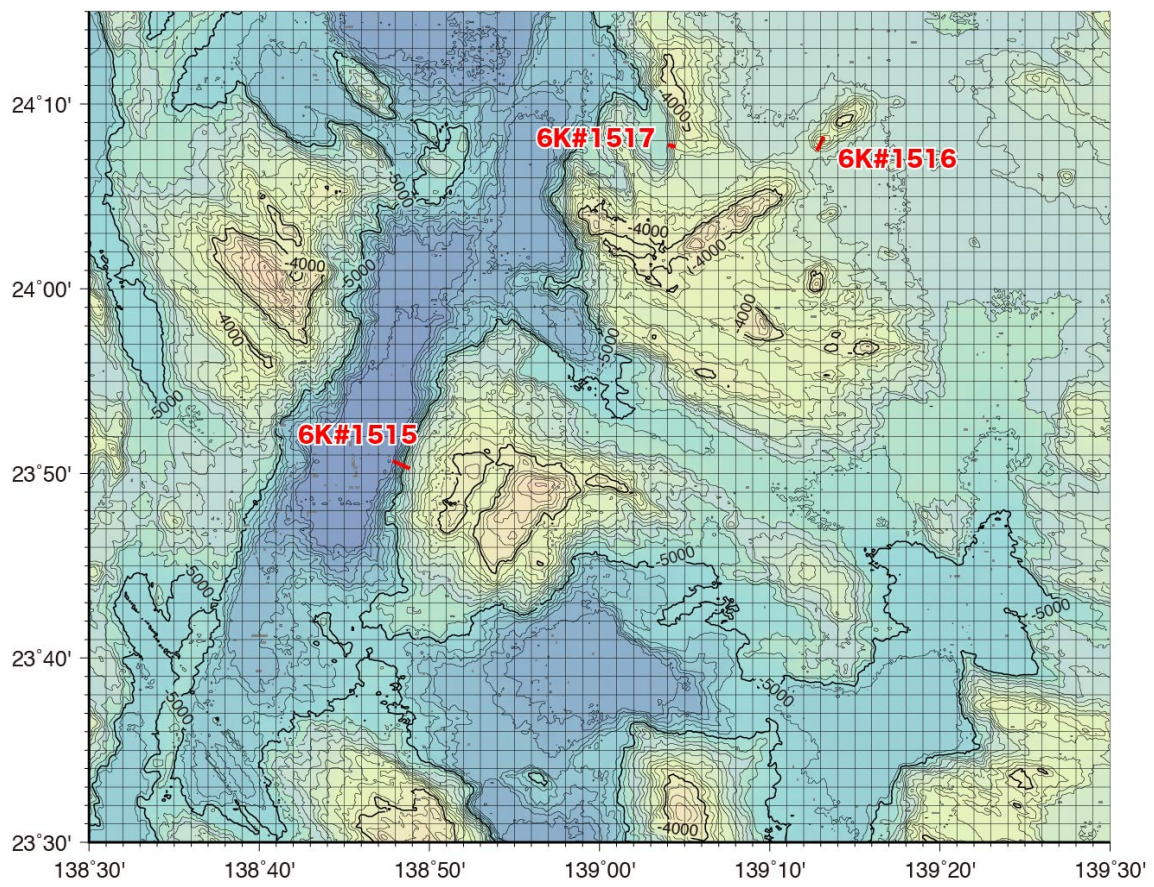


Fig. I-3 Locations of 6K-1515, 1516 and 1517 in southernmost Shikoku Basin.

YK18-07 Dive list

Date	St. No.	Locality	SP/EP	Time(JST)	Depth(m)	Lat.	Lon.	Observer	Pilot	Rocktype	Remarks
2018/6/21	6K1515	Shikoku Basin Oceanic Cone Complex	on bottom	12:19	5719	23-50.6838N	138-47.9489E	Yasuhiko Ohara	Fumitaka Saito Kazuhiko Chiba	Serpentinized peridotite, Coarse-grained gabbro, Dolerite, Scoria*, Pumice, Mudstone	Sediment sampling (S01) using a scoop
			off bottom	15:25	4677	23-50.2682N	138-48.8569E				
2018/6/22	6K1516	Enigmatic topographic high in Shikoku Basin	on bottom	11:08	4512	24-07.4724N	139-12.7785E	Masakazu Fuji	Takuma Onishi Matsumoto Keita	Basalt, Shear flow lava, Pepertite, Pumice	6K descended to the northern scarp after 6K arrived at top of high. Sediment sampling (S01) using a scoop
			off bottom	15:32	4116	24-08.2348N	139-13.1745E				
2018/6/23	6K1517	Scarp in the southernmost Shikoku Basin	on bottom	11:08	4765	24-07.7833N	139-04.0112E	Katsuyoshi Nishiyashi	Keigo Suzuki Fumitaka Saito	Basalt, Pepertite, Pumice, Mn crust, Consolidated Mudstone	6K get back at 4578 m in depth after 6K arrived at top of scarp (4203 m in depth).
			off bottom	15:22	4567	24-07.6885N	139-04.1937E				