



R/V 'Yokosuka' Cruise Report YK23-06

Collection of experimental apparatuses installed on
seafloor in Iheya North Knoll, Mid Okinawa Trough

Iheya North Knoll, Mid Okinawa Trough

Apr.23,2023-Apr.29,2023

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



1. Cruise Information

- Cruise ID: YK23-06
- Name of vessel: Yokosuka / Shinkai 6500
- Title of cruise: Collection of experimental apparatuses installed on seafloor in Iheya North Knoll, Mid Okinawa Trough
- Chief Scientist: Masahiro Yamamoto [JAMSTEC]
- Cruise period: Apr. 23. 2023 – Apr. 29. 2023
- Ports of departure / arrival: Yokosuka HQ, JAMSTEC / Naha, Okinawa, Japan
- Research area: Iheya North Knoll, Mid Okinawa Trough

2. Research Proposal and Science Party

- Title of proposal: Collection of experimental apparatuses installed on seafloor in Iheya North Knoll, Mid Okinawa Trough
- Representative of Science Party: Masahiro Yamamoto [JAMSTEC]
- Science Party (List) [Affiliation, assignment etc.]
 - Dr. Masahiro Yamamoto [JAMSTEC, Chief Scientist]
 - Dr. Tatsuo Nozaki [JAMSTEC, Co-Chief Scientist]
 - Dr. Chong Chen [JAMSTEC, Scientist]
 - Dr. Satoshi Wakai [JAMSTEC, Scientist]
 - Dr. Jun-ichiro Ishibashi [JAMSTEC, Scientist]
 - Dr. Feng-Hsin Hsu [National Taiwan University / JAMSTEC, Scientist]
 - Mr. Junji Torimoto [JAMSTEC, Scientist]
 - Ms. Natsuko Sano [Tohoku University, Ph. D. Student]
 - Ms. Hinako Masukawa [University of Tokyo / JAMSTEC, Ph. D. Student]
 - Ms. Sakura Uchiumi [Tokai University / JAMSTEC, Ph. D. Student]
 - Dr. Hiromi Watanabe [JAMSTEC, Scientist] (not on board)

● Ship Crew

Captain	Takefumi AOKI
Chief Officer	Hiroyuki KATO
1st Officer	Tetsuo SHIRAYAMA
2nd Officer	Tatsumi DEGUCHI
3rd Officer	Riku MATSUDA
Jr.1st Engineer	Shinichi IKUTA
1st Engineer	Takahiro MORI
2nd Engineer	Takamasa OCHIAI
3rd Engineer	Kazunami MATSUMOTO
Jr.3rd Engineer	Koki SHIMIZU
Chief Electronic Op.	Masamoto TAKAHASHI
2nd Electronic Op.	Ryuji ONIKUBO
Boatswain	Kaito MURATA
Quarter Master	Kazumi OGASAWARA
Quarter Master	Tsuyoshi CHIMOTO
Quarter Master	Hiroaki NAGAI
Quarter Master	Shinya KOJIMA
Sailor	Ryo NAKANISHI
Sailor	Taisei MATSUDA
No.1 Oiler	Junji MORI
Oiler	Ryota SUZUKI
Oiler	Toru HIDAKA
Assistant Oiler	Yuta WAKUGAWA
Assistant Oiler	Eima FUJIURA
Chief Steward	Kazuiro HIRAYAMA
Steward	Tsuyoshi NAGATOMO
Steward	Koichiro KASHIWAGI

Steward	Yuki SHIRASAKI
Steward	Tsugumi TANAKA

- Shinkai 6500 operating team

Submersible Operation Manager	Kazuhiro CHIBA
Deputy Submersible Operation Manager	Keita MATSUMOTO
1st Submersible Staff	Mitsuhiro UEKI
1st Submersible Staff	Akihisa ISHIKAWA
2nd Submersible Staff	Hirofumi UEKI
2nd Submersible Staff	Keigo SUZUKI
2nd Submersible Staff	Takuma ONISHI
2nd Submersible Staff	Satsuki IJIMA
2nd Submersible Staff	Naoto MINAMINO
3rd Submersible Staff	Motohiro MATSUSAKA
3rd Submersible Staff	Daiki ICHINOSE
3rd Submersible Staff	Kaisei SATO
3rd Submersible Staff	Haruka SASAKI

3. Research/Development Activities

Experimental apparatuses to be collected from seafloor

We put various experimental apparatuses on seafloor in this deep-sea hydrothermal field with some purposes during the research cruise KR20-12 (R/V Kairei and ROV Kaiko, Oct. 11-22, 2020). We attempted to collect all of the apparatuses in the YK23-06 cruise, and completed the mission completely.

- Hydrophone (ハイドロフォン)

Two hydrophones were set around hydrothermal vents to analyze soundscape in deep sea hydrothermal fields. We collected the hydrophones.

- Pumice reaction apparatus (軽石現場反応装置)

Pumice fragments collected from the Towada area was put on the funnel-shape stand and covered with a carbon-fiber bag. Two sets of this apparatus, so called pumice reaction apparatus, were installed on the natural hydrothermal vent during the cruise KR20-12 in 2020, to observe the “pumice replacement mineralization” that produces the subseafloor sulfide orebody observed at the Izana Hole, Okinawa Trough. By using this apparatus, we can partly simulate and observe the “subseafloor” mineralization process ON a seafloor.

- Radioactive material adsorption apparatus (放射性核種吸着装置)

Manganese (Mn) fiber was put into the mesh-type stainless steel box. This manganese fiber can efficiently trap and adsorb the radiogenic elements such as Ra, Th and Ac. The isotope compositions of young pristine hydrothermal fluid can contribute the development more accurate dating method by using short half-life elements such as the Ra-Th method. During the cruise KR20-12, totally three radioactive material adsorption apparatus were put on the natural hydrothermal vent at the Iheya-North Knoll, Okinawa Trough.

- Deep-sea hydrothermal vent power generation system (深海発電装置)

Fuel cell system using natural hydrothermal fluid and seawater as fuels was installed on an artificial hydrothermal vent, C0014G. Power output generated from electron-motive force between hydrothermal fluid to seawater was monitoring. In addition, electrochemical microorganisms cultivation was performed on the cathode of carbon felt sheet. We collected the system from C0014G to board, and the electrical data was extracted. Electrode samples were stored to analyze in laboratory later.

- Metal ladder box (金属腐食試験ラダーボックス)

A metal-ladder box is an apparatus for investigating the corrosion behavior of metal materials and microbial communities on the metal surface and in the corrosion products. In a metal-ladder box, 36

pieces of metal coupons such as carbon steel, Cr-content steels, stainless steels, coppers, and other alloys were immobilized with PTFE rods and plates, and two boxes were prepared. Each metal-ladder box was put on the sea-floor in the cold- and hot-water sites. Both metal-ladder boxes were successfully recovered.

- Metal bars (金属棒)

- Electric corrosion-proof examination basket (電気防食試験カゴ)

Previously, we set some metal bars on seafloor with or without hydrothermal fluid flow out to analyze corrosion-proof effect of metallic materials exposed to reducing power from hydrothermal fluid. In addition, we also set electric corrosion-proof examination basket on a stainless steel pipe of an artificial hydrothermal vent, C0014E, in which fluid eruption has already stopped. In this cruise we collected the metal bars and electric corrosion-proof examination basket from seafloor to board.

Data and samples collection

- Measurement of hydrothermal fluid temperature

We measured temperature of hydrothermal fluid from some natural and artificial hydrothermal vents using the hydrothermal fluid thermometer with a peristaltic pump.

- Hydrothermal fluid sampling

We collected hydrothermal fluid sample from the C00924A artificial vent using a plastic bag set on the end of the flow line of hydrothermal fluid thermometer.

- Seawater sampling

We collected three bottles of seawater sample on seafloor using the Niskin water samplers as the references for the experimental apparatuses and hydrothermal fluid.

- Rocks sampling

We collected rock samples including chimney wall using the SUV's manipulator.

- Animals sampling

We observed and collected animals around hydrothermal vents using a slurp gun sampler.

Dive Summary

Dive #1680

Date: Apr. 27, 2023

Site: Original Field, Iheya North Knoll

Observer: Dr. Tatsuo Nozaki

Pilot: Mr. Takuma Onishi

Co-pilot: Mr. Naoto Minamino

Payload: Niskin water sampler (5 L x 2), Hydrothermal fluid thermometer with a peristaltic pump, Bar, Cutter (2)

Event list:

11:00, 27-47.4808N, 126-54.0876E, Landing

11:20, 27-47.4355N, 126-54.0554E, Niskin(Red)

11:36, 27-47.4262N, 126-54.0500E, Retrieve Rudder Box(Red), Hydrophone(Blue)

12:12, 27-47.4167N, 126-54.0525E, Retrieve Subsea Generator, Joint. Measurement Temperature (63°C)

12:40, 27-47.4053N, 126-54.0391E, Retrieve Pumice Reaction Apparatus(Red, Blue), Metal Bar(Yellow), Measurement Temperature (38°C)

12:57, 27-47.4080N, 126-54.0399E, Retrieve Metal Bar Box(Yellow)

13:22, 27-47.4130N, 126-54.0387E, Niskin(Green), Retrieve Rudder Box(Blue), Radioactive Material Adsorption Apparatus(Blue), crowbar, Measurement Temperature (240°C), Finding MASACO(3)

13:39, 27-47.4010N, 126-54.0376E, Retrieve Hydrophone(Red), Radioactive Material Adsorption

Apparatus(Red), Sampling Rock

13:49, 27-47.4033N,126-54.0374E, Measurement Temperature(308°C)

14:08, 27-47.4135N,126-54.0022E, Finding MASACO(3)

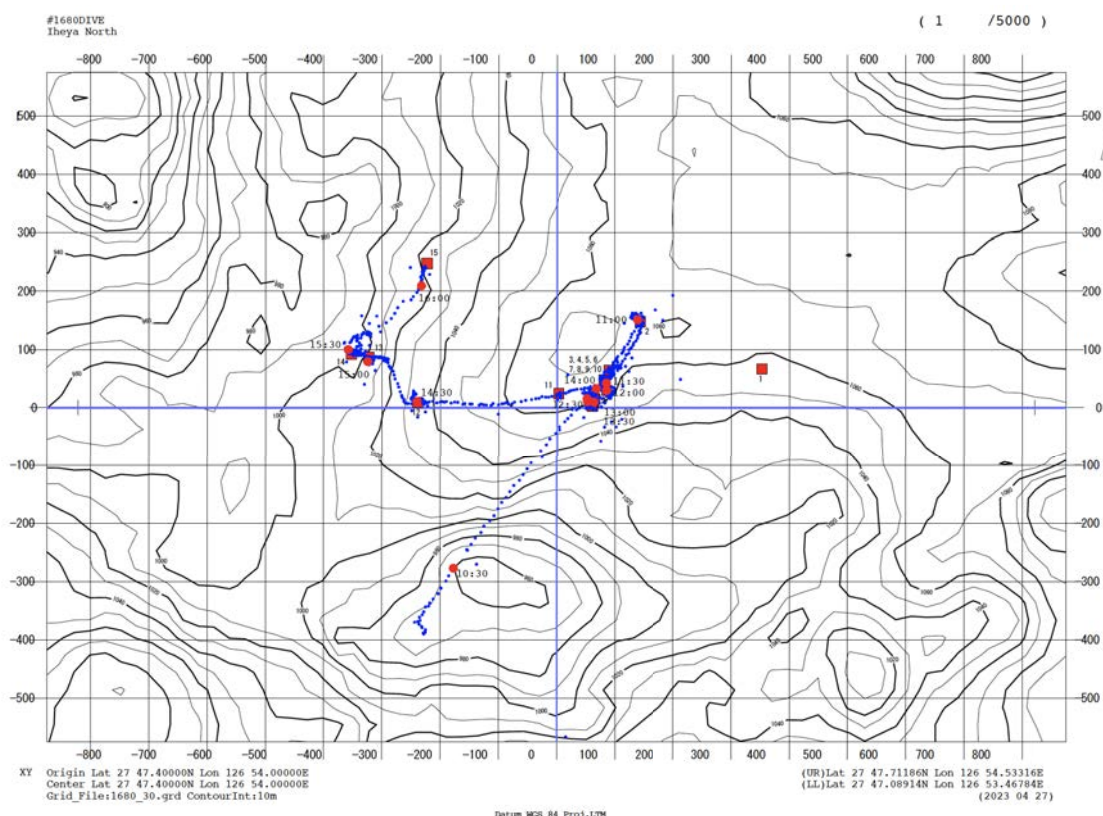
14:31, 27-47.4053N,126-53.8545E, Retrieve Electric Anticorrosion Test Box

15:14, 27-47.4474N,126-53.8034E, Measurement Temperature(288°C)

15:48, 27-47.4504N,126-53.7854E, Measurement Temperature(306°C), Sampling Dead Chimney

16:04, 27-47.5345N,126-53.8643E, Left Bottom A=53m

Dive track:



Dive #1681

Date: Apr. 28, 2023

Site: Original Field, Iheya North Knoll

Observer: Dr. Chong Chen and Dr. Masahiro Yamamoto

Pilot: Mr. Keigo Suzuki

Payload: Niskin water sampler (5 L x 2), Hydrothermal fluid thermometer with a peristaltic pump, a three-way cock and a plastic bag (10 L), Slurp gun sampler with a 6-bottles canister, Sample box (Large x 1, Small x 2, Morinaga x 1, Bar, 'Kumade' shovel, Radioactive material adsorption apparatus

Event list:

10:45, 27-47.5645N,126-54.3200E, Landing

10:51, 27-47.5524N,126-54.3057E, Sampling Niskin(Red)

11:23, 27-47.4122N,126-54.0629E, Retrieve MASACO

11:38, 27-47.4126N,126-54.0522E, Retrieve MASACO

12:11, 27-47.4136N,126-54.0376E, Sampling animals, Set Radioactive Material Adsorption

Apparatus(Red)

12:51, 27-47.4101N,126-54.0506E, Measurement Temperature(Max61°C, Average45°C)

13:53, 27-47.4028N,126-54.0404E, Measurement Temperature(Max309.7°C), Sampling

Water(bag)(309.6~309.7°C)

14:05, 27-47.4134N,126-54.0377E, Retrieve Radioactive Material Adsorption Apparatus(Red)

14:22, 27-47.4113N,126-54.0036E, Retrieve MASACO

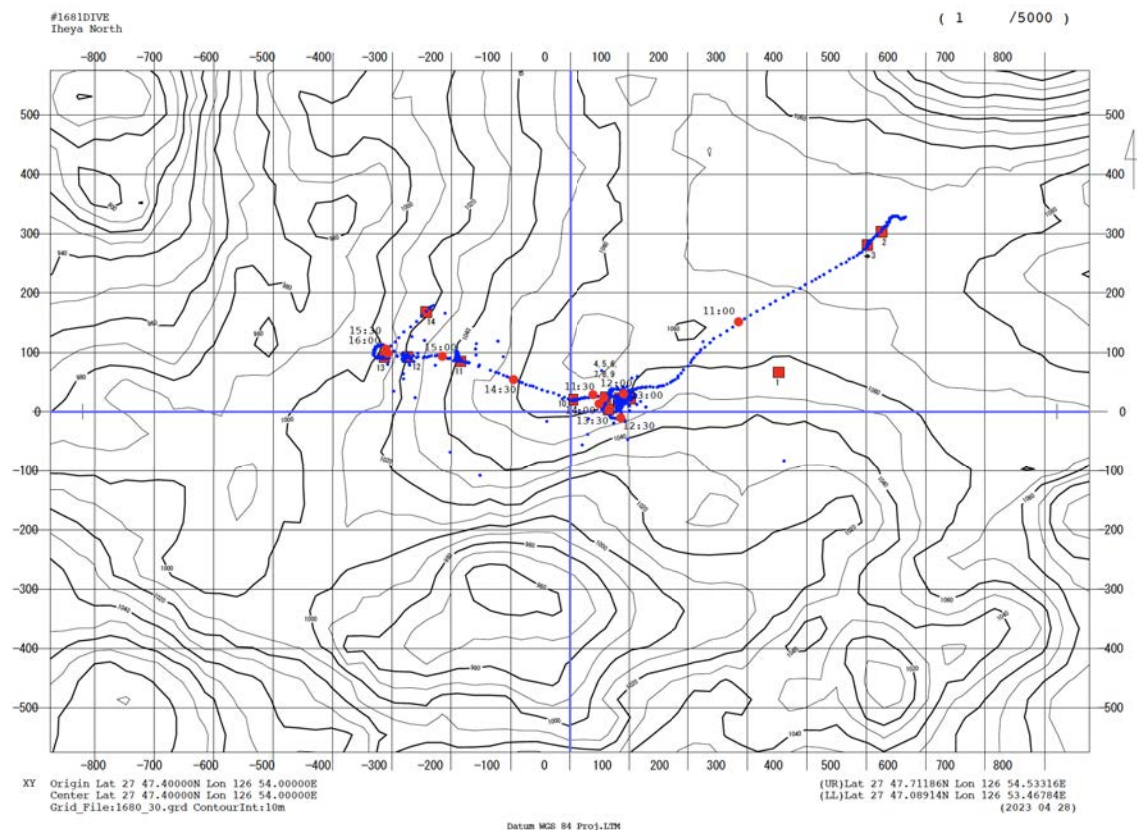
14:54, 27-47.4466N,126-53.8875E, Sampling Calyptogena

15:21, 27-47.4508N,126-53.8331E, Sampling Rocks(5), Mussels

15:55, 27-47.4500N,126-53.8090E, Sampling Shrimp, Chimney

16:04, 27-47.4919N,126-53.8521E, Left Bottom A=50m

Dive track:



○ 4. Cruise Log

Apr. 23, 2023	Departure from HQ, JAMSTEC
Apr. 24, 2023	Sailing
Apr. 25, 2023	Sailing
Apr. 26, 2023	Sailing
Apr. 27, 2023	6K dive #1680 at the Original Field, Iheya North Knoll
Apr. 28, 2023	6K dive #1681 at the Original Field, Iheya North Knoll
Apr. 29, 2023	Arrival at Naha

● **5. Notice on Using**

This cruise report is a preliminary documentation as of the end of cruise.
This report is not necessarily corrected even if there is any inaccurate description (i.e. taxonomic classifications). This report is subject to be revised without notice. Some data on this report may be raw or unprocessed. If you are going to use or refer the data on this report, it is recommended to ask the Chief Scientist for latest status.
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