



Kairei/Kaiko Cruise Report KR21-11

50th Anniversary memorial Deep-sea research excursion
to extend JAMSTEC's supporters thru diverse creators

Suruga Bay

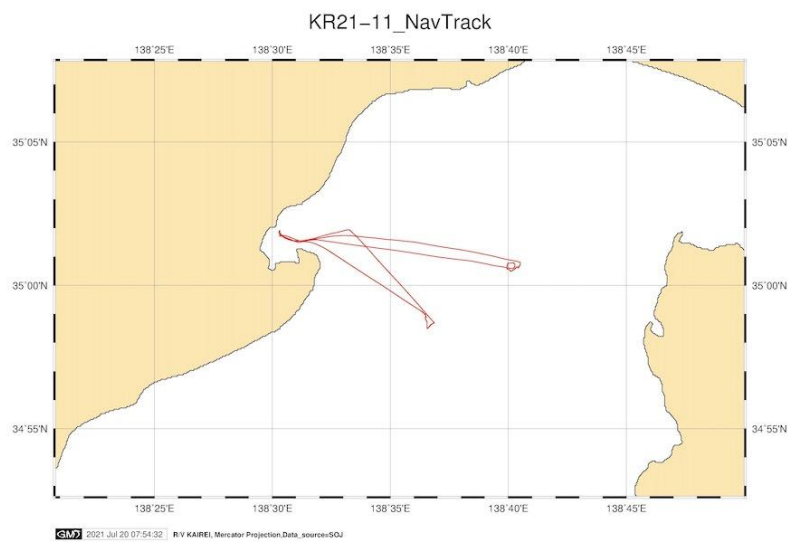
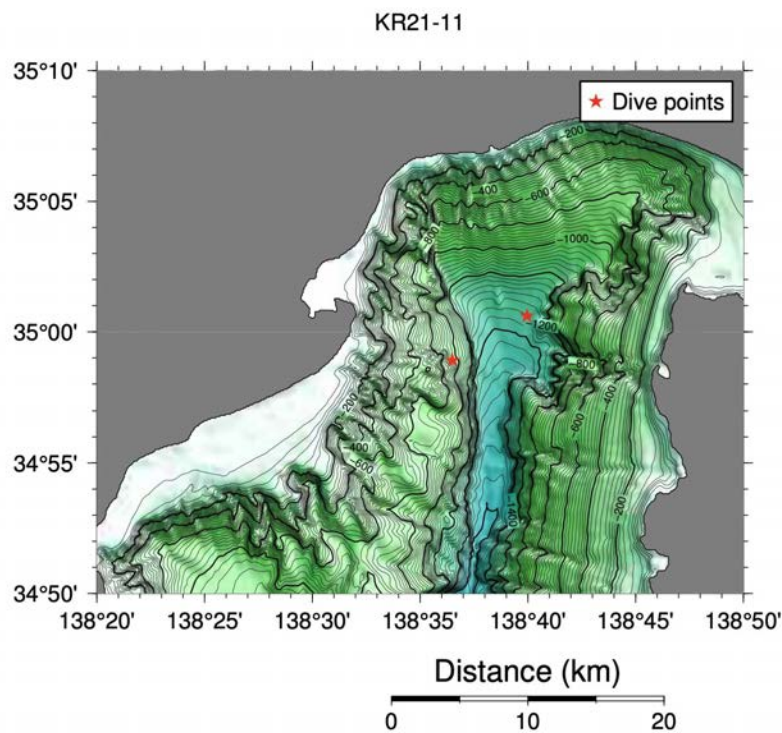
July. 19, 2021-July. 20, 2021

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



1. Cruise Information

- KR21-11
- R/V Kairei and ROV Kaiko mark IV
 - Science x Art
- 50th Anniversary memorial Deep-sea research excursion to extend JAMSTEC's supporters thru diverse creators
- Takashi Toyofuku [JAMSTEC]
- July. 19, 2021-July. 20, 2021
- Shimizu-Shimizu-Shimizu
- Suruga Bay
- Research map



2. Research Proposal and Science Party

- Title of proposal

-50th Anniversary memorial Deep-sea research excursion to extend JAMSTEC's supporters thru diverse creators-

- Representative of Science Party [Affiliation]

Takashi Toyofuku (JAMSTEC)

- Science Party (List) [Affiliation, assignment etc.]

【JAMSTEC】

Takafumi Kasaya (Deputy Chief Scientist)

Tatsuo Nozaki (Second Deputy Chief Scientist)

Shuhei Masuda

Yukiko Nagai

Masashi Tsuchiya

Remi Tsubaki

Kumi Goto

Shinsuke Kawagucci (non-boarding)

Takahiro Kasahara (non-boarding)

【NME】

Hisanori Iwamoto

【3710Lab】

Kodai Taguchi (President of 3710Lab)

Jin Kuramoto (Designer)

Kazutoyo Yamamoto (Designer)

Yutaka Ito (Designer)

Ayuko Inaba (PR)

Katsunobu Yoshida (Designer)

Toshiko Suzuki (Editor)

Souya Oikawa (Press, PR)

HUNGER (Rapper)

Mitsu The Beats (Music producer)

Yoh Oue (Designer)

Sakura Koretsune (Artist)

Gak Sato (Composer)

Eriko Kishimoto (Chef)

Makiko Iwasaki (Stylist)

Kensaku Ohshiro (non-boarding, Designer)

Elena Tutatchikova (non-boarding, Photographer)

【Fukushima Univ】

Koichi Watanabe

Takuto Umetsu

Shū yán Sūn

Taijyu Sato

Mikuri Ueda

Manae Suzuki

Jīn yáo Wáng

【Kooriyama Fureai Science Museum “Space Park”】

Akemi Kato

【Freelance】

Yoshiko Yamane (Science Illustrator)

【KAIREI crew】

TAKAFUMI AOKI, Captain

TAKESHI EGASHIRA, Chief Officer

TATSUYA NOZAWA, 2nd Officer
TAIGA YAMAMOTO, 3rd Officer
RYOTA NAKAMURA, Jr.3rd Officer
EIJI SAKAGUCHI, Chief Engineer
KAZUNORI NOGUCHI, 1st Engineer
KEITO SHIMADA, 2nd Engineer
YUDAI YOKOYAMA, 3rd Engineer
TOKINORI NASU, Chief Electronics Operator
KAZUMI UGAJIN, 2nd Electronics Operator
YUKI YOSHINO, Boat Swain
SHUICHI YAMAMOTO, Quarter Master
TSUBASA KUBOTA, Quarter Master
YOSHIAKI MATSUO, Quarter Master
YUDAI YOSHIMI, Sailor
KOSEI HIRAI, Sailor
MIZUKI NAKANO, Sailor
SHINYA SUGI, No.1 Oiler
TORU HIDAKA, Oiler
SOUMA HAYASHIDA, Assistant Oiler
AOI DANTSUKA, Assistant Oiler
KOTA MATSUMURA, Assistant Oiler
FUMIYA NAKASHIMA, Assistant Oiler
TATSUNARI ONOUE, Chief Steward
TSUYOSHI NAGATOMO, Steward
MASAAKI YAMAMOTO, Steward
RYU KUBOTA, Steward
KOICHIRO KASHIWAGI, Steward
KEITO SATO, Steward
HAYATO OKADA, Steward

【KAIKO operating team】

SEIJI SHIGETAKE, Submersible Op. Manager
TOMOE KONDO, 1/Submersible Tec. Officer
ATSUSHI TAKENOUCI, 2/Submersible Tec. Officer
SHOTA IHARA, 2/Submersible Tec. Officer
NAOKI SATO, 3/Submersible Tec. Officer
KUNIHIRO IWATA, 3/Submersible Tec. Officer
YUTO OKUHIRA, 3/Submersible Tec. Officer

3. Research/Development Activities

• Science × Art -50th Anniversary memorial Deep-sea research excursion to extend

JAMSTEC's supporters thru diverse creators-

Taking the opportunity of the 50th anniversary of JAMSTEC, we discussed how to appeal marine science and technology to a wide range of public, and came up with the idea of borrowing the power of art such as creative works and music, and launched the Science × Art project. As part of this project, we are inviting the cooperation of creators from the fields of design, modeling, clothing, textiles, and music, who are capable of producing highly creative works using the ocean and science as a motif. Through creative works that utilize collected water, seafloor sediments, images and sounds of onboard work, and the onboard experience itself, the fusion of science and art is expected to create opportunities for interest in marine research among an audience that has not been reached by conventional public relations activities. Thereby attracting new interest in JAMSTEC. This is expected to attract new interest in JAMSTEC.

JAMSTEC researchers conducted observation, water sampling, and sediment collection using ROVs, as well as microplastics and plankton collection. The creators had a chance to experience these activities. During this research cruise, the following investigations were carried out.

(1) Niskin water sampler, water directly above the sediment core sample, and seawater in the sample box were collected. Deep seawater samples will be used as creative materials for dyeing and weaving.

(2) Collected sediments will be used as materials for dyeing and weaving or ceramics.

(3) Observation of underwater and seabed environments and acquisition of images: In addition to the regular ROV-mounted camera, a 180° camera was brought on board to observe the ROV from launch to diving, operation, surfacing, and lifting, and to record environmental sounds. These video and acoustic materials will be used for music production and/or as a sound sampling source. The 180° camera was connected to the deep-sea VR observation system for real-time observation from the on-board operation room.

(4) With the idea of creating a new "seafloor" font, ROV drew and photographed some elemental characters with a stick held by the manipulator at the bottom of the deep sea.

(5) Observation of the appearance of paintings depending on depth. Diversely colored ceramic plates were observed under natural light while the ROV was ascending. The ceramic plates were made by the creators with the assumption that there would be differences in visibility by the depth with penetrated sunlight.

(6) Plankton samples were collected using a plankton net. The obtained samples were quickly sorted under a stereomicroscope on board to isolate planktonic foraminifera.

(7) A music producers filmed a music video of a rap piece on board. The live streaming was distributed online through the creators' Instagram accounts from the deck.

- **Understanding of the actual condition of microplastics and its impact on marine ecosystems**

Distribution of sedimentary microplastics in Suruga Bay

Masashi Tsuchiya, Tomo Kitahashi (M-Plastics, RIGC, JAMSTEC)

The distribution of microplastics in the sediment is largely undocumented. Substantial numbers of studies on floating microplastics have been reported, yet very few data are available in the deep-sea sediments. In the present study, we conducted microplastic surveys in the deep-sea sediment in Suruga Bay.

Push core sampling

Microplastics and meiofaunas (Tsuchiya, M, Kitahashi, T.)

Sediment samples were collected by the H-type push corer (covering 43.0 cm² seafloor surface area) during the dives #865 and #866 in Suruga Bay. We used two types of the core, acrylic and aluminum-made core tubes. Aluminum-made tubes were used in this study for microplastic analysis to prevent plastic contamination. Total two cores were used; one sediment core collected with aluminum-made core tube were used for microplastic analysis, and one sediment core collected with acrylic core tubes were used for meiofaunas at each dive. Sediment samples of 0-1 cm were retrieved for microplastics and meiofaunas. Sediment samples will be treated according to the procedure described by Nakajima et al. (2019) and extracted microplastics from both sediment and meiofaunas will be counted under a fluorescence microscope or FTIR microscopy.

• Shell Formation Process of living calcareous Foraminifera
Yukiko Nagai, Takashi Toyofuku (X-star, JAMSTEC)

On the KR21-11 cruise, Plankton nets were thrown into the sea from the port side of the R/V Kairei and plankton samples were collected from the surface of Suruga Bay (about 5 m deep). From the plankton samples collected, about 100 planktonic foraminifera were picked up and used as culture samples. The living planktonic foraminifera were brought to the laboratory of JAMSTEC. In addition, we picked up benthic foraminifera from sediment samples collected during Kaiko's #865 and #866 DIVE. These benthic foraminifera are also cultured. Both planktonic and benthic foraminifera are used as the culture samples for the study of the mechanism of shell formation. Some of the individuals that formed shells during culture were biologically fixed. After that, the samples will be dried at the critical point for fine electron microscopic observation. The detailed morphology of calcium carbonate and cytoplasm will be observed on these samples..

● **The experience of everyone from 3710 Lab**
Kodai Taguch and boarding creators (3710Lab)

** The original report was written in Japanese. The lead PI translated it into English.*

■ In order to open up new possibilities for JAMSTEC's research and development activities, we invited people with various occupations and specialties to come on board. There were a variety of ways in which the people came aboard the ship, including those who had formed an image of their output beforehand and those who tried to think of their output based on the inspiration they received from being aboard the ship. Some preferred to get detailed information in advance. However, after boarding the R/V Kairei, it seemed that all of the participants shared a sense of the strength of the appeal of the experience itself. They also felt that the careful work of each and every ship crew member makes the scientific cruise possible, and that they could sense the significance of fundamental research, which is not something that can be understood immediately. The subject and content of the research and development itself are also attractive enough. I think that the goodness of "JAMSTEC" as a whole will be brought into sharp relief only when the participants can feel the system that makes the activities themselves possible, the cooperative system, and the appeal of each and every sailor and researcher there. "I feel that the official and legitimate history of the JAMSTEC organization is only meaningful if there are small histories and memories that are not so obvious and are not recorded. I think there is a potential for education in these areas and a way to connect more people, and I believe that finding these areas will in turn convey the appeal and significance of JAMSTEC's research and development activities themselves. I think that this project could be a way to illustrate the "various ways of connecting" with JAMSTEC, and I think it was a very valuable project.

■ I had a great time on the ship. Thank you very much for this opportunity. I really wish I could have thought of more things when I came aboard. For my work, I learned a lot about the interior design of the ship (colors, symbols and fonts such as equipment diagrams, illustrations, accessories, etc.), the efficiency of the kitchen and the detailed storage of food.

■ Although it was only a half-day experience, I still felt like I got a lot of hints about the "richness resources" that JAMSTEC has. For example, in terms of apparel, I wondered how the crew members were dressed, but since fashion is about the relationship with one's living environment, it would be a bit foolish to bring urban sophistication into the ship. I think it's more appealing as a style to say, "I didn't pay attention to it, and before I knew it, it became amazing. I think it's richer. Between the "attachment and indifference" of the sailors to their work clothes, from helmets to jackets, shirts, belts, pants, shoes, life jackets, and all other equipment, I am sure that something like the character of the JAMSTEC personality will emerge. Furthermore, I'm sure that we can find "certain things about work clothes" that are also common among employees of organizations such as JR (Japan Railway), electric power companies, and gas companies. I'm sure the fathers of the world won't talk about their own work clothes or daily clothes in the context of the young people, but they will say, "Yes! But I'm sure there is a common ground among their peers (which is the connection to the outside world). Approaching young people is important, but I feel that "I get it, I get it" directed at the baby-boom generation will also have a very strong centripetal force. I've found some hints of this kind, and I'd like to transcribe them into a list.

■ Throughout the cruise, I felt firsthand that JAMSTEC's science, ship engineering, and navigation operations are not only advanced, but also on the cutting edge of tradition (or the passing down of technology, as it were). Being around people who deal with manufacturing on a daily basis, I believe that skills and creativity can be found in people, objects, and spaces. I also believe that the better and healthier they are, the more they help to create new things, generate ingenuity, and bring about innovation. Perhaps because of this, from various parts of the Kairei, I felt an air of affection, an accumulation of good things, people and time, and the passage of a long time in which many people have sincerely faced their work. I also felt a sense of craftsmanship with spirit and pride in the work that each person was doing. As a complete stranger to the field, I had no idea what to expect on the

day of the conference, so I set sail with only high expectations. Reading the message from the chief researcher through the materials, the online pre-meeting, and the other minimal requirements for boarding the ship were all very helpful in preparing for the day. I was very grateful.

■ We are thinking of adding the products created by the participants to the JAMSTEC official online store. There are many attractive items in the current shop, and there are some items that I would like to buy, but I think that the target audience is limited to JAMSTEC fans. We thought it would be a good idea to consider selling items that were created by people involved in KR21-11. It would be interesting if we could attract them to the website and online store where they can learn about the project.

■ Thank you very much for the valuable experience of boarding the ship. I usually work in the textile, fiber, and fashion industries, so I was able to do a lot of research around these areas. I was impressed by the use of textiles, fabrics, and techniques related to "lifesaving," "communication," and "boundaries" on board.

"Lifesaving - textile approaches to life jackets, shipboard wardrobe regulations, protruding objects, etc. (e.g. handmade synthetic leather covers)

"Communicating - communicating flags, figurines, identifying the color of the carpet on each floor, how to divide the color of the floor and projections, etc.

"Boundaries: Boundaries, such as ropes, ropes, etc., and how to use them.

I feel that these are characteristic of the way we work at sea. These uses of "lifesaving," "communication," and "boundaries" are some of the things we come into contact with casually in our daily lives on land, but there are also many things that have become skeletonized and unconscious. There are various reasons, developments, and people in charge of creating and operating them lurking around, and I felt that by conducting further research on these people and outputting the results, it would be possible to induce interest in the textiles and fibers around us.

■ I was surprised to see how many people were involved in the preparation and implementation of deep-sea exploration, and how they carefully checked each step as they proceeded. During the two days aboard the ship, I was also impressed by the differences in the appearance of the inside of the sea and the ocean floor depending on the area to be explored. I will never forget how the marine snow covered the entire screen. I was told that it contained not only dead organisms but also jellyfish mucus. I felt that the structure of the world in the ocean is different from that on land, with both living and non-living things floating around and mixing together. In the observation experiment of the ceramic plate painting I brought with me, the painting gradually became visible in the blue light from a depth of about 200 meters when the oceanic vessel surfaced. At the depth of 200 meters, we could see the pattern in the blue light. At the depth of 200 meters, the pattern looked darker, but as it surfaced, the pattern faded and became harder to see, and we could see the difference in colors. Comparing them to the paintings I had memorized in my mind, the way they looked on land and under the sea was more beautiful than I had imagined. This year, I am working on a large embroidery piece that glows in the dark, inspired by the "whale bone biome" (to be shown at Sendai Mediatheque in Sendai City, Miyagi Prefecture from November). During this embarkation, I realized the remoteness of the marine world, the abundance of life mixed in the sea, the various shapes of marine snow, the creatures living on the sea floor, and the texture of the sludge, all of which have influenced and changed the images of the works I am currently creating. During this time aboard the ship, I was sketching scenes that left an impression on me (the marine snow, the landing of the kaikou, what I saw on the ship, etc.). Looking back at my sketches, I think my impression of the ocean has changed from "big water" to "a mass of life. I was also impressed by the contrast of colors, such as the orange of the Kaiko and the blue of the Kairei, the green of the deck and the black of the shadows.

■ I was impressed by the contrast of colors: the orange of the seashells and the blue of the sails, the green of the deck and the black of the shadows. In the process of creating a font, we asked the sea floor to write letters. On the first day, they wrote 2 letters, and on the second day, they wrote 15

letters. The experience of drawing the seafloor on the first day was fed back to the second day, and the brushes on the ROV were updated. It was difficult to draw lines in the mud on the seafloor by manipulating the ROV's hands. I am glad that the atmosphere was relaxed. It was good that the lecturer focused on the essential issues, such as accepting patients with coronary heart disease and accepting amateurs. I witnessed the situation where medical supplies were hodgepodge, such as the contents of the PCR test kits for Inaba and myself, who were tested at the same time, were different. When I thought about the tight situation in the medical field, I was left with a strong impression of the current situation where society is more divided than ever, and this is becoming visible on the surface.

■ The two-day glimpse into the world of researchers surprised me even more than the world of manufacturing, with their inquisitive minds and imaginations backed up by knowledge. It was an extraordinary experience for those of us who were on board for the first time, but we recognized a larger world view that could not be more real. God is in the details, such was my impression. Although the sea was calm, it was also a strange experience that I could not get rid of the land sickness for almost a week afterwards. The HTI-94-SSQ hydrophone microphone installed on the ship is capable of recording frequencies far beyond the range of human hearing, so I'm looking forward to seeing what kind of sound information it contains.

■ I was surprised to learn that a large ship is operated by the steady handiwork of each and every crew member. During the two days on the ship, I interacted with the researchers and was impressed by their dedication and love for their research fields, as well as their rich characters. I realized that JAMSTEC's large organization is also driven by the spirit and individuality of each staff member, and I thought it would be possible to convey the appeal of JAMSTEC to people other than its existing fans by introducing these people and their backgrounds.

■ Thank you very much for giving me this opportunity. Normally, my job is to visit and listen to people for interviews, but on this trip, I talked to the crew members about their daily work, episodes while on board, personal memories of the sea, and how they see the sea. I had the image of a research vessel operating in a place far away from land, but by learning about the activities of the crew through their personal stories, I could feel the connection between the activities of JAMSTEC and our daily lives, and there was a moment when the outline and sense of distance seemed to dissolve. I think the fact that the point of this trip was in the bay and we could see the land from the deck also contributed to this change in consciousness. I was also impressed by the fact that I was able to board the ship together with people from various fields of expression and research, which opened up the scenery in front of me while sharing their viewpoints and perspectives.

■ I thought it would be interesting to bring back to the sea (or return to the sea) the works created with the sounds and words you collected this time, and experience them on the ship and in the sea. I would be happy if the crew on board could experience it as well, and I would also like to have a place and time where the public can experience it as well. I'm particularly interested in the way sound reaches us underwater, and I'd like to have the opportunity to listen to the music and rap that you have created in the sea (?). This time, we dove into Suruga Bay and its waters, but I thought it would be fun to create an opportunity to listen to them in another part of the ocean, or in a corner of a city where the ocean is completely unimaginable, and experience the scenery and time that the JAMSTEC ship sees through your works, and have them roll into unexpected places. That's what I was thinking.

○ 4. Cruise Log

R/V "KAIREI" KR21-11 Cruise Log

Date & Time	Description	Weather / Wind / Sea Condition
2021/07/18 Sun.	Position: 35-02.0N,138-30.3E (Shimizu port)	bc / SW-3 / 2
20:20	Scientists onboard "KAIREI" at Shimizu port	
21:00-21:45	scientists meeting	
2021/07/19 Mon.	Noon Position: 35-00.6N,138-40.0E (central Suruga-wan bay)	bc / SSW-3 / 2
06:30	Creators onboard "KAIREI" at Shimizu port	
07:00-07:25	short briefing for creators	
07:50	Let go all shore lines and left Shimizu for central Suruga-wan bay	
08:30-08:55	Carried out education & training for scientists and creators	
09:56	Hoisted up KAIKO Mk-IV	
10:00	Launched and commenced KK865 dive operation	
11:29	Landed on the sea floor (D=1,352m)	
12:37	Left the sea bottom (D=1,351m)	
13:47	"KAIKO Mk-IV" on surface	
13:55	Recovered "KAIKO Mk-IV"	
16:00	Arrived at Shimizu port	
17:00	Some creators disembarked	
19:00-20:20	creators-scientists meeting	
2021/07/20 Tue.	Noon Position: 34-58.9N,138-36.5E (central Suruga-wan bay)	bc / South-3 /

		2
06:50	Creators onboard "KAIREI" at Shimizu port	
07:50	Let go all shore lines and left Shimizu for central Suruga-wan bay	
08:30-08:55	Carried out education & training for creators	
09:45	Hoisted up KAIKO Mk-IV	
09:49	Launched and commenced KK866 dive operation	
10:55	Landed on the sea floor (D=979m)	
13:12	Left the sea bottom (D=980m)	
14:08	"KAIKO Mk-IV" on surface	
14:18	Recovered "KAIKO Mk-IV"	
17:00	Arrived at Shimizu port	
17:30	Creators disembarked	
	Scientists disembarked	

● 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.
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>
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