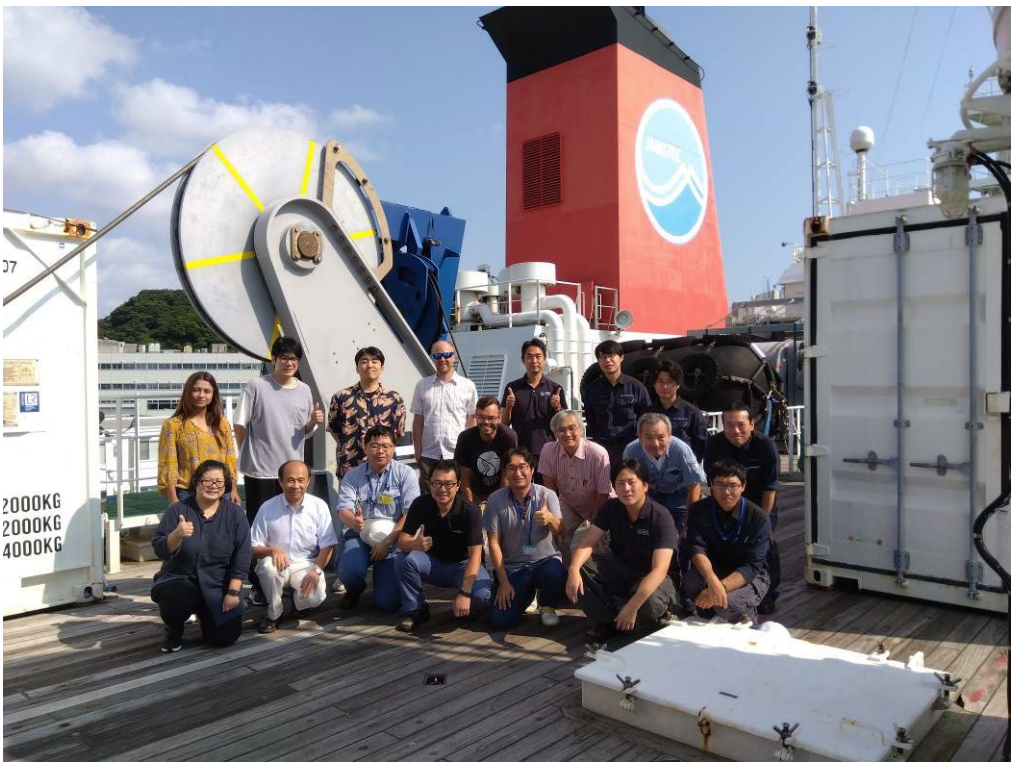
doi:10.17596/0003966

R/V Kaimei Cruise Report

KM24-09



BMS drilling Part 1 at Higashi Aogashima Knoll Caldera hydrothermal field to unraveling the gold enrichment mechanism at subseafloor

23rd August 2024 – 8th September 2024

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

Contents

1. Cruise Information

● Cruise ID: KM24-09

● Name of vessel: R/V Kaimei

● Title of the cruise: BMS drilling Part 1 at Higashi Aogashima Knoll Caldera hydrothermal field to unraveling the gold enrichment mechanism at subseafloor

● Title of proposal: (P24-02) BMS drilling Part 1 at Higashi Aogashima Knoll Caldera hydrothermal field to unraveling the gold enrichment mechanism at subseafloor

(JC24-07) In-situ exposure test of the concrete material at deep seafloor

● Cruise period: 23rd August 2024 to 8th September 2024

● Ports of departure and arrival: JAMSTEC Yokosuka HQ to JAMSTEC Yokosuka HQ

● Research area: Higashi-Aogashima Knoll Caldera in the Izu-Ogasawara area

● Research map:

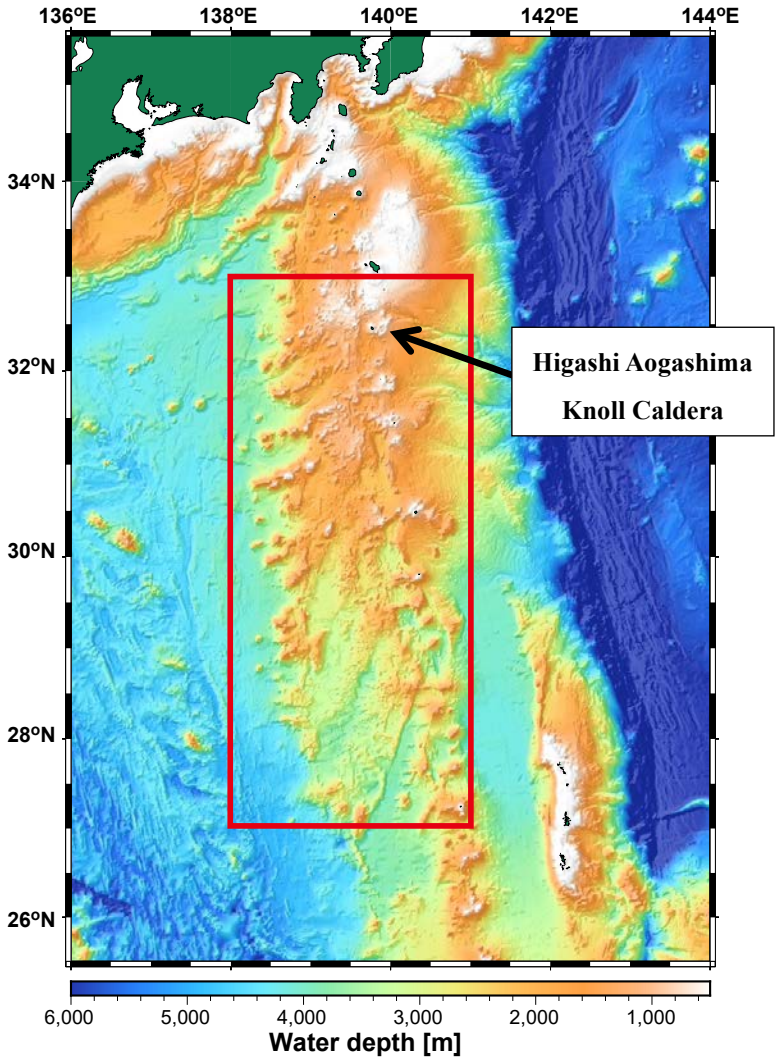


Fig. 1-1 Investigation area map of the cruise KM24-09C

2. Researchers and Crews

● Chief scientist

NOZAKI Tatsuo (JAMSTEC)

● Representative of the scientific party

NOZAKI Tatsuo (JAMSTEC)

KASAYA Takafumi (JAMSTEC)

● Scientific party

TORIMOTO Junji	JAMSTEC
KURIBAYASHI Takahiro	Tohoku University
TOYODA Shin	Okayama University of Science (OUS)
Jamieson John	Memorial University (MUN)
Martin Andrew Jonathan	University of Nevada (UNLV)
Martinez Claudia	University of Nevada (UNLV)
JEON Yechan	Seoul National University (SNU)
HSU Fenghsin	National Taiwan University (NTU)
WAKAI Satoshi	JAMSTEC
GENDA Takayuki	The University of Tokyo
KASAYA Takafumi	JAMSTEC
KIKUTA Hiroyuki	JAMSTEC
IIJIMA Kouichi	JAMSTEC
OHTA Yusuke	JAMSTEC

● Technical supporting staffs

IWAMOTO Hisanori	Nippon Marine Enterprises Ltd. (NME)
YOKOI Seiya	Nippon Marine Enterprises Ltd. (NME)
KIDO Yoshiki	Marine Works Japan Ltd. (MWJ)
SUZUKI Yuta	Marine Works Japan Ltd. (MWJ)
TANI Tomohiro	Marine Works Japan Ltd. (MWJ)

● Kaimei crew members

Captain	KIMURA Naoto
Chief Officer	MURAMATSU Takeshi
2nd Officer	SUZUKI Akira
3rd Officer	SARASHINA Hiroki

Jr.3rd Officer	TSURUMAKI Aoi
Chief Engineer	FUNAE Koji
1st Engineer	MIKAMI Ryuzo
2nd Engineer	SHIMADA Keito
Jr.2nd Engineer	ONO Kazuki
3rd Engineer	KOGA Tomoya
Chief Electronic Operator	NASU Tokinori
2nd Electronic Operator	MAEDA Kohei
3rd Electronic Operator	OKADA Fumine
Boat Swain	OHATA Masanori
Able Seaman	HIRAI Saikan
Able Seaman	MIYASHITA Takuya
Able Seaman	NASU Kenta
Able Seaman	MIURA Takumi
Sailor	NAKAYAMA Shotaro
Sailor	OKOYAMA Taisuke
No.1 Oiler	FUJIWARA Masayuki
Oiler	SUZUKI Ryota
Oiler	WATANABE Seiya
Assistant Oiler	SHIMIZU Marina
Assistant Oiler	KUBO Kiyoyuki
Chief Steward	SONODA Kazuma
Steward	NOJIRI Takehiro
Steward	SHIRAISHI Tatsuya
Steward	KATO Taku

● KM-ROV and BMS Operation Team

Operation Manager	ISHITSUKA Tetsuya
1st ROV Operator	WAKAMATSU Homare
1st ROV Operator	KONDO Tomoe
1st ROV Operator	KUMAGAI Shinnosuke
2nd ROV Operator	CHIDA Yosuke
2nd ROV Operator	TAKENOUCHI Atsushi
2nd ROV Operator	TAYAMA Yudai
2nd ROV Operator	GOTO Takuma
2nd ROV Operator	IWATA Kunihiro

2nd ROV Operator	KOGUMA Atsushi
2nd ROV Operator	OKUHIRA Yuto
3rd ROV Operator	TAKEDA Kai
3rd ROV Operator	SASAKI Haruka
3rd ROV Operator	NAKATSUKA Gakuto

3. Observation

3.1 Objectives & Background

Higashi Aogashima Knoll Caldera (hereafter called HAKC) hydrothermal field is a relatively new one discovered in 2015 by the research group of The University of Tokyo (The University of Tokyo, 2015, 2016; Japan Oil, Gas and Metals National Corporation (JOGMEC), 2018). There have been known three hydrothermal sites within the HAKC hydrothermal field; (1) Central Cone Site, (2) Southeast Site and (3) East Site (Katase et al., 2016; Iizasa et al., 2019). Out of these three hydrothermal sites, an abnormal gold enrichment (average Au concentration = 102 ppm, n =15) was observed only at the Central Cone Site (Iizasa et al., 2019). In particular, the gold concentration of the mound samples at the Central Cone Site is abnormally high, up to 275 ppm (Iizasa et al., 2019). The abnormal gold enrichment at the Central Cone Site is considered to be closely associated with the boiling process of hydrothermal fluid and its concomitant transportation of nano Au particles from the subseafloor (Iizasa et al., 2019). However, researches on the HAKC hydrothermal field are at a beginning stage and only basic petrographic observations about chimney and mound rock samples (Iizasa et al., 2019), a bathymetric map by multibeam echosounder (MBES) (Katase et al., 2016), preliminary water column (hydrothermal plume) survey by MBES (Kaneko and Kasaya, 2022) and some biological studies (Methou et al., 2023; Wang et al., *in press*) were reported so far.

Three years ago, the cruise KS-21-20 by R/V Shinsei Maru with remotely operated vehicle (ROV) Hyper Dolphin (HPD) was conducted as the first multi-disciplinary research cruise from the aspect of economic geology, (fluid) geochemistry, geochronology, macro-/micro-biology and geophysics. Purposes of the cruise KS-21-20 were to obtain the samples of rock, seawater, hydrothermal fluid, benthic animals and microorganisms as well as geophysical data such as bathymetry, gravity and magnetic intensity to unravel the reason/cause/phenomenon of abnormal gold enrichment in a multi-disciplinary manner at the HAKC hydrothermal field. During the cruise KM22-11C in 2022, we tried to collect more rock, fluid, animal, microbiological samples as well as geophysical data to unraveling the abnormal gold enrichment mechanism at the HAKC field, but we could not conduct any dive surveys due to the impacts of typhoon and strong tidal currents. In the last year's cruise of KM23-08_09C, we collected more samples and geophysical data, as well as the observation topographical unique points detected by AUV detailed bathymetric surveys conducted during previous cruises of YK21-10, KM23-01, KM23-02 and KM23-11, leading to the discovery of the new hydrothermal site named as South of East Site. In this cruise (KM24-09), we aimed to drill the seafloor down to 60 mbsf by using benthic multicoring system (BMS) to understand the subseafloor lithology, structure, alteration and mineralization to understand the gold enrichment mechanism at the HAKC hydrothermal field.

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3.2 Preliminary Results.

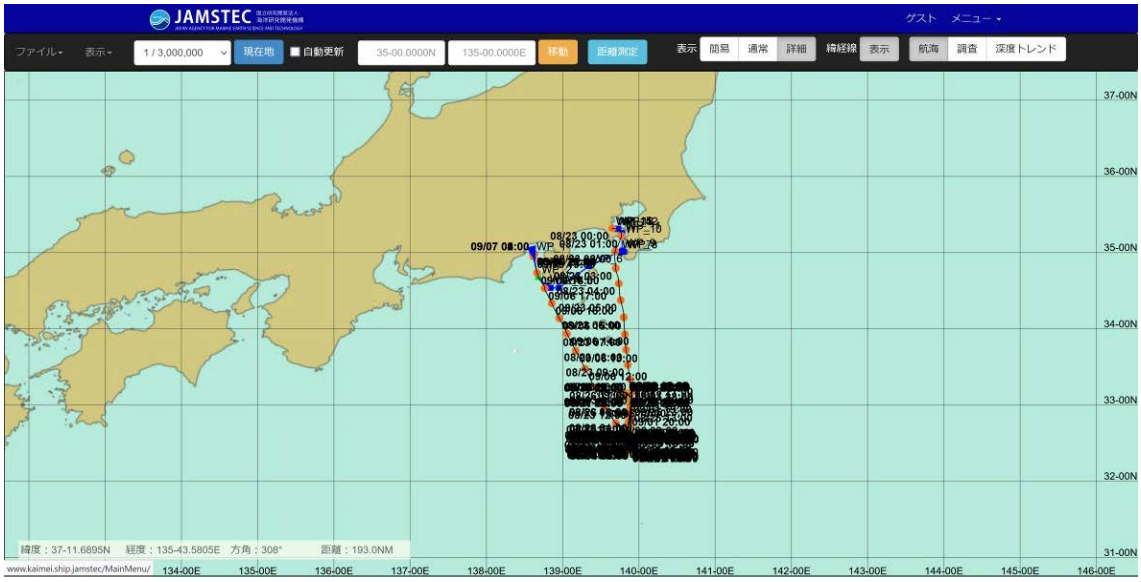

Fig. 3-1 Entire ship track during the cruise KM24-09

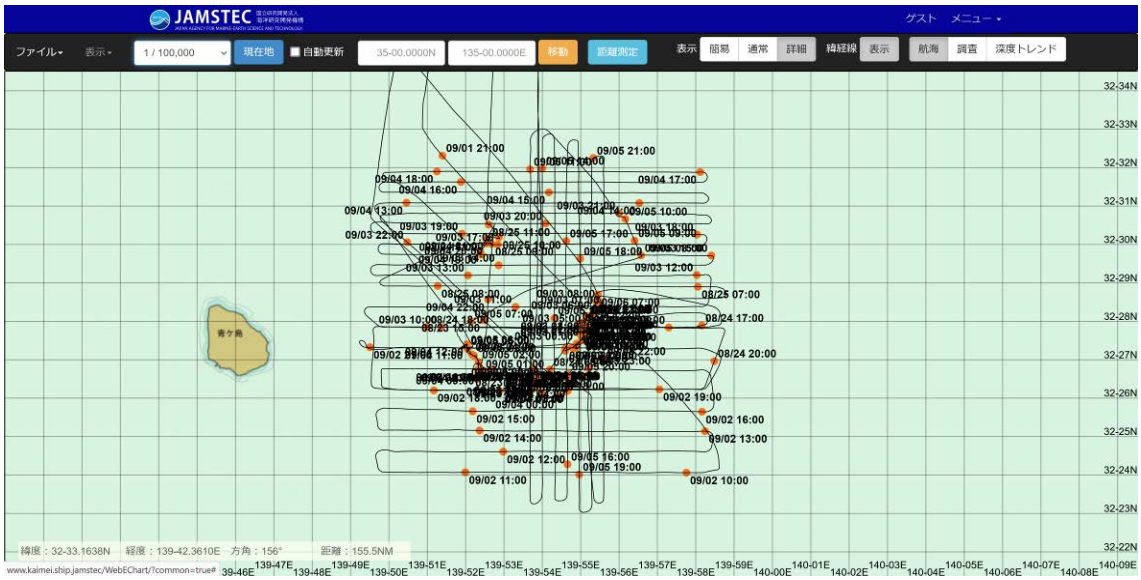

Fig. 3-2 Ship track around Higashi Aogashima Island during the cruise KM24-09

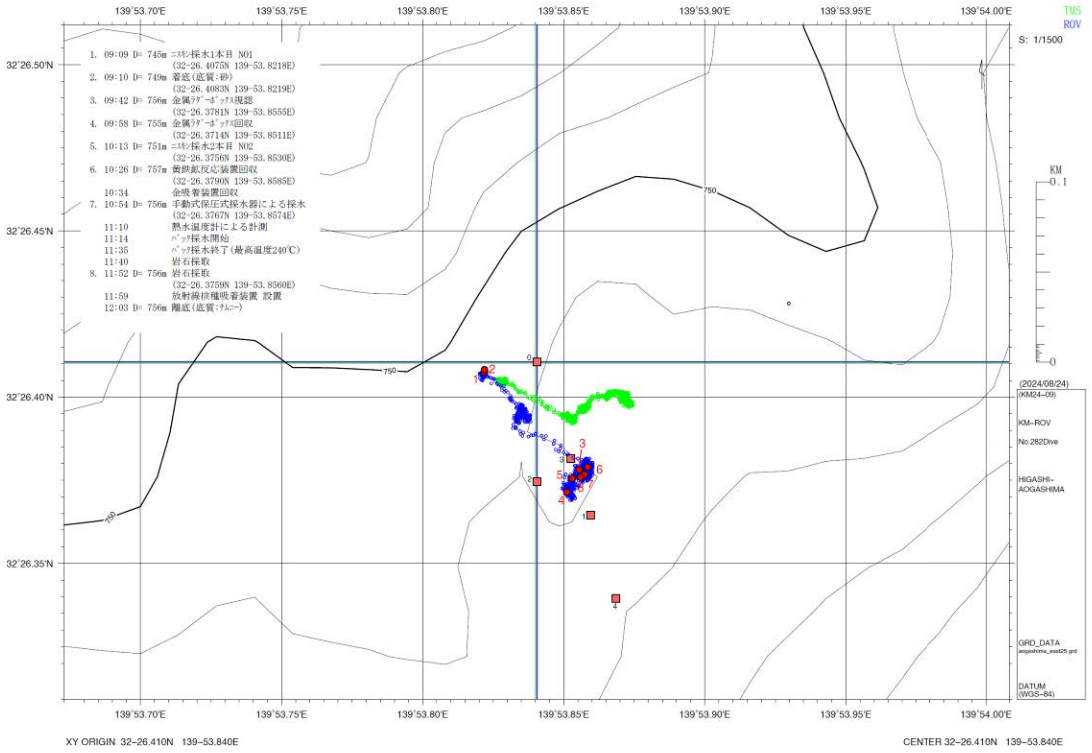

Fig. 3-3 ROV dive track during the dive KM-ROV#282 at Central Cone (CC) Site.

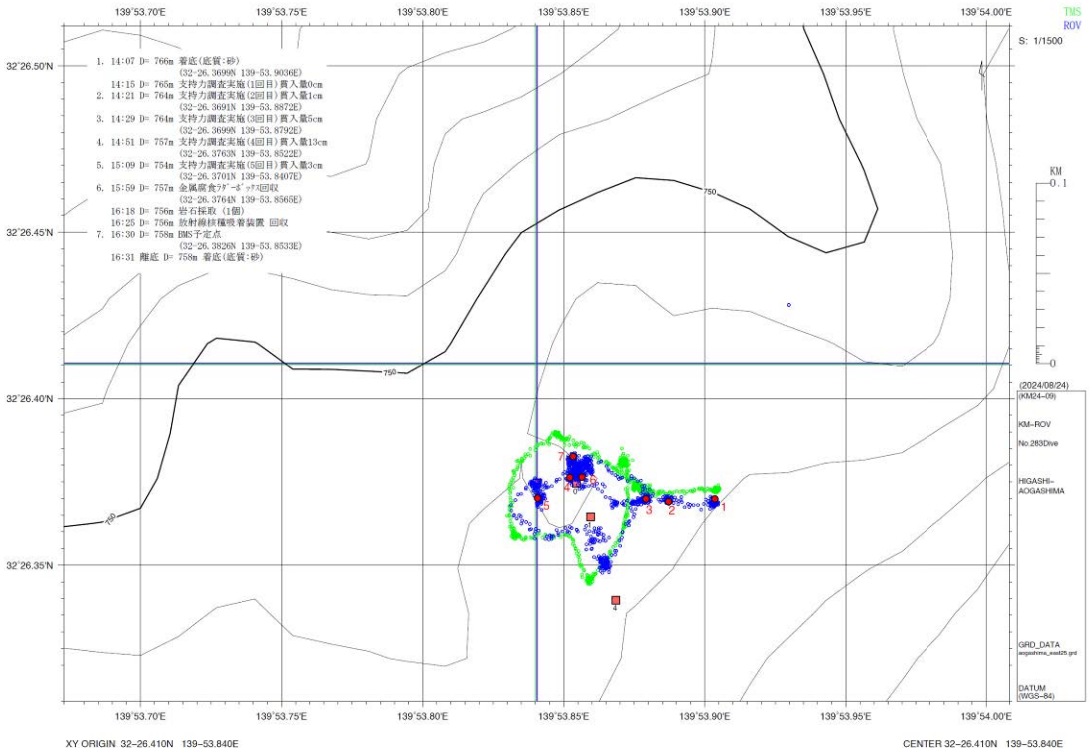

Fig. 3-4 ROV dive track of the dive KM-ROV#283 at Central Cone (SE) Site.

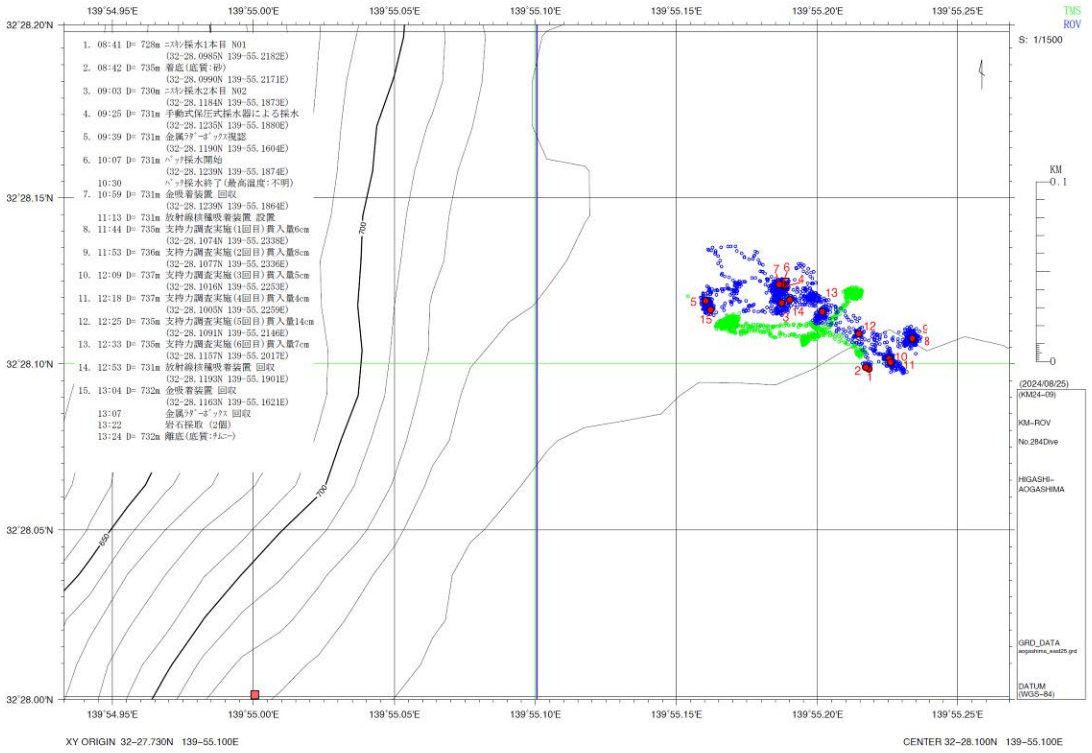

Fig. 3-5 ROV dive track of the dive KM-ROV#284 at East (E) Site.

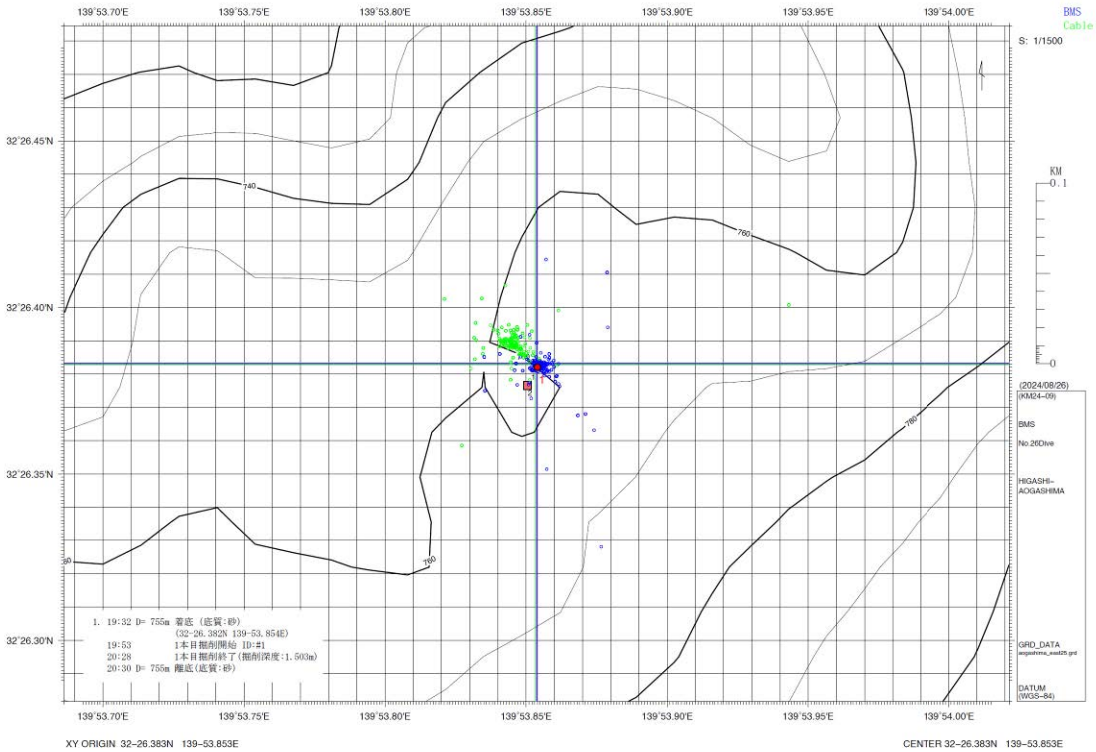

Fig. 3-6 BMS dive track of the dive BMS#26 at Central Cone (CC) Site.

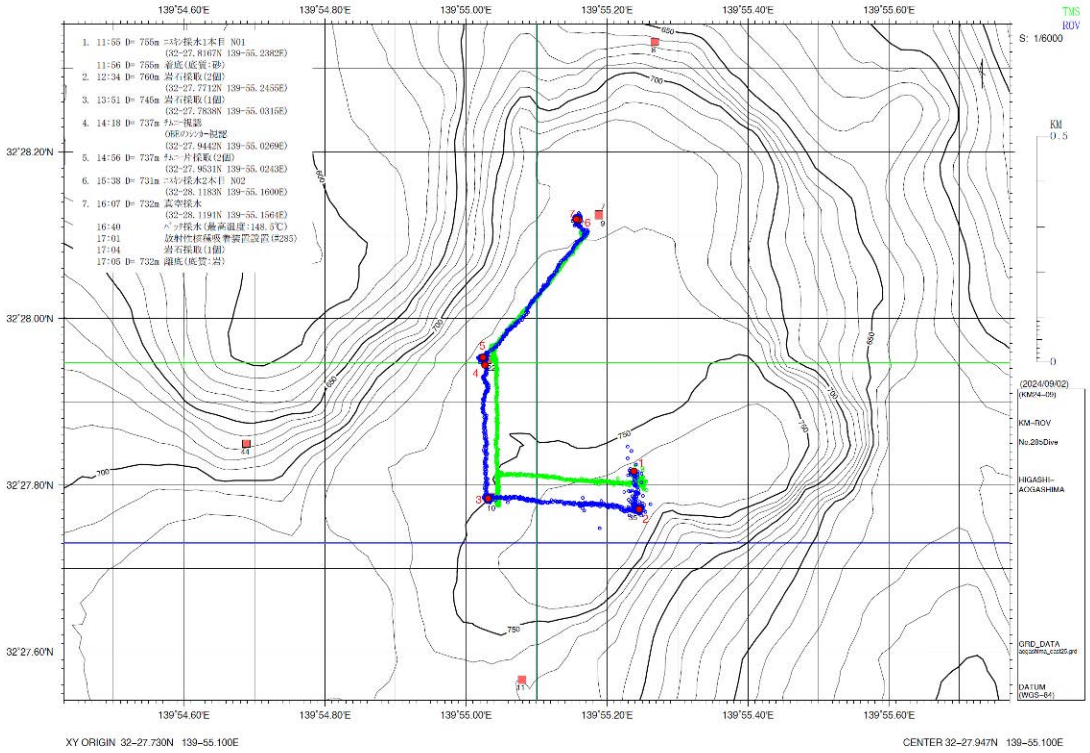

Fig. 3-7 ROV dive track of the dive KM-ROV#285 at South of East (SOE) and East (E) Sites.

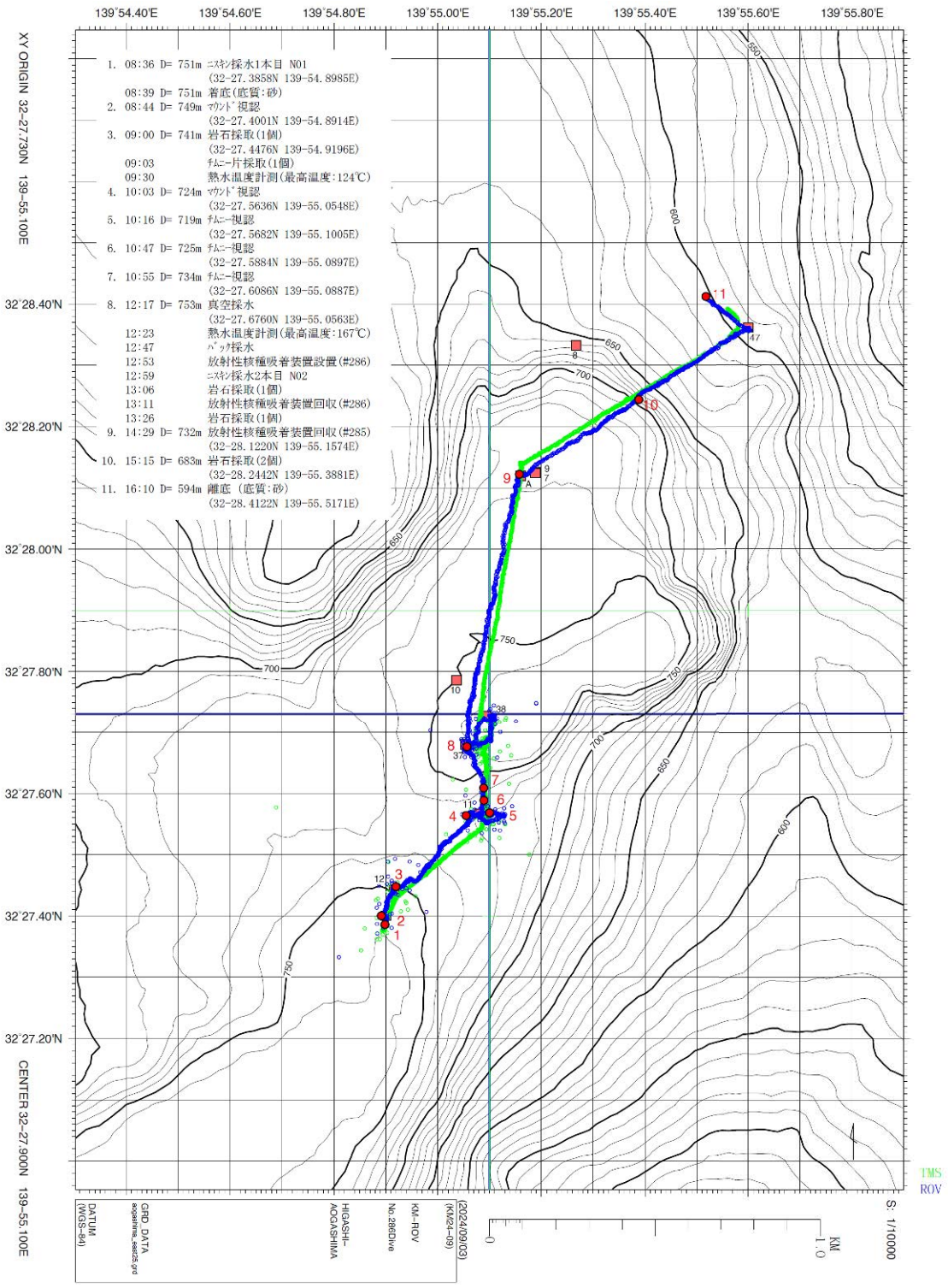

Fig. 3-8 ROV dive track of the dive KM-ROV#286 at South of East (SOE) and East (E) Sites.

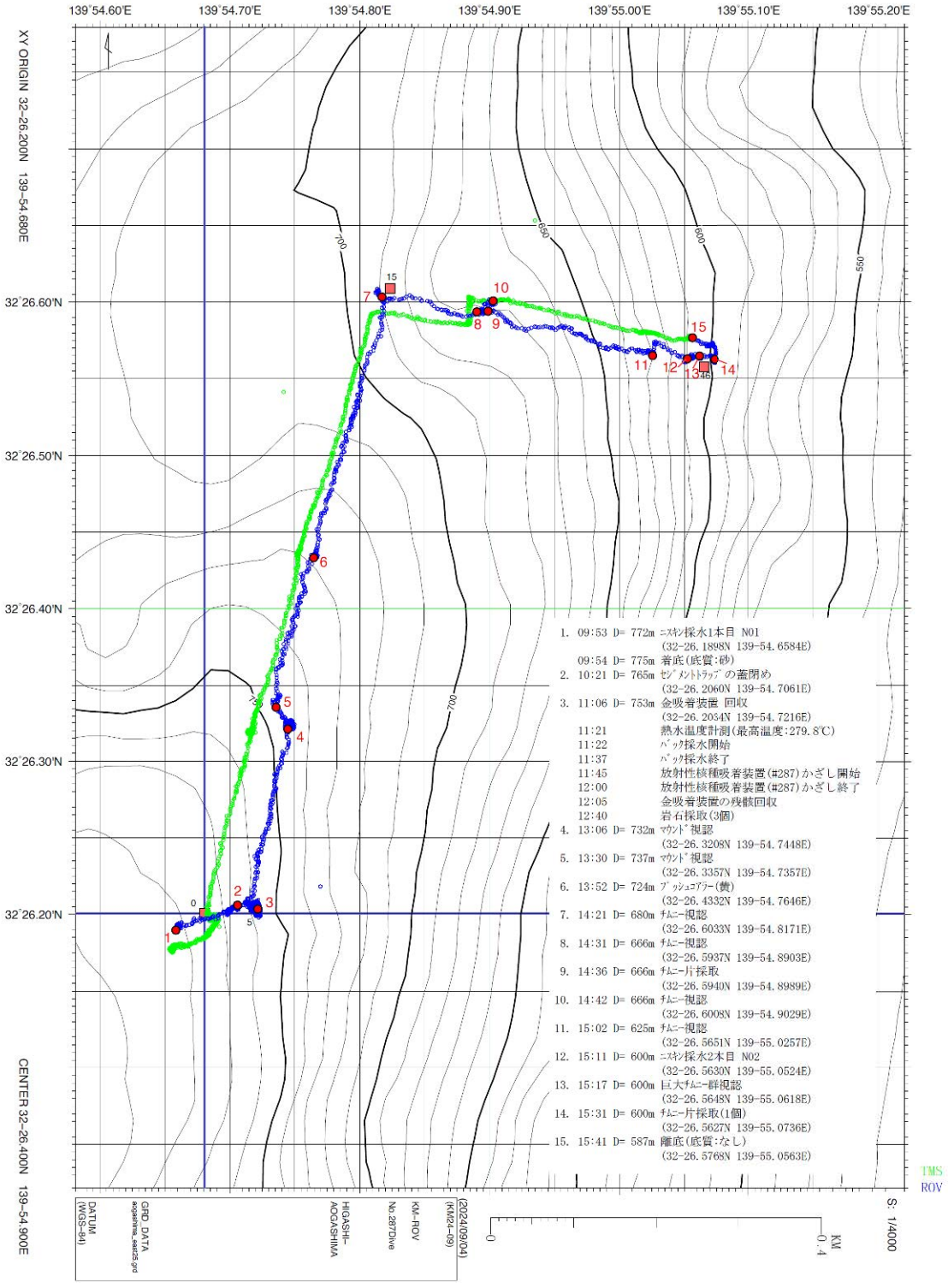

Fig. 3-9 ROV dive track of the dive KM-ROV#287 at Southeast Site.

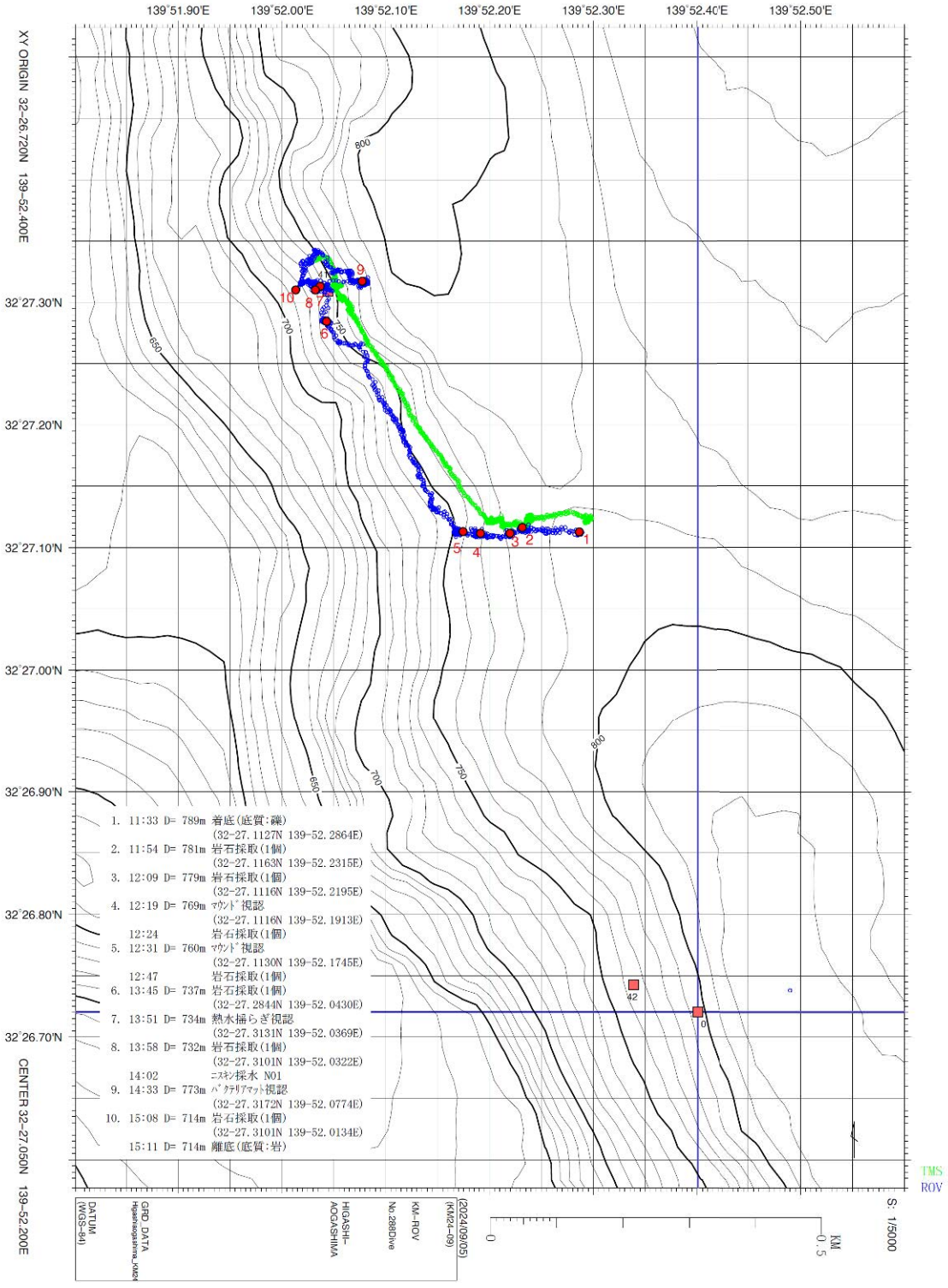

Fig. 3-10 ROV dive track of the dive KM-ROV#288 at West Site.

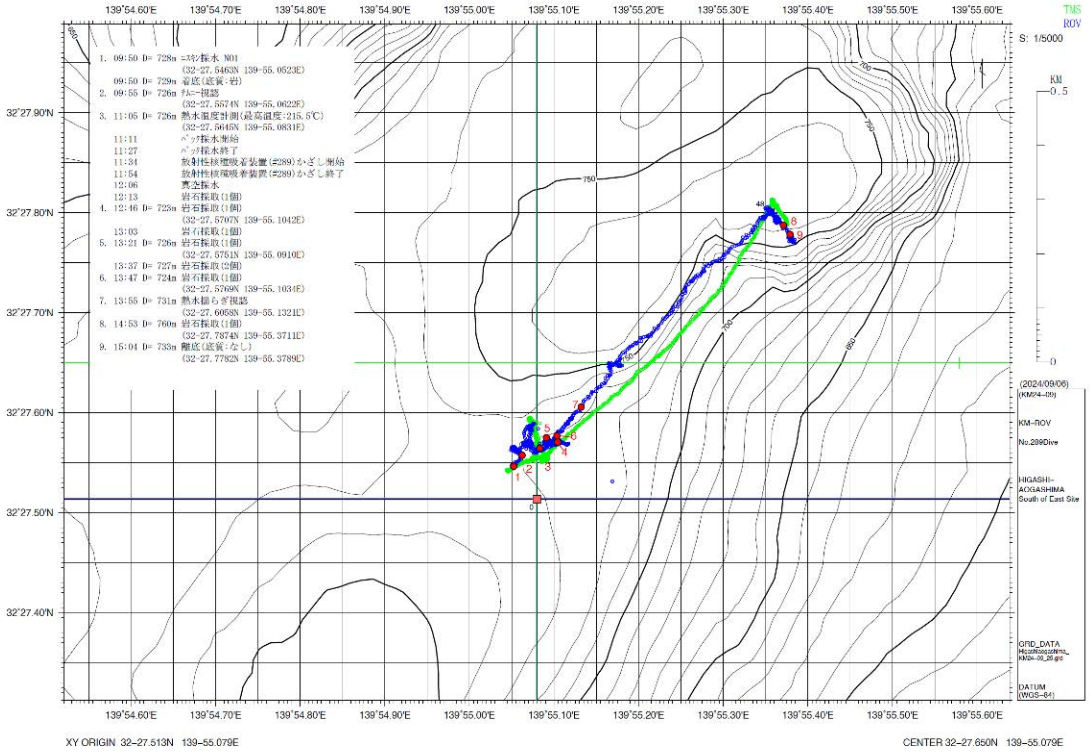

Fig. 3-11 ROV dive track of the dive KM-ROV#289 at South of East Site.

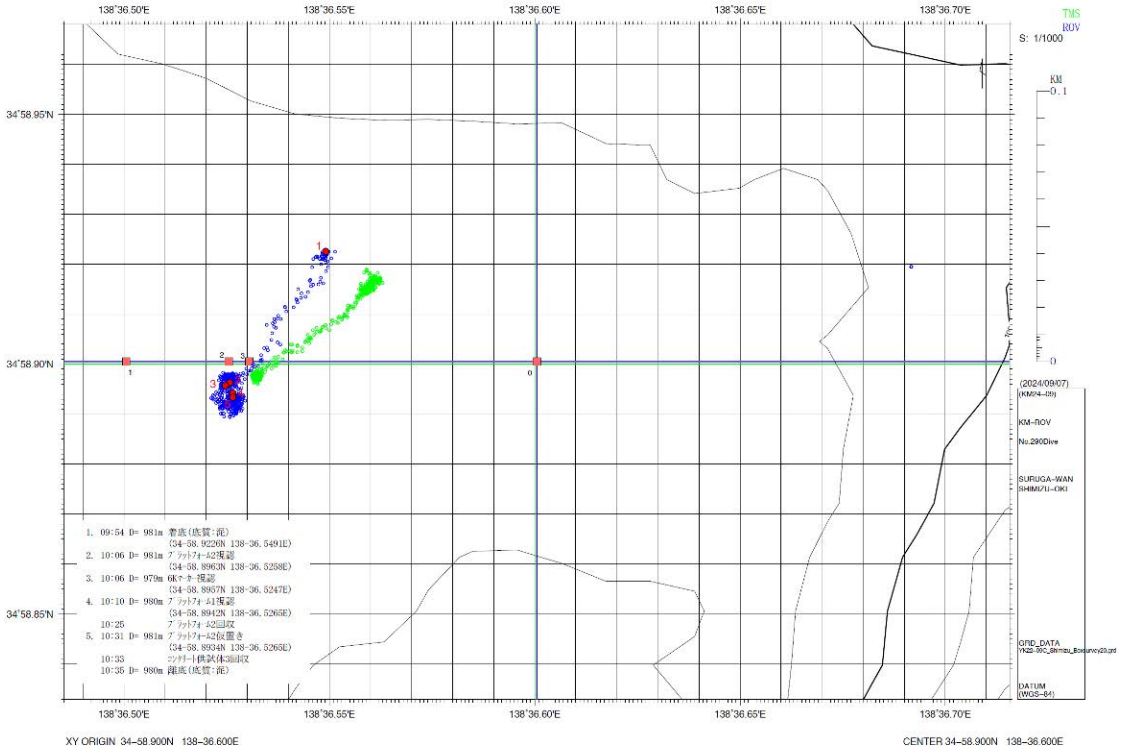

Fig. 3-12 ROV dive track of the dive KM-ROV#290 at Shimizu offshore, Suruga Bay.

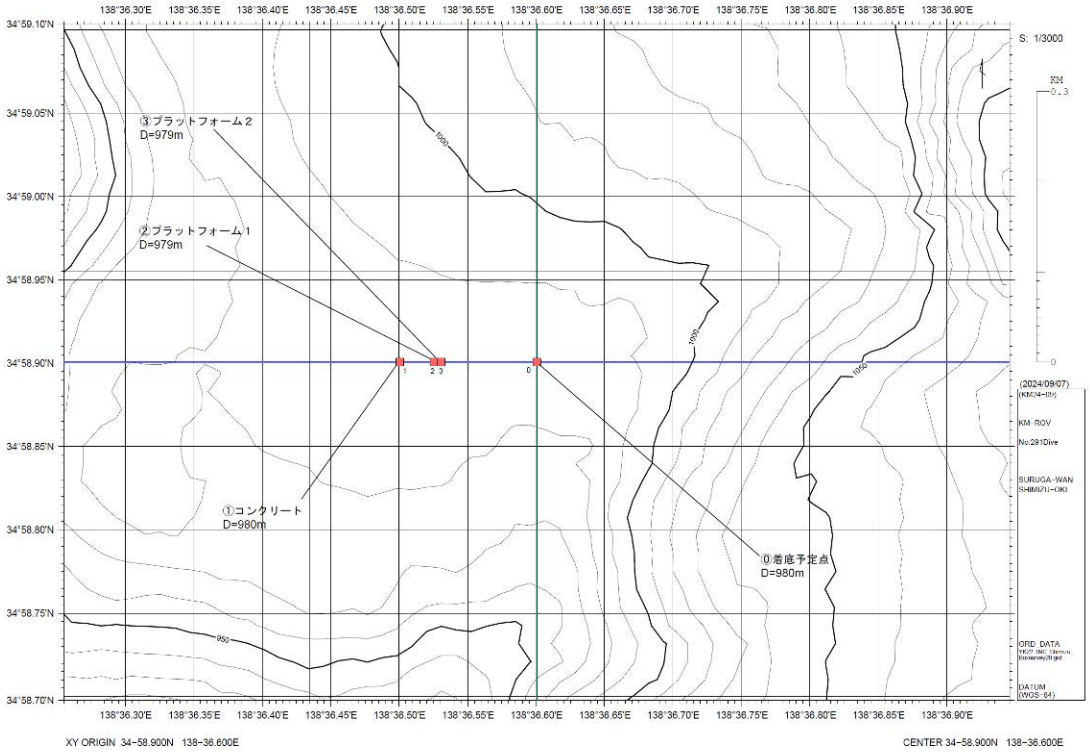

Fig. 3-13 ROV dive track of the dive KM-ROV#291 at Shimizu offshore, Suruga Bay.

4. Cruise Log

日付 Date	時間 Local Time	内容 Note	本船位置／気象／海象 Noon Position Weather/Wind/Sea Condition
23-Aug-24	8:00	Scientists party onboard R/V KAIMEI	Eastward Ohshima
	9:00	Let go all shore line & left YOKOSUKA port	34-46.7N,139-41.9E
	10:00-10:40	Onboard lecture for evacuation and onboard life	Weather:c
	18:00-18:25	Scientists meeting	Wind direction/force: South/4
	23:20	Arrived at research area	Wave scale: 3
	23:37	Let go XCTD	Swell scale: 1
			Visibility(miles): 8
24-Aug-24	0:39	Com'ced MBES wide-area ploom survey	East AOGASHIMA knoll Caldera
	5:00	Finished MBES wide-area ploom survey	32-26.4N,139-53.9E
	8:36	Hoisted up "KM-ROV" #282	Weather: bc
	8:42	Launched "KM-ROV",then it dove & com'ced her operation #2	Wind direction/force: SSE/4
	9:10	"KM-ROV"landed on the sea bottom (D=749m)	Wave scale: 3
	12:03	"KM-ROV"left the sea bottom(D=756m)	Swell scale: 1
	12:32	"KM-ROV" came up to surface	Visibility(miles): 8
	12:38	Recovered "KM-ROV"& finished the operation	
	13:32	Hoisted up "KM-ROV"	
	13:38	Launched "KM-ROV",then it dove & com'ced her operation #283	
	14:07	"KM-ROV"landed on the sea bottom (D=766m)	
	16:31	"KM-ROV"left the sea bottom(D=758m)	
	17:07	"KM-ROV" came up to surface	
	17:12	Recovered "KM-ROV"& finished the operation	
	18:00-18:05	Resercher's meetings	
	18:38	Com'ced MBES wide-area ploom survey	
25-Aug-24	1:18	Finished MBES wide-area ploom survey	East AOGASHIMA knoll caldera
	2:01	Com'ced MBES mapping survey	32-28.1N,139-55.2E
	4:49	Finished MBES mapping survey	Weather: bc
	8:09	Hoisted up "KM-ROV" #284	Wind direction/force: ESE/4
	8:35	Launched "KM-ROV",then it dove & com'ced her operation #2	Wave scale: 3
	8:42	"KM-ROV"landed on the sea bottom (D=735m)	Swell scale: 1
	13:24	"KM-ROV"left the sea bottom(D=732m)	Visibility(miles): 8
	14:06	"KM-ROV" came up to surface	
	14:11	Recovered "KM-ROV"& finished the operation	
	16:00	Com'ced MBES mapping survey	
	17:11	Finished MBES mapping survey	
	17:15	Transit to Hachijo-jima Island off	
	18:00-18:05	Scientist meeting	
26-Aug-24	7:10	Transit to reseach area	East AOGASHIMA knoll caldera
	11:00	Arrived at research area	32-26.4N,139-53.9E
	17:44	Hoisted up "BMS"	Weather: c
	17:54	Launched "BMS",then it dove & com'ced her operation #26	Wind direction/force: ESE/6
	18:00-18:10	Scientists meeting	Wave scale: 4
	19:32	"BMS" landed on the sea bottom (D=755m)	Swell scale: 2
	19:53	"BMS" drilled (D=755m, Max depth=1.503m)	Visibility(miles): 8
	20:30	"BMS" left the sea bottom(D=755m)	
	21:05	"BMS" came up to surface	
	21:28	Recovered "BMS"& finished the operation	
	23:20	Transit to Hachijo-jima Island off	
27-Aug-24	3:00	Arrived at Hachijo-jima Island off	Hachijo-jima Island off
	18:00-18:05	Scientists meeting	33-07.5N,139-50.2E
			Weather: c
			Wind direction/force: SE/5
			Wave scale: 3
			Swell scale: 1
			Visibility(miles): 8
28-Aug-24	18:00-18:05	Scientists meeting	Hachijo-jima Island off
			33-07.6N,139-50.2E
			Weather: bc
			Wind direction/force: SE/4
			Wave scale: 3
			Swell scale: 1
			Visibility(miles): 8
29-Aug-24	18:00-18:05	Scientists meeting	Hachijo-jima Island off
			33-07.6N,139-50.2E
			Weather: bc
			Wind direction/force: SE/4
			Wave scale: 3
			Swell scale: 1
			Visibility(miles): 8
30-Aug-24	9:00-10:00	Scientists seminar	Hachijo-jima Island off
	18:00-18:05	Scientists meeting	33-07.5N,139-50.0E
			Weather: r
			Wind direction/force: SW/4
			Wave scale: 2
			Swell scale: 1
			Visibility(miles): 6

31-Aug-24	9:00-10:30	Scientists seminar	Hachijo-jima Island off
	18:00-18:05	Scientists meeting	33-07.5N,139-50.0E
			Weather: r
			Wind direction/force: SSW/5
			Wave scale: 2
			Swell scale: 1
			Visibility(miles): 6
1-Sep-24	9:00-10:00	Scientists seminar	Hachijo-jima Island off
	18:00-18:05	Scientists meeting	33-07.5N,139-50.0E
			Weather: o
			Wind direction/force: East/3
			Wave scale: 2
			Swell scale: 1
			Visibility(miles): 7
2-Sep-24	2:00	Transit to Higashi-Aogashima knoll cardela	East AOGASHIMA knoll caldera
	5:45	Arrived at research area	32-27.8N,139-55.3E
	5:49	Let go XBT	Weather: bc
	11:18	Hoisted up "KM-ROV" #285	Wind direction/force: SSE/5
	11;24	Launched "KM-ROV",then it dove & com'ced her operation #2	Wave scale: 3
	11:56	"KM-ROV"landed on the sea bottom (D=755m)	Swell scale: 2
	17:05	"KM-ROV"left the sea bottom(D=732m)	Visibility(miles): 8
	17:35	"KM-ROV" came up to surface	
	17:41	Recovered "KM-ROV"& finished the operation	
	18:00-18:05	Scientists meeting	
	18:57	Com'ced MBES mapping survey	
3-Sep-24	5:48	Finished MBES mapping survey	East AOGASHIMA knoll caldera
	8:02	Hoisted up "KM-ROV" #286	32-27.7N,139-55.1E
	8:08	Launched "KM-ROV",then it dove & com'ced her operation #2	Weather: r
	8:39	"KM-ROV"landed on the sea bottom (D=751m)	Wind direction/force: SSW/5
	16:10	"KM-ROV"left the sea bottom(D=594m)	Wave scale: 3
	16:35	"KM-ROV" came up to surface	Swell scale: 1
	16:40	Recovered "KM-ROV"& finished the operation	Visibility(miles): 4
	17:52	Com'ced MBES mapping survey	
	18:00-18:05	Scientists meeting	
4-Sep-24	6:51	Finished MBES mapping survey	East AOGASHIMA knoll caldera
	9:18	Hoisted up "KM-ROV" #287	32-26.2N,139-54.7E
	9:24	Launched "KM-ROV",then it dove & com'ced her operation #2	Weather: o
	9:54	"KM-ROV"landed on the sea bottom (D=775m)	Wind direction/force: South/3
	15:41	"KM-ROV"left the sea bottom(D=587m)	Wave scale: 2
	16:04	"KM-ROV" came up to surface	Swell scale: 1
	16:11	Recovered "KM-ROV"& finished the operation	Visibility(miles): 7
	17:15	Com'ced MBES wide-area ploom survey	
	18:00-18:10	Scientists meeting	
	21:20	Finished MBES wide-area ploom survey	
	21:55	Com'ced MBES mapping survey	
5-Sep-24	3:15	Finished MBES mapping survey	East AOGASHIMA knoll caldera
	9:35	Hoisted up "KM-ROV" #288	32-27.1N,139-52.3E
	9:42	Launched "KM-ROV",then it dove & com'ced her operation #2	Weather: bc
	11:33	"KM-ROV"landed on the sea bottom (D=789m)	Wind direction/force: North/1
	15:11	"KM-ROV"left the sea bottom(D=714m)	Wave scale: 1
	15:36	"KM-ROV" came up to surface	Swell scale: 1
	15:42	Recovered "KM-ROV"& finished the operation	Visibility(miles): 8
	18:00-18:05	Scientists meeting	
	19:53	Com'ced MBES mapping survey	
6-Sep-24	7:36	Finished MBES mapping survey	East AOGASHIMA knoll caldera
	9:16	Hoisted up "KM-ROV" #289	32-27.5N,139-55.0E
	9:23	Launched "KM-ROV",then it dove & com'ced her operation #2	Weather: bc
	9:50	"KM-ROV"landed on the sea bottom (D=729m)	Wind direction/force: SW/3
	15:04	"KM-ROV"left the sea bottom(D=733m)	Wave scale: 2
	15:33	"KM-ROV" came up to surface	Swell scale: 1
	15:38	Recovered "KM-ROV"& finished the operation	Visibility(miles): 8
	16:00	Transit to Suruga-Bay Shimizu Off	
	18:00-18:10	Scientists meeting	
7-Sep-24	4:15	Arrived at research area(Suruga-Bay)	Suruga-Bay
	6:45	Let go XBT	34-58.9N,139-36.5E
	9:12	Hoisted up "KM-ROV" #290	Weather: bc
	9:22	Launched "KM-ROV",then it dove & com'ced her operation #2	Wind direction/force: South/3
	9:54	"KM-ROV"landed on the sea bottom (D=981m)	Wave scale: 1
	10:35	"KM-ROV"left the sea bottom(D=980m)	Swell scale: 0
	11:05	"KM-ROV" came up to surface	Visibility(miles): 8
	11:11	Recovered "KM-ROV"& finished the operation	
	11:22	Hoisted up "KM-ROV"	
	11:30	Launched "KM-ROV",then it dove & com'ced her operation #291	
	12:00	"KM-ROV"landed on the sea bottom (D=978m)	
	12:25	"KM-ROV"left the sea bottom(D=980m)	
	12:57	"KM-ROV" came up to surface	
	13:05	Recovered "KM-ROV"& finished the operation	
	13:30	Transit to Yokosuka(JAMSTEC)	
	18:00-18:50	Scientists meeting and seminar	
8-Sep-24	9:00	Arrived at JAMSTEC, then completed voyage KM24-09	

5. Notice on Using

Notice on using: Insert the following notice to users regarding the data and samples obtained.

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.
Users of information on this report are requested to submit Publication Report to JAMSTEC.

http://www.godac.jamstec.go.jp/darwin/explain/1/e#report
E-mail: submit-rv-cruise@jamstec.go.jp