



R/V Kaimei Cruise Report KM25-02 Leg1

Seismic observation and active-source explorations in the
Sofu Seamount area



Sofu Seamount

Feb. 22, 2025 – March 08, 2025

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

Contents:

1. Cruise Information :
2. Research Proposal and Scientific Party
3. Research/Development Activities
4. Cruise Log
5. Notice on using:

1. Cruise Information

- Cruise ID: KM25-02 Leg1
- Name of vessel: R/V Kaimei
- Title of cruise: Seismic observation and active-source explorations in the Sofu Seamount area
- Chief Scientist [Affiliation]: Aki Ito [JAMSTEC]
- Cruise period: Feb. 22, 2025 – March 08, 2025
- Ports of departure / call / arrival: Yokosuka - Yokosuka
- Research area: Sofu Seamount
- Research map

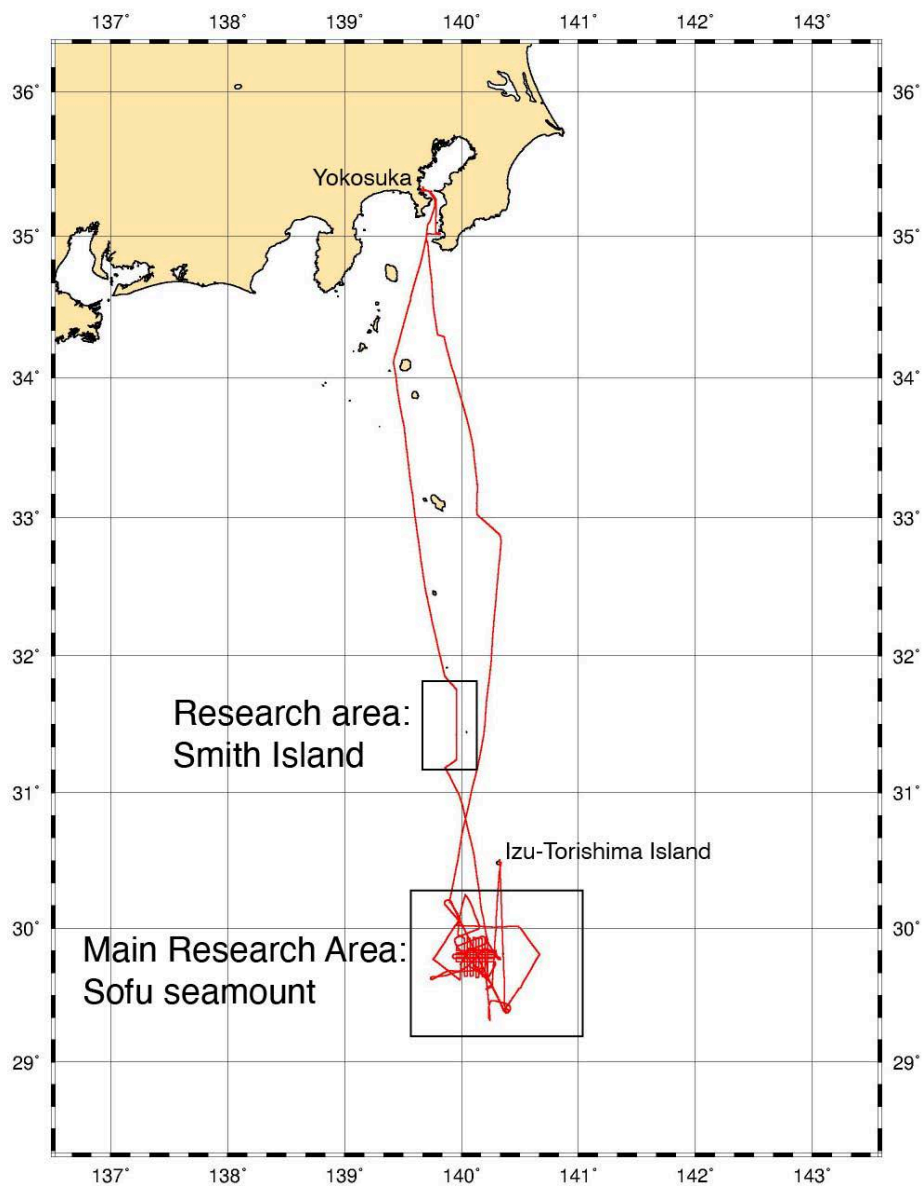


Figure 1 Ship track of KM25-02 Leg1 cruise.

2. Research Proposal and Science Party

- Title of proposal: Seismic observation and active-source explorations in the Sofu Seamount area

- Representative of Science Party:

Aki Ito [JAMSTEC]

- Science Party:

Aki Ito	[JAMSTEC]
Satoru Tanaka	[JAMSTEC]
Koichiro Obana	[JAMSTEC]
Masaru Nakano	[JAMSTEC]
Tomoya Nakajima	[JAMSTEC]
Kenta Yoshida	[JAMSTEC]
Yoshihiko Tamura	[JAMSTEC]
Gou Fujie	[JAMSTEC]
Yasuyuki Nakamura	[JAMSTEC]
Seiichi Miura	[JAMSTEC]
Ryuta Arai	[JAMSTEC]
Kazuya Shiraishi	[JAMSTEC]
Ryo Miura	[JAMSTEC]
Yuka Kaiho	[JAMSTEC]
Tetsuo No	[JAMSTEC]
Shuichi Kodaira	[JAMSTEC]
Shigeaki Ono	[JAMSTEC]

- Onboard Scientist

Aki Ito	[JAMSTEC]
Ryuta Arai	[JAMSTEC]
Tomoya Nakajima	[JAMSTEC]

- Onboard Technician

Yuki Owatari	[NME]
Yoshiki Horiuchi	[NME]
Kenya Yamanaka	[NME]
Natsune Iho	[NME]
Toshimasa Nasu	[NME]
Hiroto Jimba	[NME]
Naoto Noguchi	[NME]
Kimiko Serizawa	[NME]
Masanori Yokoi	[NME]
Ikumasa Terada	[NME]
Taro Shirai	[NME]
Toshinori Saijo	[NME]
Tatsuya Sugiyama	[NME]
Yuta Suzuki	[NME]

● Crew

Master	Naoto Kimura	[NME]
Chief Officer	Takeshi Muramatsu	[NME]
1st Officer	Akira Suzuki	[NME]
2nd Officer	Asami Kikuchi	[NME]
Jr.2nd Officer	Shun Ito	[NME]
3rd Officer	Aoi Tsurumaki	[NME]
Jr.3rd Officer	Toshihiko Miyamae	[NME]
Chief Engineer	Kazuhiko Kaneda	[NME]
1st Engineer	Takahiro Mori	[NME]
2nd Engineer	Keito Shimada	[NME]
Jr.2nd Engineer	Kota Fujii	[NME]
3rd Engineer	So Ikegami	[NME]
Chief Electronic Operator	Shunsuke Fukagawa	[NME]
2nd Electronic Operator	Ryosuke Matsui	[NME]
3rd Electronic Operator	Kohei Maeda	[NME]
Boat Swain	Yuki Yoshino	[NME]
Able Seaman	Takuya Miyashita	[NME]
Able Seaman	Shohei Uehara	[NME]
Able Seaman	Yuta Ohjiri	[NME]
Able Seaman	Kenta Nasu	[NME]
Able Seaman	Takumi Miura	[NME]
Sailor	Yuta Kiyota	[NME]
No.1 Oiler	Hiroyuki Oishi	[NME]
Oiler	Katsuyuki Yoshida	[NME]
Assistant Oiler	Shota Manna	[NME]
Assistant Oiler	Koitaro Saramoto	[NME]
Assistant Oiler	Kiyoyuki Kubo	[NME]
Chief Steward	Kazuhiro Hirayama	[NME]
Steward	Koichiro Kashiwagi	[NME]
Steward	Yuma Fujimoto	[NME]
Steward	Taku Kato	[NME]

3. Research/Development Activities

- Purpose and background:

Earthquake activity including several M6-class earthquakes increased near Izu-Torishima islands in the Izu-Ogasawara arc in early October 2023. Interestingly, on October 8, tsunamis without significant earthquakes as well as distinct T-phase signals were observed, but the generation mechanism of the phenomena was not well understood. Subsequent research based on bathymetric surveys, T-phase source locations, and tsunami analysis has shown that the series of activities was related to submarine volcanic activity at Sofu Seamount located approximately 80 km south of Izu-Torishima islands.

During the KM25-02 Leg1 cruise, we conducted multi-channel reflection seismic (MCS) survey and refraction experiment crossing over Sofu Seamount to investigate the structure of sediments and faults, and the magma reservoir beneath the submarine volcano. In addition, we recovered 14 ocean bottom seismometers (OBS) installed in November and December 2023 for long-term seismic observations in order to reveal the seismic and volcanic activity in and around Sofu Seamount. On our way back to Yokosuka, we also made a bathymetric survey near Smith Island.

- List of observations

(1) OBS deployment

We deployed OBSs at 51 sites along the AG1 refraction experiment line at approximately 2 km intervals as shown in Figure 2. Planned coordinates are in Table 1. All OBS is of Katsujima type, equipped with a three-component 4.5 Hz short-period seismometer and a hydrophone. The deployment scenes are presented in Figure 3. The OBS were lifted up by a crane at the end of the ship and were released by opening the crane hook at the sea level. The OBS was descended to the seafloor by the weight of the anchor. Acoustic communication between the ship and the OBS was conducted to monitor the OBS location during the descent. The position of the OBS on the seafloor was estimated by a Super short base line acoustic system (SSBL) of the vessel's positioning system.

The transponder system of one of the OBS at Site 40 did not function properly after deployment, so an additional OBS was deployed at that site. As a result, a total of 52 OBSs were used for the refraction experiment.

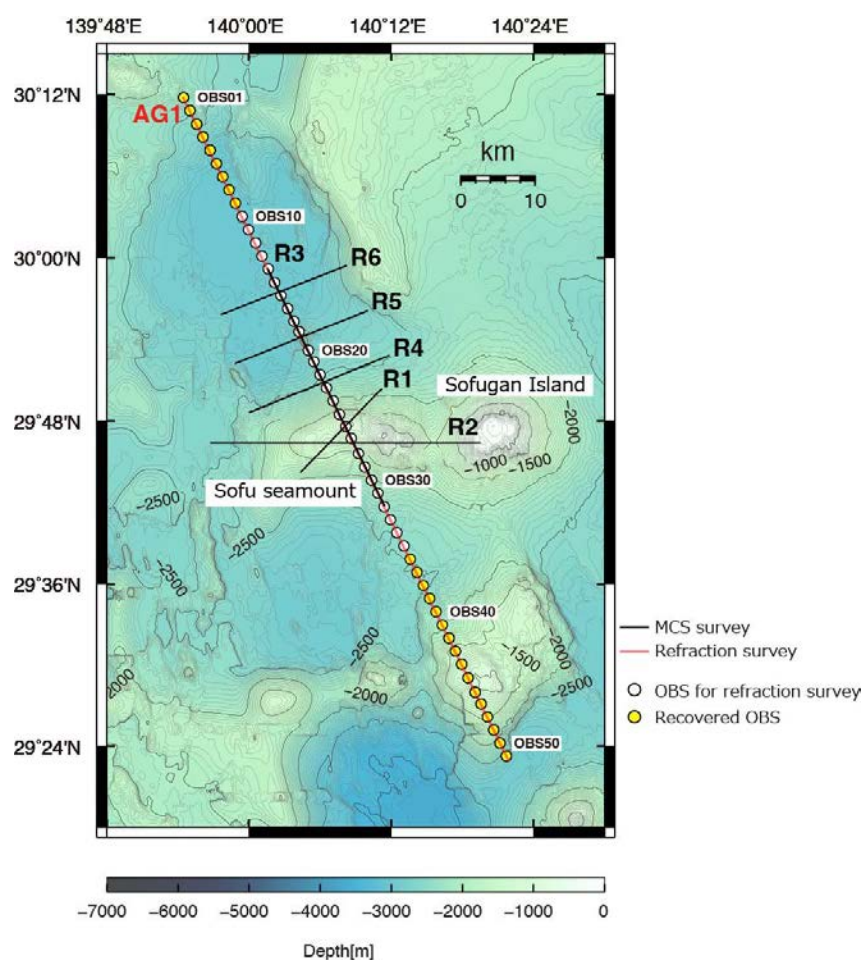


Figure 2 Layout of the refraction experiment and MCS survey. Red and black lines show the lines of the refraction experiment and the MCS survey. White and yellow circles indicate OBSs for the refraction experiment. The yellow ones were recovered during this cruise.

Table 1 Location of OBS for refraction experiment (planned coordinates).

OBS ID	Lat. (N)	Lon. (E)	Depth (m)	Remarks
OBS01	30° 11.75'	139° 54.48'	2,312	
OBS02	30° 10.78'	139° 55.02'	2,422	
OBS03	30° 09.81'	139° 55.56'	2,521	
OBS04	30° 08.84'	139° 56.10'	2,643	
OBS05	30° 07.87'	139° 56.70'	2,917	
OBS06	30° 06.90'	139° 57.24'	2,918	
OBS07	30° 05.93'	139° 57.78'	2,997	
OBS08	30° 04.96'	139° 58.32'	2,968	
OBS09	30° 04.00'	139° 58.86'	3,005	
OBS10	30° 03.02'	139° 59.40'	2,999	

OBS11	30° 02.05'	139° 59.94'	2,993	
OBS12	30° 01.09'	140° 00.54'	2,974	
OBS13	30° 00.11'	140° 01.08'	2,973	
OBS14	29° 59.15'	140° 01.62'	2,962	
OBS15	29° 58.18'	140° 02.16'	2,962	
OBS16	29° 57.20'	140° 02.70'	2,952	
OBS17	29° 56.24'	140° 03.24'	2,892	
OBS18	29° 55.31'	140° 03.78'	2,793	
OBS19	29° 54.54'	140° 04.20'	2,669	
OBS20	29° 53.18'	140° 04.98'	2,701	
OBS21	29° 52.36'	140° 05.46'	2,721	
OBS22	29° 51.39'	140° 06.00'	2,608	
OBS23	29° 50.42'	140° 06.54'	2,399	
OBS24	29° 49.45'	140° 07.08'	2,058	
OBS25	29° 48.48'	140° 07.62'	1,516	
OBS26	29° 47.56'	140° 08.16'	921	
OBS27	29° 46.69'	140° 08.64'	1,189	
OBS28	29° 45.57'	140° 09.24'	1,576	
OBS29	29° 44.60'	140° 09.78'	1,816	
OBS30	29° 43.63'	140° 10.32'	2,061	
OBS31	29° 42.65'	140° 10.86'	2,186	
OBS32	29° 41.69'	140° 11.40'	2,304	
OBS33	29° 40.72'	140° 11.94'	2,420	
OBS34	29° 39.74'	140° 12.48'	2,451	
OBS35	29° 38.78'	140° 13.08'	2,463	
OBS36	29° 37.81'	140° 13.62'	2,493	
OBS37	29° 36.83'	140° 14.16'	2,499	
OBS38	29° 35.86'	140° 14.70'	2,518	
OBS39	29° 34.90'	140° 15.24'	2,400	
OBS40	29° 33.92'	140° 15.78'	2,205	Two OBSs were deployed.
OBS41	29° 32.95'	140° 16.32'	2,006	
OBS42	29° 31.98'	140° 16.86'	1,730	
OBS43	29° 31.01'	140° 17.40'	1,493	
OBS44	29° 30.04'	140° 17.94'	1,266	
OBS45	29° 29.07'	140° 18.48'	1,082	
OBS46	29° 27.95'	140° 19.08'	1,037	
OBS47	29° 27.13'	140° 19.56'	1,255	
OBS48	29° 26.15'	140° 20.10'	1,590	
OBS49	29° 25.19'	140° 20.64'	1,860	
OBS50	29° 24.22'	140° 21.18'	2,103	
OBS51	29° 23.25'	140° 21.72'	2,507	

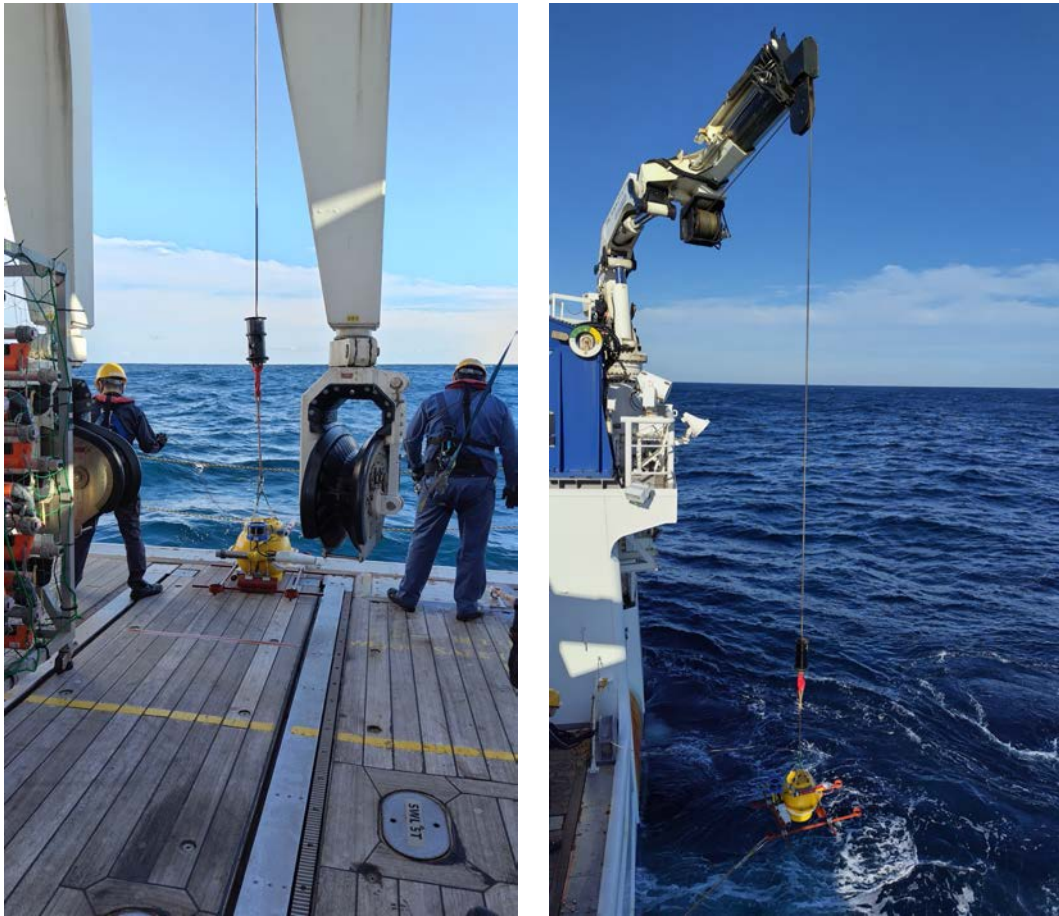


Figure 3 Scenes of OBS deployment for refraction experiment.

(2) Refraction experiment

An airgun array of approximately 10,600 cu. in. was fired every 200 m along the 100 km long AG1 line shown in Figure 2. Figure 4 shows the photo of airgun array on the starboard side of the R/V Kaimei. Planned coordinates of AG1 are in Table 2.



Figure 4 Airgun array of the R/V Kaimei.

Table 2 Location of Explorations (planned coordinates).

Line ID	Eastern or Northern End		Western or Southern End		Types of Exploration
	Lat. (N)	Lon. (E)	Lat. (N)	Lon. (E)	
R1	29° 50.39'	140° 11.22'	29° 44.18'	140° 04.32'	MCS
R2	29° 46.38'	140° 19.50'	29° 46.38'	139° 56.70'	MCS
R3	29° 59.15'	140° 01.62'	29° 41.69'	140° 11.40'	MCS
R4	29° 52.80'	140° 11.82'	29° 48.60'	140° 00.00'	MCS
R5	29° 56.10'	140° 10.02'	29° 52.20'	139° 58.80'	MCS
R6	29° 59.40'	140° 08.22'	29° 55.80'	139° 57.60'	MCS
AG1	30° 11.75'	139° 54.48'	29° 23.25'	140° 21.72'	Refraction

(3) MCS survey

A multichannel hydrophone streamer cable of 2850 m length was used to acquire the reflection signal from boundaries between media of different acoustic impedances. The cable photo is in Figure 5. An airgun array of approximately 10,600 cu. in. was fired every 50 m along 6 lines (R1, R2, R3, R4, R5, R6 in Figure 2) with a total length of approximately 150 km. Planned coordinates of MCS survey lines are in Table 2.



Figure 5 Multi-channel hydrophone streamer cables.

(4) OBS recovery

We recovered OBSs from sites 01 to 09 and from sites 36 to 51 along the AG1 line. Figure 6 shows the recovery scenes. At Site 40, two OBSs were recovered as described in (1) OBS deployment. For OBS retrieval, acoustic signals were sent from the ship to the OBS to release the iron weight. The OBS ascended to the surface by buoyancy and was picked up by the hook and crane on the right side of the ship. We did not recover 26 OBSs from OBS10 to OBS35 in the middle of AG1 line to observe the ambient noise for a few weeks and to estimate the S-wave velocity of the shallow structure beneath Sofu Seamount. They were recovered on March 2025 during cruise KM25-02Leg2, which started immediately after our cruise.



Figure 6 Scenes of OBS retrieval.

(5) OBS recovery for long-term seismic observations

We have started the long-term seismic observations with 15 OBSs, consisting of six Short Period OBSs (SPOBS) and nine Broad Band OBSs (BBOBS), from around the end of 2023. External views of both OBSs are shown in Figure 7, and the locations and planned coordinates of the OBSs are shown in Figure 8 and in Table 3. SPOBS (TOBS-24N, Tokyo Sokushin Co. Ltd.) is equipped with a three-component 4.5 Hz short-period seismometer and a hydrophone. They were deployed by Kaiyo-maru No. 3 (Kaiyo Engineering Co. Ltd.) on December 4 and 7, 2023. BBOBS is consisting of a broadband seismic sensor (CMG-3T 360s for OBS, Guralp systems Ltd.) and a differential pressure gauge. They were deployed on November 11, 2023, during the KM23-14 cruise by R/V Kaimei and on December 7, 2023, by Kaiyo-maru No. 3. Eight of the 15 OBSs are equipped with a pressure sensor (RBR Ltd.). See Table 3. The recovery procedure is the same as (4) OBS recovery above. We did not send a release command to one SPOBS at S12B because no response was confirmed. As a result, we have recovered a total of 14 OBSs other than this one. Several release commands were sent on March 23, 2025, during cruise KM25-02Leg2, however, we were unable to recover the OBS at S12B.



Figure 7 External views of the OBSs used for long-term seismic observation. SPOBS (left) and BBOBS (right).

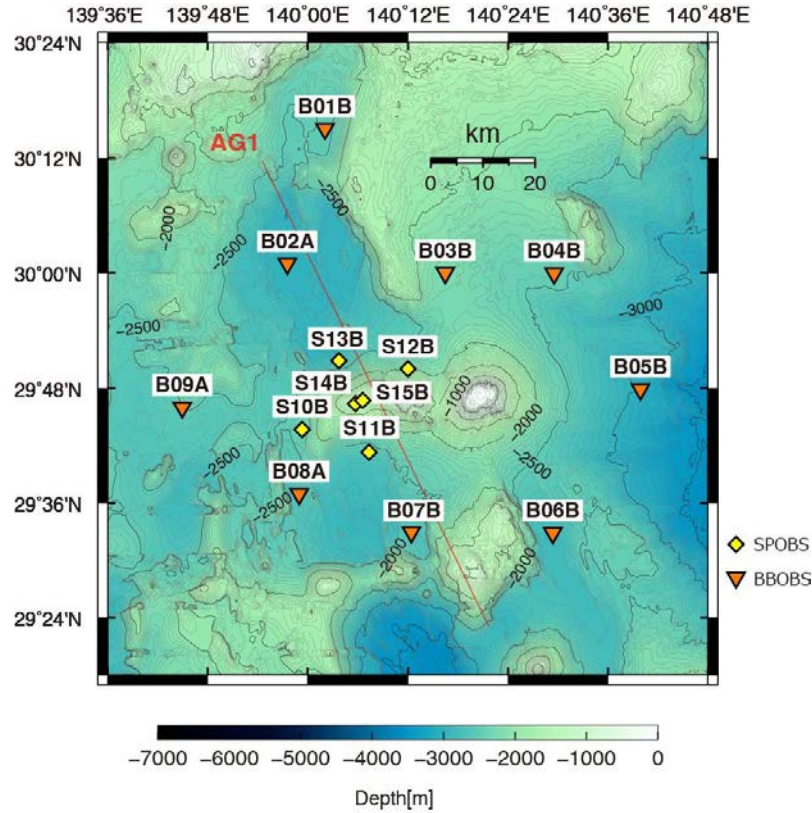


Figure 8 OBS locations for long-term seismic observation. Yellow diamonds and reverse triangles show the locations of SPOBS and BBOBS.

Table 3 Location of OBS for long-term seismic observation (planned coordinates).

OBS ID	Lat. (N)	Lon. (E)	Depth (m)	Types of OBS	Recording period	Remarks
S10B	29° 43.70'	139° 59.32'	2,436	SPOBS	2023/12~2024/7	
S11B*	29° 41.32'	140° 07.30'	2,615	SPOBS	2023/12~2024/7	
S12B*	29° 50.00'	140° 12.00'	2,007	SPOBS	2023/12~2024/7	Not recovered
S13B*	29° 50.86'	140° 03.69'	2,747	SPOBS	2023/12~2024/7	
S14B*	29° 46.37'	140° 05.69'	1,132	SPOBS	2023/12~2024/7	
S15B*	29° 46.75'	140° 06.60'	1,301	SPOBS	2023/12~2024/7	
B01B	30° 15.02'	140° 02.06'	2,613	BBOBS	2023/12~2025/2	
B02A*	30° 01.00'	139° 57.56'	2,975	BBOBS	2023/11~2025/2	
B03B	30° 00.00'	140° 16.53'	2,230	BBOBS	2023/12~2025/2	
B04B	29° 59.97'	140° 29.50'	2,459	BBOBS	2023/12~2025/2	
B05B	29° 47.89'	140° 39.89'	3,053	BBOBS	2023/12~2025/2	
B06B	29° 32.85'	140° 29.39'	2,813	BBOBS	2023/12~2025/2	
B07B	29° 32.92'	140° 12.43'	2,648	BBOBS	2023/12~2025/2	No data due to data recorder failure
B08A*	29° 36.95'	139° 59.01'	2,679	BBOBS	2023/11~2025/2	
B09A*	29° 45.96'	139° 44.95'	2,554	BBOBS	2023/11~2025/2	

* Equipped with a pressure sensor

(6) Bathymetry, magnetic, gravity

Bathymetry, magnetometer and gravity data were collected during the cruise. The bathymetry data were collected by Kongsberg EM712 and EM122 for shallow and deep water depths, respectively. The effective depth ranges of these two systems are from 3m to 3600m and from 20 to 11000m, respectively. Gravity meter is Marine Gravity Meter MGS-6 from Micro-g LaCoste Inc. Magnetic data were acquired by SFG-2015 three-component magnetometer from TERATECHNICA Inc. The G882 cesium magnetometer from Geometrics Inc. has been towed around the Sofu Seamount area.

(7) XCTD (eXpendable-Conductivity, Temperature and Depth)

Four XCTD casts were made during the cruise to obtain seawater temperature and salinity.

4. Cruise Log

Date	Day of week	Remarks
2025/2/22	Sat.	Embarkation on R/V Kaimei at Yokosuka HQ. Departure from Yokosuka HQ. Transit to the northernmost point of the refraction experiment line (AG1).
2025/2/23	Sun.	Start OBS deployment along AG1 from the northmost point (OBS01 to OBS33, OBS35 to OBS40-1). Transit to Izu-Torishima Island for evacuation due to bad weather.
2025/2/24	Mon.	Stay near Izu-Torishima Island.
2025/2/25	Tue.	Transit to the southernmost point of AG1. Restart OBS deployment on AG1 (OBS51 to OBS40-2, OBS34). Transit to the southernmost point of AG1. Deployment of paravane and airgun array.
2025/2/26	Wed.	Start shooting for refraction data. Withdraw airgun array (No.1 and 2 arrays) on the middle of AG1 due to air leakage. Repair the airgun array (No.1 array). Deployment of the hydrophone streamer cable while repairing airgun. Deployment of airgun array and restart shooting from the middle of AG1.
2025/2/27	Thu.	Continued refraction experiment. Transit to the northernmost point of the MCS line (R3) and start shooting for MCS data. Transit to the westernmost point of the MCS line (R1). Transit to the easternmost point of the MCS line (R2). Transit to the westernmost point of the MCS line (R4).
2025/2/28	Fri.	Transit to the easternmost point of the MCS line (R5). Transit to the westernmost point of the MCS line (R6). Withdraw the hydrophone streamer cable, airgun array, and paravane. Start OBS (for long-term seismic observations) retrieval (B01B, B02A, B03B, B04B).
2025/3/1	Sat.	Continued OBS retrieval (B05B, B06B). Start OBS retrieval along AG1 from the southernmost point (OBS51, 50, 49, 48, 47, 46, 45, 44, 43, 42, 41, 40). OBS retrieval (for long-term seismic observations) retrieval (B07B). OBS retrieval along AG1 (OBS39, 38). OBS (for long-term seismic observations) retrieval (S11B, S14B, S15B). Release command not sent to S12B due to no response from it.
2025/3/2	Sun.	Continued OBS (for long-term seismic observations) retrieval (S13B, S10B, B08A, B09A). OBS retrieval along AG1 from OBS09 to northernmost point (OBS09, 08, 05, 04, 03, 02, 01). OBS 06 and 07 remain on the seafloor even though they received the release command. After OBS01 retrieval, retry sending release command to OBS 06 and 07, and successfully recovered them. Deployment of cesium magnetometer. Start bathymetric and magnetic surveys.
2025/3/3	Mon.	Continued bathymetric and magnetic surveys.
2025/3/4	Tue.	Continued bathymetric and magnetic surveys. OBS retrieval along AG1 (OBS37, 36). Confirm the S12B response again, but no response was received.
2025/3/5	Wed.	Transit to Smith Island. Start bathymetric survey near Smith Island.
2025/3/6	Thu.	Transit to Yokosuka.
2025/3/7	Fri.	Stay at off-Tateyama.
2025/3/8	Sat.	Arrival to Yokosuka port. Disembarkment.

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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