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ROV KAIKO7000II & R/V KAIREI

KR12-05

Off Hatsushima, Sagami Bay, Central Japan

Feb.20,2012 - Feb.25,2012

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

●**Contents**

1. Cruise Information

● Cruise ID: KR12-05

● Name of vessel: R/V Kairei

● Title of the cruise: Off Hatsushima, Sagami Bay Cruise

● Title of proposal (If there are no scientific proposals, it is not necessary to fill this section for exception)

● Cruise period: Feb.20,2012 – Feb.25,2012

● Ports of call: Yokohama Port – Shimizu Port

● Research area: Off Hatsushima, Sagami Bay

● Research Map

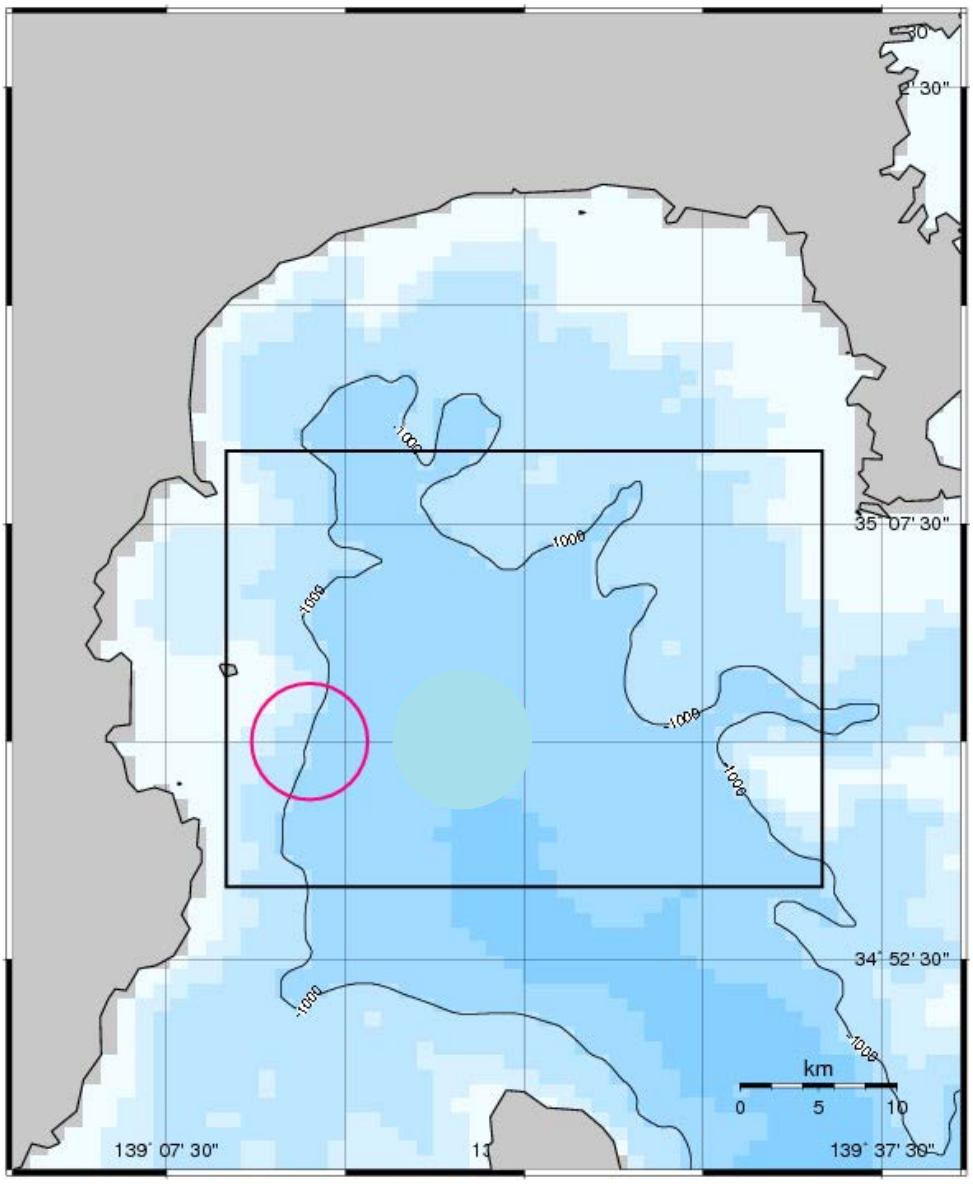


Fig.1 Research area (in the circle).

2. Researchers

● Chief scientist: Kazumasa Oguri (Institute of Biogeosciences/ Marine Technology Center, JAMSTEC)

● Representative of the science party

(1) Kazumasa Oguri (JAMSTEC)「深海底における酸素濃度プロファイル・消費フラックスの観測」

(2) Mitsuru Jinbo (Kitasato Univ.)「アレイズハオリムシの着生・変態要因の探索」

(3) Takami Nobuhara (Shizuoka Univ.)「深海化学合成生物群集の三次元構造研究を基軸とした海洋生物学・古生物学の融合」

● Science party

Kazumasa Oguri (BioGeos/MARITEC, JAMSTEC)

Takashi Toyofuku (BioGeos, JAMSTEC)

Mitsuru Jinbo (Kitasato Univ.)

Hiroshi Miyake (Kitasato Univ.)

Takao Yoshida (BioGeos, JAMSTEC)

Yuki Hongo (BioGeos, JAMSTEC)

Madoka Kitajima (New Enoshima Aquarium)

Takami Nobuhara (Shizuoka Univ.)

Shigeaki Kojima (AORI, Univ. Tokyo)

Eriko Seo (AORI, Univ. Tokyo)

Kanta Suzuki (Shizuoka Univ.)

Mizuho Sato (Yokohama National Univ.)

Koji Seike (Port and Airport Research Institute)

● R/V Kairei Crew members

Captain	Koji SAMESHIMA
Chief Officer	Takefumi AOKI
2nd Officer	Kazuki MIYAKE
3rd Officer	Yumihiko KOBAYASHI
Chief Engineer	Hiroyuki SHIBATA
1st Engineer	Koji FUNAE
2nd Engineer	Kenichi SHIRAKATA
3rd Engineer	Shogo YOSHIMURA
Chief Electronics Operator	Yoichi INOUE
2nd Electronics Operator	Michiyasu KATAGIRI
Boat Swain	Kazuo ABE
Able Seaman	Takuo KUBOTA
Able Seaman	Yukito ISHII

Able Seaman	Daisuke YANAGITANI
Sailor	Shinsuke UZUKI
Sailor	Toru NAKANISHI
Sailor	Ryoma TAMURA
No1. Oiler	Masaru KITANO
Oiler	Moriya ABE
Oiler	Hiroyuki OISHI
Oiler	Toshikazu IKEDA
Assistant Oiler	Makoto KOZAKI
Assistant Oiler	Syota SHIMOHATA
Chief Steward	Isao MATSUMOTO
Steward	Koji KIRITA
Steward	Yoshio OKADA
Steward	Kiyotaka KOSUJI
Steward	Haruka KINOSHITA

● KAIKO 7000II team

Operation Manager	Yoshinobu NAMBU
1st ROV Operator	Atsumori MIURA
2nd ROV Operator	Kiyoshi TAKISHITA
2nd ROV Operator	Homare WAKAMATSU
2nd ROV Operator	Tetsuya ISHITSUKA
2nd ROV Operator	Seiji SHIGETAKE
3rd ROV Operator	Ryu ASAI
3rd ROV Operator	Shota IHARA

3. Observation

● Observation

3.1. Time series observations of O2 profiles and the uptake in deep sea sediment.

Kazumasa Oguri (Institute of Biogeosciences / Marine Technology Center, JAMSTEC)
Takashi Toyofuku (Institute of Biogeosciences, JAMSTEC)

3.1.1. Purpose

To understand biogeochemical cycles on deep sea sediments, planar O2 optode mounted on a lander system was deployed in KY11-01 cruise. The optode system measured two dimensional O2 profiles, and connected to Hatsushima deep-sea station to supply electric power. The measurement was continued from 2011/1/20 to 2012/2/21. In this cruise, the lander and the extension cable were recovered by ROV KAIKO 7000II.

3.1.2. Method

3.1.2.1 Recovery of lander mounted on planar O2 optode system and extension cable

During the dive #543, KAIKO 7000II arrived in front of Hatsushima deep sea station. The extension cable plug was removed and the protect cap was inserted. Then, KAIKO 7000II brought one end of the cable (with the plug) in front of the lander system mounted the planar O2 optode system. The cable plug was inserted to the parking rest port of the lander. The lander was hung by KAIKO 7000II and recovered on board. The equipments were removed from the lander, washed by fresh water and stored.

In front of the lander, sediments were collected with scoop for foraminiferal studies. The sediment was greenish brown sandy silt. The sediment including living polychaetes and small sized bivalves. Aboard ship, the sediments were stored in plastic buckets to bring back to laboratory. The sediments are kept in 4°C incubator during the cruise. Some of sediments have been sieved to sort out bivalves and other organisms.

3.1.3. Result

When the optode was deployed, the sensor surface was placed at the sediment-water interface. After 14months, the sensor (inverted periscope) was exposed on the sediment surface due to an erosion. The cause of the erosion seems biological activities because many crabs and fish were seen around/on the lander (Fig.3.1.1) From the result, it seems to be hard for long-term (over one year) monitoring at sediment-water interface.

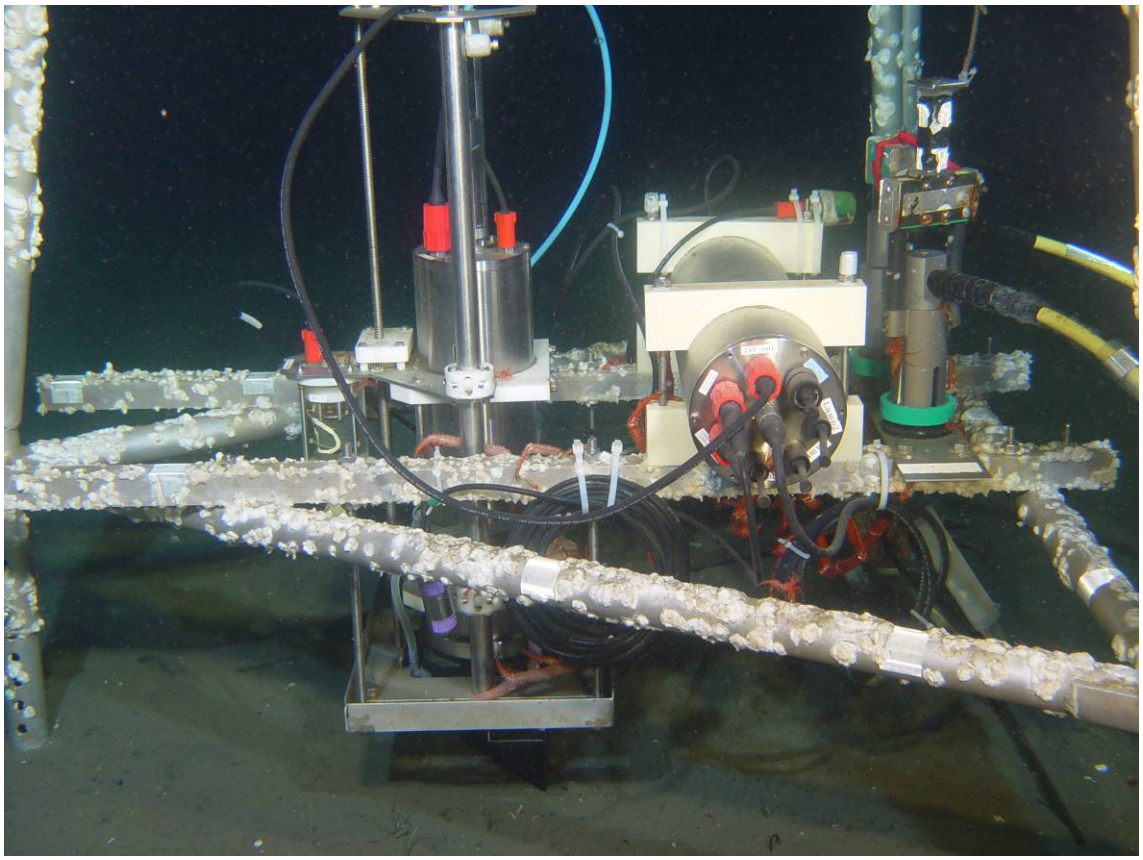


Fig 3.1. Photo of the lander frame and the sensor taken before recovery. Many crabs were climbed on the frame. Note that sediment surface around the sensor was eroded and the sensor was completely appeared in the water. Aluminum oxide or chloride indicated as white granules were formed on the lander surface.

3.1.4. Future plan

After bringing the optode system to the laboratory, the working record from the startup to the shutdown will be analyzed to read the information recorded into the ROM. Then recovery of the data will be attempted. The O2 profiles at the sediment-water interface will be visualized if the data were recorded. The cause of the formation of aluminum oxide or chloride would be a leakage of the electric current from the cylinder or the connection of the extension cable. The leaking point will be determined for the maintenance. Using with the electronics recently developed, the O2 optode system itself will be greatly updated by the next deployment.

Collected foramnifera specimens will be sorted from sediment under binocular in laboratory on land. The living individuals will be served for observations of behaviour and living ecology under well controlled laboratory condition.

3.2. The analysis of symbiosis between deep-sea bivalves and intracelluer symbiont .

Takao Yoshida (Institute of Biogeosciences, JAMSTEC), Yuki Hongo (Institute of Biogeosciences, JAMSTEC), Kazue Ohishi (Institute of Biogeosciences, JAMSTEC), Masaaki Konishi (Institute of Biogeosciences, JAMSTEC), Akihiro Tame (Marine Works Japan, Ltd).

3.2.1. Purposes

Deep-sea bivalves, including *Calyptogena* spp. and *Bathymodiolus* spp, form dense communities on the deep sea floor near hydrothermal vents and seeps. These bivalves have vestigial digestive tracts and are nutritionally dependent on chemoautotrophic symbiotic bacteria, which are harbored within their gill epithelial cells. However, detailed symbiotic mechanisms are still unknown. To elucidate the symbiotic relationship between deep-sea bivalves and intracellular bacterial symbiont, we collected the *Calyptogena* clams and *Bathymodiolus* bivalves.

3.2.2. Method

To investigate the symbiosis between deep-sea bivalves and symbiont, we planned to two dives (#545 and #546) at Off Hatsushima. During the dives, several samples, such as *Calyptogena* clams, *Bathymodiolus* mussels, and vestimentiferan tubeworms were collected.

3.2.3. Result

Both two dives (#545 and #546) were started at 35-00.9202N, 139-13.3711E. At first, *Bathymodiolus* bivalves were collected at approximately 900 m site in Off Hatsushima. After collecting, we moved from 900m to 850m. At 850m site, vestimentiferan tubeworms and *Calyptogena* clams were collected. After dive, the *Calyptogena* clams were immediately dissected, and blood, serum, and other tissues were frozen and stored at -80ºC until used. Other samples were also stored at -80ºC. Small size individuals of *Calyptogena* clams and *Bathymodiolus japonicus* were fixed in 4% paraformaldehyde in PBS, and stored at 4ºC. Other samples were keep in aquarium at 4ºC.

3.2.4 Future plan

*Analysis of expression of several genes in *Calyptogena* clam

*Analysis of blood cells of *Calyptogena* clam

* Analysis of metabolite of *Calyptogena* clam

* Analysis of symbiont in vestimentiferan tubeworms

Detailed analyses of these samples will be performed after the cruise.

3.3 Search for settlement and metamorphosis factor for *Alaysia* sp. larvae.

Mitsuru Jimbo (School of Marine Biosciences, Kitasato University)
Hiroshi Miyake (School of Marine Biosciences, Kitasato University)
Takao Yoshida (Institute of Biogeosciences, JAMSTEC)
Hiroki Hongo (Institute of Biogeosciences, JAMSTEC)

3.3.1 Observation

There are many deep sea organisms around the hydrothermal vents and cold seep. These organisms often symbiose with chemosynthetic bacteria, such as methane-oxidizing bacteria or sulphur-oxidizing bacteria. Phylogenetic analysis showed that the host organisms mutualise with some specific bacteria.

One of deep sea organisms, tubeworms, belongs to vestimentifera, and they do not have any mouth and digestive gland. They developed the organ for symbionts, trophosome, in which the sulphur-oxidizing bacteria were lived. Thus, their life should depend on their symbiont. They are often colonised, perhaps because of the existence of symbiotic bacteria, and suitable environment. However, the larvae of them can be swimming, and after settlement, they can not move anywhere. Thus, the place of the settlement was very important for their survival, because their symbionts and energy source exists in restricted area.

The settlement cues were found in some organisms. It was thought that the larvae of an ascidian *Halocynthia roretzi* were settled by a adult factor, lumichrome, since it existed in the tunic of adult ascidian, and induced metamorphosis of the larvae. Thus, one of settlement cue of tube worms might be substances of adult organisms and/or environment.

Alaysia sp., one of the tubeworms, was also colonised each other, and sometimes with *Lamellibrachia* sp. When reared in the normal pressure, the Alaysia sp. released their larvae. The larvae already developed to trocophore, and were ready to settle. The objective was that the settlement cue for *Alaysia* sp. was searched among the organisms arround *Alaysia* sp.

3.3.2 Methods

This proposal carried out during dive #546. KAIKO 7000II was arrived at sea floor off Hatsushima. *Bathymodiolus* colony was observed at 35-00.9332N 139-13.3772E, and was collected by slurp gun. An fish was also obtained. Then KAIKO 7000II was moved to *Calyptogena* colony (35-00.9559N 139-13.3123E, depth 855 m). *Calyptogena* spp. was collected by the Kumade sampler. After that, KAIKO 7000II moved to tubeworm colony

(35-00.9534N 139-13.2992E, depth 853 m). The tubeworms, *Alaysia* sp. and *Lamellibrachia* sp. was collected by manipulator. *Alaysia* sp. was reared onboard overnight. The released larvae were collected by filtrating the reared sea water with plankton net. Mollusks, *Calyptogena* sp. and *Bathymodiolus* spp. were dissected, and eluted hemolymph was collected. After centrifugation, the supernatant was collected as hemolymph. In the case of tubeworms, the hemolymph was obtained by cutting the tube. At dive 545, same samples, and mud were collected.

3.3.3 Research results

Alaysia larvae were collected for the bioassay, and many of them looked like trochophore larvae. The volume of the obtained hemolymph of *Lamellibrachia* sp. and Alaysia sp. was 5 ml and 10 ml, respectively. The hemolymph of *Calyptogena* sp. and *Bathymodiolus* sp. sufficient to carry out the settlement assay.

3.3.4 Future plans

Alaysia larvae are reared in the sea water containing hemolymphs or mud. After 24 h, the number of settled larvae was counted, and then the settlement factor should be evaluated. The morphological change with or without hemolymph or mud will be also observed.

3.4. Interactive approaches by marine biologists and paleontologists for understanding methane-seep community structure and its taphonomy

Takami Nobuhara (Faculty of Education, Geological Institute, Shizuoka University)

3.4.1 Puropose

Fossil chemosynthetic assemblages and their modes of fossil occurrence record much information on community structures, sub-bottom section, sedimentary and fossilization processes. However we need to unravel the tangled threads of such various factors in order to reconstruct the geological-past chemosynthetic ecosystems with sub-bottom profiles. In this cruise, we aim to obtain basal data on fossilization processes of *Calyptogena* and *Bathymodiolus* communities off Hatsushima Island, with special attention to their escape ability against rapid burial, age-structure of dead shells surrounding the living colonies. We also intend to make clear sub-bottom sediment profiles, and get living samples of *Calyptogena*, *Bayjumodiolus*, and other infaunal animals, for taxonomical identification and various biological studies.

3.4.2. Observations & Activities

In KAIKO II Dive #544 (22nd Feb.), the dive started at 35-00.200N, 139-13.450E, and the vehicle moved southwestwards about 320m, surveying chemosynthetic communities (Figure 3-4-1). We made an artificial burial experiment for a *Calyptogena* colony at 35-00.1899N, 130-13.4255E, 1158 m in depth, and observed the animal responses for an hour. To survey the profiles of sub-bottom sediments, we tried making a push-core sampling using MBARI core sampler close to the site. Two carbonate blocks with living sponges were sampled by the manipulator. Kaiko II moved once 250m SSE and surveyed through the chemosynthetic colonies in order to catch the outline mapping. Thereafter KAIKO II returned the first artificial burial site (artificial burial experiment). We rediscovered the burial instrument and observed the animal conditions three hours later since the artificial burial. We also sampled bottom sediments, dead shells, and living animals, in and around the artificial burial site by the Kumade-sampler.

In addition, in KAIKO II Dive#545 (23rd Feb.), two acrylic enclosures were set at the margin of the large *Calyptogena* colony, 35-00.9469N, 139-13.3137E, 856m in depth (Figure 3-4-2), including three *Calyptogena* individuals in enclosure number KT545-1 and one *Calyptogena* and one *Conchocele* individual in enclosure no. KT545-2. The clams were artificially buried by native mud sediments at 15:45 and leave it one day.

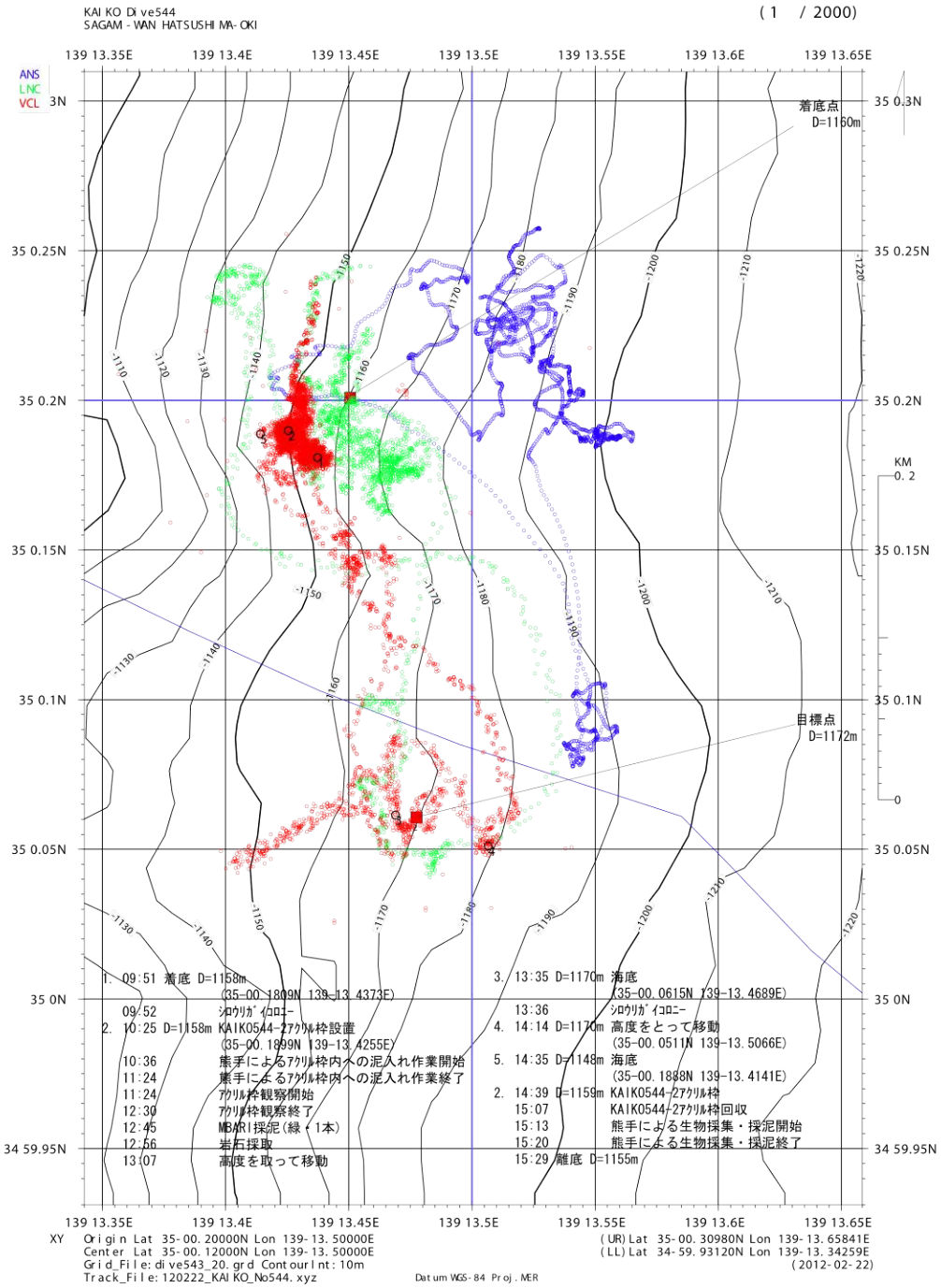


Fig. 3-4-1 Track of Dive#544

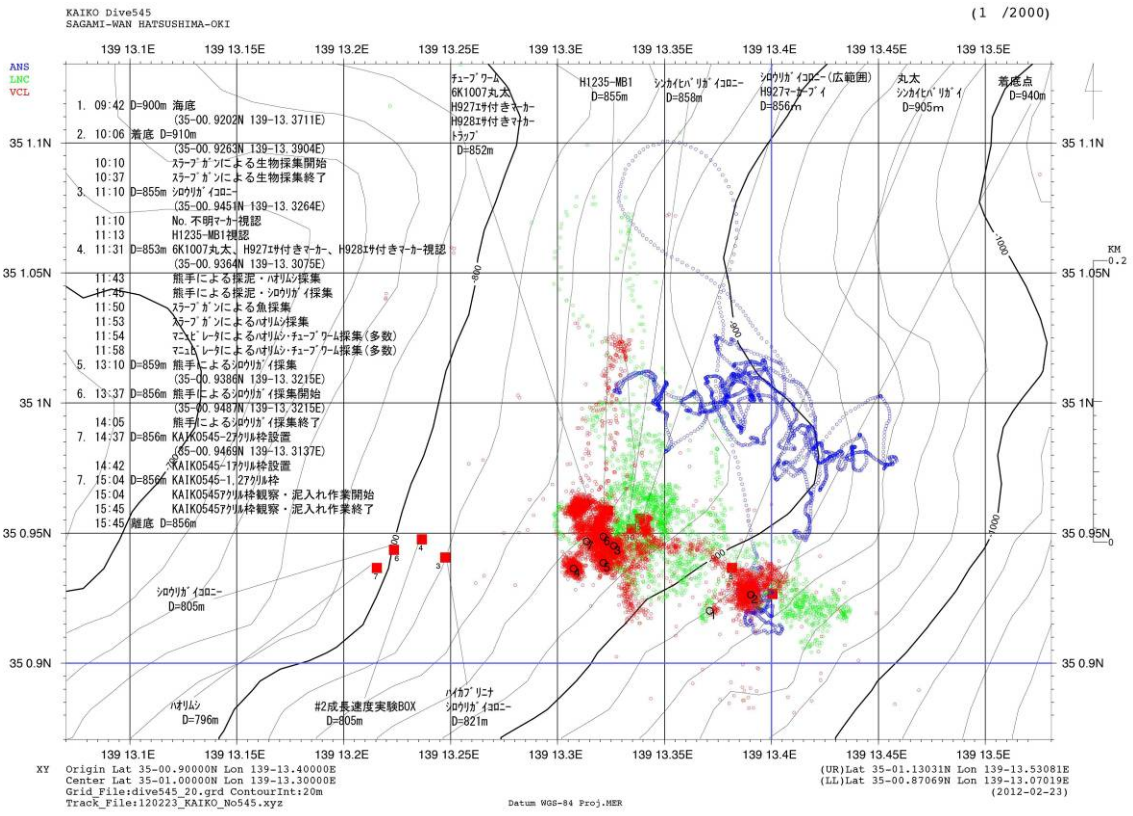


Fig. 3-4-2 Track of Dive#545

At 13:46 in the next day (Dive#546), we revisited the burial site (KT-545-01, 02) in Dive#545, and observed the animal conditions. We also made a push-core sample close to the burial enclosure instruments by MBARI core sampler.

3.4.3. Methods & Instruments

Artificial burial experiments: First, a transparent acrylic enclosure (25cm×25cm×18cm high) was set on a *Calyptogena* colony by a manipulator of KAIKO II. Second, the living animals in the enclosure were rapidly buried by native sediments, which were scooped using the Kumade-sampler. Third, the vehicle stayed and observed the animal responses for about one hour.

Sediments and organisms samplings: Sediments and dead shells were scooped together with living organisms by the Kumade-sampler in and around the living *Calyptogena* colonies. A MBARI-core sampler were used for push-coring of sediments between the colonies.

3.4.4. Research results

Artificial burial experiments: A transparent acrylic enclosure was set on a *Calyptogena* colony (including 16 individuals) in Dive #544. During one hour after artificial burial, about five individuals blow out the cover sediments by excurrent thorough their exhalant-siphons. Their activities were recorded in Hi-vision video images. Three hours later, we could not recognize remarkable changes in their position. In this survey, we cannot find an infaunal *Bathymodiolus* colony, and could not examine this artificial burial experiments for them. In Dive#545-546, some *Calyptogena* individuals are recogunized to emerge their siphons on the bottom surface, but the others are not recognized.

Sediments and organisms samplings: We sampled a MBARI core in Dive#545, about 25 cm long, close to the artificial experiment site of the *Calyptogena* colony. The sediments consist of the upper yellow-brown oxic fluffy mud layer (16 cm thick) and the lower dark greenish-grey reducing coarse sediments (9 cm thick). The lower coarse sediments contain shell fragments. We also sampled organisms in and around the burial site by the Kumade-sampler, and obtained 13 live specimens of *Calyptogena*, many provanid gastropods, and so on. White semi-transparent sponges attached to carbonate blocks were also obtained. A MBARI core sample in Dive#546, about 25 cm long, consists of blacky grey clayey silt.

3.4.5. Future plans

Artificial burial experiments: The hi-vision video records will be analyzed from the viewpoint of moving speed and blow-out timings of *Calyptogena* individuals. Particle-size and sorting-degrees of covered sediments will be made clear using the MBARI core sample. Some ideas for improvement of the experiment will be tested using shallow-water bivalves.

Fossilization processes: Basal data for fossilization will be deposited such as size distribution of dead shells and live specimens from the same *Calyptogena* site. Preservation conditions of dead shells (fragmentation, abrasion, and dissolution) will be examined.

Taxonomic works: This survey area contains two *Calyptogena* species (*Calyptogena soyoae* and *C. okutanii*). Taxonomy of *Calyptogena* specimens will be examined on the basis of molecular data and morphological examination, in order to make clear their distribution, life habitats, ecology and speciation.

3.5. Long-term rearing of seep animals in aquarium.

Madoka Kitajima (Enoshima aquarium)

3.5.1. Background and Objective

In Enoshima aquarium, we have been trying to cultivate some of the deep-sea animals inhabiting in hydrothermal vent and seep, and establishing a cultivation system to raise these animals (Figure 3.5.1).

During this cruise, we have collected seep animals using the section sampler system and sorted all the samples. We are going to identify these samples and analyze the seep biodiversity in Sagami bay off Hatsushima Island.

(Figure 3.5.1. Chemosynthetic ecosystem aquarium. Seep is located on the right side of the tank.)

3.5.2. Summary of animals collected

We have collected live deep-sea mussels (*Calyptogena* spp., *Bathymodiolus japonicas, Bathymodiolus platifrons*) , red crab (*Paralomis multisoina*), waist cage shrimp (*Munidopsis naginata*), and tube worms (*Lamellibrachia* sp., *Alaysia* sp.) and kept in aquaria on the ship. After the cruse, we will transport Enoshima aquarium and keep them in the artificial seep tank.

3. 5.3. Research of biodiversity

We collected lot of samples in addition to the species mention above. The samples were mostly polychaeta, gastropod and arthropod. We took pictures of them when they are alive (Figure 3.5.2-5), and then fixed using 10% formalin.

(Figure 3.5.2-5. Examples of collected samples)

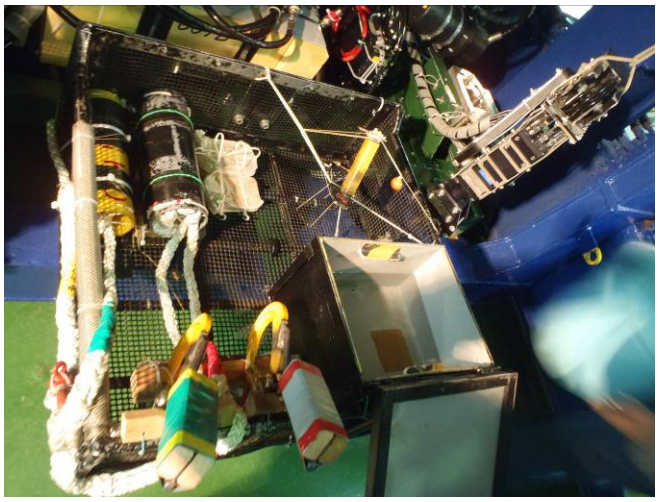
3.5.4. Outreach activity

We released 6 stories of "My cruise diaries" from Enoshima aquarium's web-page every day. When many customers accessed the web contents, they can study and understand for fun our institutes and researches on board.

3.5.5. Future plans

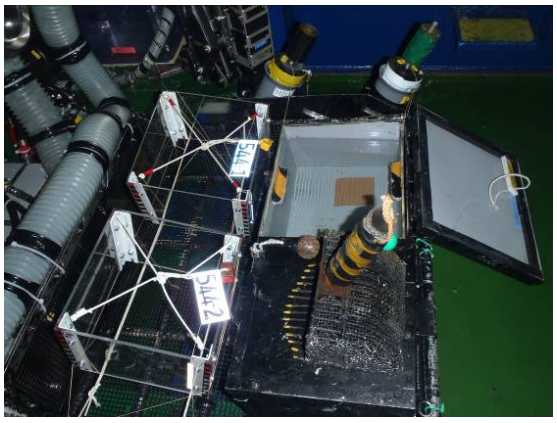
- Make the observation of these animal behaviors for a long time.
- Development of the long-term rearing method of seep animals in the tank.
- These animals breed in aquarium.

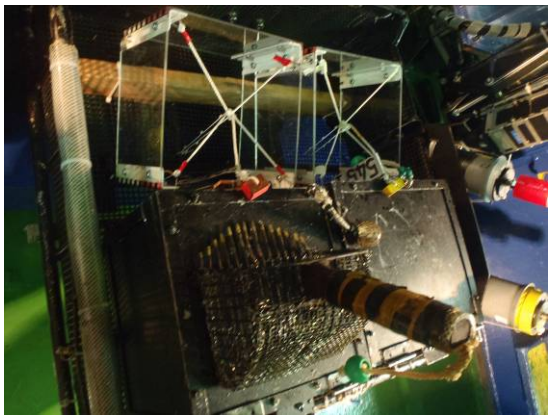
○ List of observation equipments

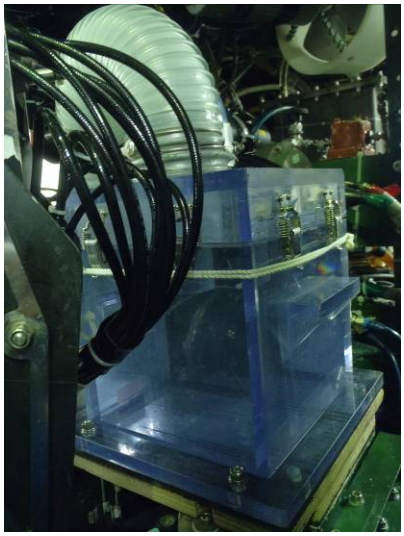


Recovery hooks x2
Sample box x1
Scoop x1

Dive #543 Payload photo





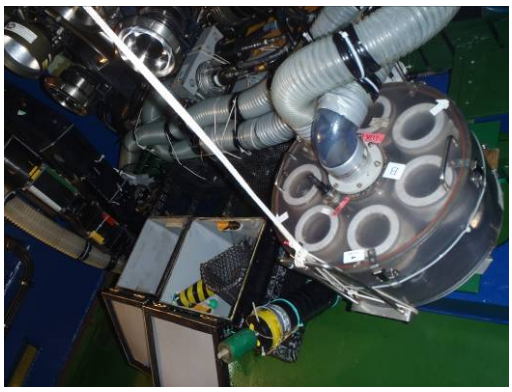


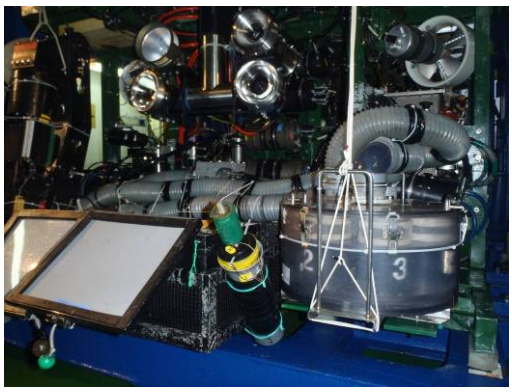
Plexiglas boxes x2
Sample box x1
Scoop x1
Push cores x2
Vacuum sampler with single canister

Dive #544 payload

Plexiglas box x2
Sample box x1
Scoop x1
Push cores x2
Vacuum sampler with single canister

Dive #545 payload





Dive #546 payload

Sample boxes x2
Scoop x1
Vacuum sampler with revolver canister

Dive data

平成２３年度
かいこう７０００Ⅱ　調査潜航
５４３ＤＩＶＥ（３８）
相模湾

２０１２年2月２１日

１．測地系　　ＷＧＳ－８４（世界測地系）

２．測位　　Ｄ－ＧＰＳ　（Trimble SPS751）

３．ＸＢＴ　　計測　　Ｓ／Ｖ＝１４８８．４ｍ／ｓ（１２００ｍ）

４．着底点　　特異点①　初島ステーション
３５°－００．１８２‘Ｎ
１３９°－１３．４８０‘Ｅ　　Ｄ＝１１７０ｍ

５．潜航配置　指揮：南部
ランチャーPILOT：重竹　ビークル PILOT：若松　ビークル CoPILOT：石塚

６．潜航目的　深海底における酸素濃度プロファイル・消費フラックスの観測

７．作業内容　・初島ステーション近傍にて周辺観察及び採泥
・初島ステーションより展張ケーブルコネクタ取外し及びダミーキャップ取付け
・ランダー及び展張ケーブルの回収

８．日程
０６：００　操縦盤立ち上げ、作動確認
０８：００　結合作業
０８：４０　着水
０９：５０　着底
１５：００　離底
１６：００　水切り

１６：２０　　揚収完了

９．備考

特異点②　ランダー推定位置　35°00.160’N　139°13．507’E

・ランダー空中重量：414kg

・展張ケーブル空中重量：47kg

平成２３年度
かいこう７０００Ⅱ　調査潜航
５４４ＤＩＶＥ（３９）
相模湾初島沖

２０１２年2月２２日

１．測地系　　ＷＧＳ－８４（世界測地系）

２．測位　　Ｄ－ＧＰＳ　（Trimble SPS751）

３．ＸＢＴ　　計測　　Ｓ／Ｖ＝１４８８．４ｍ／ｓ（１２００ｍ）

４．着底点　　特異点①　３５°－００．２００‘Ｎ
　　１３９°－１３．４５０‘Ｅ　　Ｄ＝１１６０ｍ

５．潜航配置　指揮：南部
　　ランチャーPILOT：浅井　ビークル PILOT：石塚　ビークル CoPILOT：重竹

６．潜航目的　深海化学合成生物群集の三次元構造研究を基軸とした海洋生物学･古生物学の融合

７．作業内容　・アクリル枠設置実験（貝類の反応観察）
　　・熊手及び MBARI 採泥
　　・スラープガンによる生物採集
　　・岩石採集

８．日程　　０６：００　操縦盤立ち上げ、作動確認
　　０８：００　結合作業
　　０８：４０　着水
　　０９：５０　着底
　　１５：００　離底
　　１６：００　水切り
　　１６：２０　揚収完了

９．備考　　特異点②　35° 00.060’N　139° 13．477’Ｅ　（D=1172ｍ）

平成２３年度
かいこう７０００Ⅱ　調査潜航
５４５ＤＩＶＥ（４０）
相模湾初島沖

２０１２年2月２３日

１．測地系　　ＷＧＳ－８４（世界測地系）

２．測位　　Ｄ－ＧＰＳ　（Trimble SPS751）

３．ＸＢＴ　　計測　　Ｓ／Ｖ＝１４８９．９ｍ／ｓ（１０００ｍ）

４．着底点　　特異点①　３５°－００．９２６‘Ｎ
　　１３９°－１３．４００‘Ｅ　　Ｄ＝９４０ｍ

５．潜航配置　指揮：南部
　　ランチャーPILOT：井原　ビークル PILOT：重竹　ビークル CoPILOT：浅井

６．潜航目的　・深海化学合成生物群集の三次元構造研究を基軸とした海洋生物学･古生物学の融合
　　・アレイズハオリムシの着生・変態要因の探索

７．作業内容　・アクリル枠設置実験（貝類の反応観察）
　　・熊手及びMBARI採泥
　　・スラープガンによる生物採集

８．日程　　０６：００　操縦盤立ち上げ、作動確認
　　０８：００　結合作業
　　０８：４０　着水
　　０９：４０　着底
　　１５：００　離底
　　１６：００　水切り
　　１６：２０　揚収完了

９．備考

特異点②　35°00.954'N　139°13.319'E（D=852m）
チューブワーム、6 K1007 丸太、H927 エサ付きマーカー、H928 エサ付きマーカー、トラップ

特異点③　35°00.940'N　139°13.247'E（D=821m）ハイカブリニナ、シロウリガイコロニー

特異点④　35°00.947'N　139°13.236'E（D=805m）#2 成長速度実験 BOX

特異点⑤　35°00.955'N　139°13.338'E（D=856m）シロウリガイコロニー
（広範囲）、H927 マーカーブイ

特異点⑥　35°00.943'N　139°13.223'E（D=805m）シロウリガイコロニー

特異点⑦　35°00.936'N　139°13.215'E（D=796m）ハオリムシ

特異点⑧　35°00.936'N　139°13.381'E（D=905m）丸太、シンカイヒバリガイ

特異点⑨　35°00.958'N　139°13.323'E（D=855m）H1235-MB1

特異点⑩　35°00.951'N　139°13.334'E（D=858m）シンカイヒバリガイコロニー

平成２３年度
かいこう７０００Ⅱ　調査潜航
５４６ＤＩＶＥ（４１）
相模湾初島沖

２０１２年2月２４日

１．測地系　　ＷＧＳ－８４（世界測地系）

２．測位　　Ｄ－ＧＰＳ　（Trimble SPS751）

３．ＸＢＴ　　計測済　　Ｓ／Ｖ＝１４８９．７ｍ／ｓ（９００ｍ）

４．着底点　　特異点①　３５°－００．９３６‘Ｎ
１３９°－１３．３８１‘Ｅ　　Ｄ＝９０５ｍ

５．潜航配置　指揮：南部
ランチャーPILOT：若松　ビークル PILOT：浅井　ビークル CoPILOT：井原

６．潜航目的　・深海化学合成生物群集の三次元構造研究を基軸とした海洋生物学･古生物学の融合
・アレイズハオリムシの着生・変態要因の探索

７．作業内容　・スラープガンによる生物採集
・熊手及びMBARI採泥
・アクリル枠観察

８．日程　　０６：００　操縦盤立ち上げ、作動確認
０８：００　結合作業
０８：４０　着水
０９：４０　着底
１５：００　離底
１６：００　水切り
１６：２０　揚収完了

９．備考

特異点②ｼﾛｳﾘｶﾞｲｺﾛﾆｰ、H927ﾏｰｶｰ

35° 00.955'N　　139° 13.338'E　D=856m

特異点③ﾁｭｰﾌﾞﾜｰﾑ、6K1007　丸太

35° 00.954'N　　139° 13.319'E　D=852m

特異点④#545ｱｸﾘﾙ枠

35° 00.9469'N　　139° 13.3137'E　D=856m

Dive Log of KR12-05 KAIKO 7000II Dive # 543				SAGAMI-WAN HATSUSHIMA-OKI	2012/02/21
Time (JST)	VDep. (m)	Alt. (m)	Head (Deg)	Description	Remarks
08:48	113			DO measurement start	
09:10	400			fish 小魚たち	
09:11	414			fish(sardine?) 小魚（イワシのような）たくさん	
09:23	750			fish(often) ときどき小魚が映ります	
09:24	791			small jellyfish 小さいクラゲ	
09:35	1023			sea spider ウミグモ	
09:41	1023			Separate vehicle from launcher	
09:44	1054			red jellyfish	
09:45	1057			sea spider ウミグモ	
09:51	1134			something red 何か赤い生物、くらげみたい	
09:53	1150			fish swim 縦泳ぎの魚	
09:55	1162			A float ブイ	
09:56	1164			Blown out with suspension particle 泥で見えない	
09:57	1165			Move 移動	
09:57	1169			Clams and fish シロウリガイと魚	
09:58	1172			Hatsusima Station 初島ステーションが見えます	
10:00	1174			Landing at Hatshima station	
10:01	1174			Watching lander carble at Hatsushima station	
10:03	1174			go to station	
10:08	1175			Landing befor lander cable	
10:09	1175			Searching for cable cap	
10:12	1175			Fish	
10:13	1175			Bring the cable cap ?	
10:16	1175			Confirm the cable cap	
10:18	1175			Start of removeing the terminal end of cable cap	
10:40	1175			Congratulations ! end of removing the terminal end	
10:45	1175			Terminal end puts in sample basket	
10:51	1175			Go to lander cable	
10:52	1175			Remove the lander cable	
10:56	1175			Start of connectinging the cable cap	
10:58	1175			End of connecting the cable cap	
11:00	1175			Bring the lander cable	
11:06	1175			Ascend and go to lander 離底し，ランダーへ向かう	
11:07	1177			Landing 着底 ライト？があるため一旦着底	
11:09	1030			Ascending from bottom 離底	
11:10	1042			Leaf on the sea floor 海底に葉っぱ？を視認	
11:16	1054			Homer ホーマー視認	
11:21	1054			Landing 着底	
11:23	1054			Ascending and serch lander 着底	
11:25	1054			Lander ランダー視認	Over 4 clabs on
11:30	1085			Landing 着底	
11:37	1181			Incert of parking port ダミープラグにケーブルキャップをつける	
11:40	1053			Ascend and move to sampling of sediment 離底し，採泥に適した	
12:04	1181			Landing 着底	
12:07	1181			Grip Kumade sampler 熊手取り出し	
12:13	1181			Start to sampling of sediment 採泥開始	
12:25	1181			Finish to sampling of sediment (4 times) 採泥終了（4掬い）	
12:33	1181			Ascending 離底	
12:37	1177			Lander ランダー視認	
12:41	1180			Landing 着底	
12:46	1180			Start to hook 回収フックの取り付け開始	
12:51	1180			Hooked フック取り付け	
12:59	1180			Ascending 離底	
13:00	1179			Start to hook 回収フックの取り付け開始	
13:03	1178			Hooked フック取り付け	
13:04	1175			Take out recovery rope 回収ロープ放出	
13:04	1173			Finish to take out recovery rope 回収ロープ放出完了	
13:05	1170			Ascending from bottom 浮上開始	

Dive Log of KR12-05 KAIKO 7000II Dive # 544				SAGAMI-WAN HATSUSHIMA-OKI	2012/02/22
Time (JST)	VDep. (m)	Alt. (m)	Head (Deg)	Description	Remarks
08:34	0		188	Start to dive	
08:44				DO measurement start	
09:34	1025	138	203	Separate the vehicle	
09:51	1158	0	333	Arrived at sea-bottom	
09:52	1158	0	333	Fish	
09:52	1158	0	333	Observation sea-bottom	
10:02	1158	0	333	Took a photo (Calyptogena)	
10:13	1158	0	344	Moved to clam colony	
10:25	1158	0	316	Setted a clear box on the Calyptogena clams	
10:34	1158	0	316	Observation sea-bottom (Black Sediment)	
10:36	1158	0	316	Took in a sediment in the clear box (埋没実験)	
10:59	1158	0	318	Crabs seen far side in centaral of monitor 画面中央奥にカニ	
11:13	1159	1	316	Vehicle ascend a little ビークルが少し浮上	
11:16	1158	2	319	Mud blow-out from a hole (exhalant siphon?) 穴から泥が噴出	
11:20	1159	1	318	"Black leaf?" stuck in the claw of Kumade sampler 熊手の中に葉	
11:22	1159	1	318	Artificial burial completed and observation start. 埋没完了.観察開	
11:25	1158	1	318	"red shrimp" エビ	
11:27	1159	1	318	Two "red shrimps" struggle fo a bait (polychate?). エビが餌(ゴカ	
11:29	1159	1	318	Mud blow-out. 泥が噴出	
11:32	1159	1	318	Explosieve mud blow-out. 大きな噴出(爆発)	
11:35	1159	1	318	Small gastropod (provanid?) on outiside wall of enclosure. 巻貝を	
11:37	1159	1	318	Small gastropod (provanid?) craw up the wall. 小巻貝が枠の外側	
11:38	1159	1	318	Some white turbidity like a smoke from the subbottom もや	
11:47	1159	1	318	Emerge of bivalve from the sub-bottom 泥の中から貝がでてくる	
12:04	1159	1	323	Mud blow-out. 泥が噴出	
12:05	1159	1	323	Mud blow-out. 泥が噴出	
12:13	1159	1	317	Maybe six Calyptogena individuals remerge from the subbottom. シロウリガイはおそらく6個体堆積物から見えてる	
12:23	1159	1	327	One hour passed since set of enclosure. 枠設置から一時間経過	
12:25	1159	1	328	Put on Kumade sampler 熊手をおく	
12:26	1159		332	Try to hold MBARI core sampler (green) but stop. MBARIコア(緑)持ったけどやめる	
12:28	1159		333	Hold Kumade sampler again, move it to the left side of the acrylic enclosure. 熊手また持つ、移動させる アクリル枠の左側	
12:29	1159		336	Hold the MBARI core sampler (green). MBARIコア(緑)持つ	
12:33	1159		348	Try to push the MBARI core sampler (green) into the sediments, but cannnot insert it because of underground hard objects (dead shells?). MBARIコア(緑)シロウリ付近で採取しようとしたけど底質が硬くて入りませんでした	
12:36	1159		352	Second trial to push core sampling (MBARI core with green ravel) near the left side of basket, but results in failure. All sediments fall out from the core sampler. MBARIコア(緑)かいこうバスケット横で採取しようと思ったけどダメでした	
12:39	1159		351	Third trial of MBARI core sampling (green ravel) on the right side of 2nd trial where dead shells are scattered. MBARIコア(緑)死に殻があるところ付近で採取	
12:40	1159		357	Succeed in MBARI core sampling (green ravel). MBARIコア(緑)採取成功	
12:45	1159		345	Manipulator hit against the acrylic enclosure a little, and Kumade sampler retreived. マニピュレータ、アクリル枠に少し当たる くまで回収	
12:45	1159		335	Vehicle ascending from bottom. 離底	
12:49	1158		21	Vehicle landing on bottom. 着底	
12:53	1158		21	Pass the Kumade sampler from right to left manipulator. 熊手を右手から左手に受け渡し	
12:54	1158		21	Sampleing sponges attachet to carbonate slab blocks. カイメンと、板状の岩石サンプリング	
12:58	1158		20	Put the sponge sample into the box on the left side of vehicle. カイメンと岩石サンプルは左舷のボックスに入れました	
13:01	1158		19	Second sampling of sponges, which attached to pyramid-like rocks. カイメンと岩石サンプルその2採取	
13:03	1158		18	Sampling of small rock with sponge in left box	
13:07	1158		18	Go to south area	
13:08	1139		153	Fish	
13:34	1169		76	Arrived at sea bottom	
13:36	1171		1	Fish	
13:39	1170			Calptogena colony	
13:42	1165		262	Sponges attach the rock	

Dive Log of KR12-05 KAIKO 7000II Dive # 545			SAGAMI-WAN HATSUSHIMA-OKI		2012/02/23
Time (JST)	VDep. (m)	Alt. (m)	Head (Deg)	Description	Remarks
08:37	0			Start to dive	
09:12	461		9	Peel a black tape 何かのテープが剥がれた（黒テー	
09:17	600		0	A jellyfish クラゲ	
09:28	752	158	120	Separate the vehicle	
09:43	900	11	65	See bottom and a marker 海底目視 マーカー	
09:43	900	11	65	Move to marker No.1マーカー1番に移動	
09:50	898	4	120	Move to the landing point. A marker 再度、海底	
10:01	910	5	299	See Clams and Bathymodiolusヒバリガイ類・シロウリガイ類視認	
10:05	911	1	261	Landing 着底	Near Clams on a rock ヒバリガイ類つき岩のすぐそばに着底
10:14	910	1	260	Start of collect Bathymodiolus by slurpgun スラープガンでヒバリガイ類の採集開始	
10:27	910	1	255	Collect fish by slurpgun 魚をスラープガンで	
10:29	910	1	255	Finish of collecting by slulpgun スラープガン	
10:36	910	2	242	Ascending from bottom 離底	
10:40	914	1	230	Landing 着底	Near tube worms and a marker of flowerpotハオリムシと
10:45	914	3	298	Ascending from bottom 離底	
10:46	902	3	290	Moving 移動	
10:48	902	3	281	See sponges on the rock カイメン？つき岩を	
10:52	896	5	289	See a sea anemone イソギンチャク視認	
11:01	869	4	270	A jellyfish クラゲ	
11:08	858	2	235	A fish 魚	
11:09	855	2	251	See a marker マーカーを視認	
11:11	855	2	278	A huge amount of empty shell 大量のシロウリ	
11:13	855	0	275	Landing 着底	Near a staining box (H1235-1) 染色ボックスH1235-1付近に着底
11:17	854	1	220	Moving 移動	
11:24	854	2	103	See a marker and land マーカーを視認、着底	
11:25	849	4	343	Red cable 赤いケーブル	
11:27	852	2	252	Moving 移動	
11:29	854	2	243	See a marker マーカーを視認	
11:31	853	4	320	Lanading 着底	
11:32	854	2		Start of collect tube worms ハオリムシを採集開始	
11:34	854	2	248	Collect a fish by slurp gun 魚をスラープガンで採集	
11:39	853	2	281	Hold a Kumade sampler くまでをつかむ	
11:41	854	2	278	Sample sediment by Kumade sampler. Collect the left side of ship (twice)熊手で周辺の泥を掬い、左舷ボックスへ（2掬い）	
11:48	853	2	268	Zoom in tube worms ハオリムシにズーム	
11:50	853	2	267	Suck a habitant of tube worms by slurp gun. Collect a fish ハオリムシの生息場をスラープガンで吸う. 魚を採取	
11:53	853	1	265	Sampling of tube worms by manipulator. Collect the left side of ship. ハオリムシをマニュピレーターで採取.左舷ボックスへ	
11:57	853	2	274	Sampling of tube worms by manipulator. Collect the left side of ship. ハオリムシをマニュピレータで採取.左舷ボックスへ	
12:02	854	2	259	Close the right side box ボックスのふたを閉めた	
12:05	854	2	258	Record this site No.11 場所記録 11番	
12:07	851	4	82	Ascending from bottom 離底	
12:12	860	6	1	Clams and tube worms シロウリガイ、チューブワーム	
12:27	892	4	303	See sea bottom 海底視認	
12:27	889	4	353	Rocks, clam shells and corals 岩、シロウリガイ死殻、サンゴ	
12:29	882	5	337	A big sea anemone 大きいイソギンチャク	
12:36	862	2	342	See sea bottom 海底視認	
12:38	861	3	13	Poor sight due to suspended particle 泥で見えない	
12:49		3	237	Rocks, clam shells 岩、シロウリ貝殻	
12:50	858	2	251	Red fish 赤い魚	
12:51	858	3	277	Many tube worms チューブワーム沢山	
12:52	856	2	246	Many clams シロウリガイ沢山	

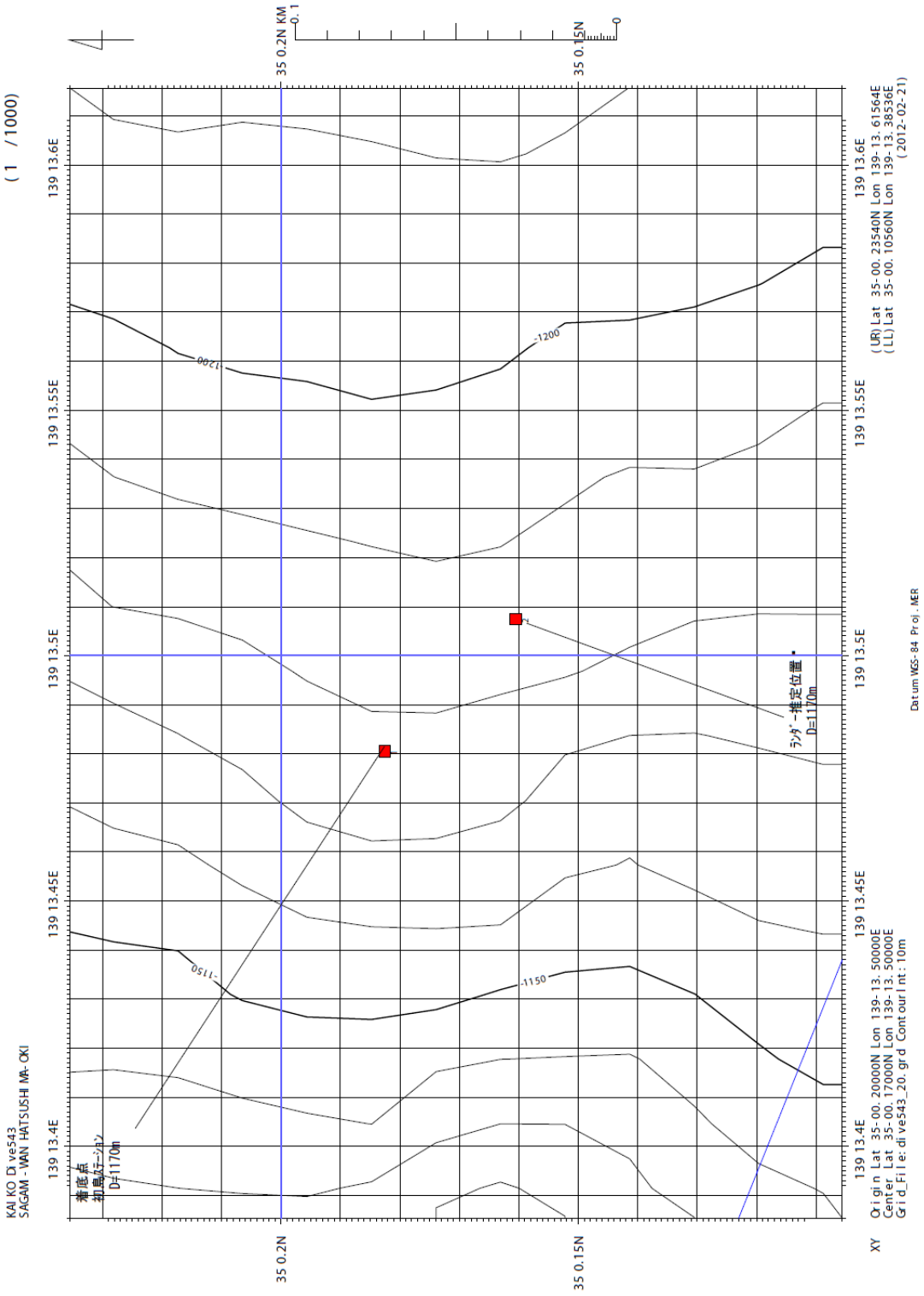
Dive Log of KR12-05 KAIKO 7000II Dive # 546				SAGAMI-WAN HATSUSHIMA-OKI	2012/02/24
Time (JST)	VDep. (m)	Alt. (m)	Head (Deg)	Description	Remarks
08:38	0			Start to dive 潜航開始	
09:16	499		33	A large group of squids イカの大群	
09:32	802	88	353	Separate vehicle from launcher ヴィークル離脱	
09:41	875	4	139	Glance of seafloor 海底確認	
09:41	875	4	197	Move to event mark No.1 イベントマーク1番へ移動	
10:00	917	3	103	Glance of seafloor 海底確認	
10:02	914	3	260	Crab カニ	
10:14	913	3	291	See Batymodiolus spp. ヒバリガイコロニー発見	
10:21	913	1	300	Langing 着底？	Hovering by putting basuket on a rock because cliff 崖なので、バスケットを岩に当てる形でホバリング
10:23	913	1	301	Observation of surroundings 周辺観察	
10:29	914	1	299	Start to collect to Batymodiolus by slurp gun スラープガン	
10:41	914	1	281	And collect to Clams by slurp gun シロウリガイも採集	
10:50	914	1	289	Confirm that half of the canister was fullfilled with samples	
10:51	914	1	289	Collect to Clams by slurp gun 引き続き、シロウリガイを採	
11:03	914	0	266	Confirm the canister キャニスターを確認	
11:04	914	2	266	Finish collecting by slurp gun スラープガンでの採集終了	
11:06	911	2	282	Ascending from bottom 離底	
11:07	911	1	269	A fish and a crab struggle for a shellfish 魚とカニが貝を取	
11:10	908	2	273	Moving 移動	
11:16	888	7	321	A jellyfish クラゲ	
11:20	869	3	257	Clams are scattered on bottom シロウリガイの殻が海底に	
11:24	856	2	244	See a marker マーカーを視認	
11:28	855	0	239	Landing 着底	
11:29	853	2	232	Ascending from bottom 離底	
11:30	856	0	243	Landing 着底	
11:31	856	0	243	Observation of Clams シロウリガイを観察	
11:35	856	0	241	Open left box 左舷側ボックスを開ける	
11:37	856	0	241	Hold a Kumade sampler 熊手を持つ	
11:38	856	0	240	Start to collect to Clams by Kumade sampler 熊手でシロウリガイを採集開始	
11:40	856	0	242	Sample Clams by Kumade sampler. Collect to left side of ship. (4 times) シロウリガイを採集、左舷側ボックスへ(_4回)	
11:57	856	2	221	Ascending and landing 離底、すぐ着底	
12:01	856	0	224	Sample Clams by Kumade sampler. Collect to left side of ship. 熊手でシロウリガイのサンプリング、左舷ボックスへ	
12:02	856	0	14	Sampled sediment is black 一緒にサンプリングされた堆積物は真っ黒	
12:04	856	0	224	Collect to Clams by Kumade sampler. Collect to left side of ship. 熊手でシロウリガイのサンプリング、左舷ボックスへ	
12:07	856	0	224	Ascending from bottom 離底	
12:10	856	1	243	Landing 着底、ビークルが岩に乗ってるみたい	
12:12	856	1	280	Ascending and landing 離底、着底	
12:14	857	1	278	Sample Clams by Kumade sampler. Collect to left side of ship. 熊手でシロウリガイサンプリング、左舷ボックスへ(2回)	
12:25	857	1	284	Ascending and landing 離底、すぐ着底	
12:26	857	2	284	Sample sediments by Kumade sampler. Collect to left side of ship. (Twice) 熊手で泥をサンプリング、左舷ボックスへ(2回)	
12:37	857	1	283	Close the box ボックス蓋閉めました	
12:40	856	2	268	Ascending from bottom 離底	
12:42	854	2	249	Starfish ヒトデ	
12:43	853	3	270	See marker of log and big rock 丸太マーカー、大岩	
12:44	854	2	264	Landing 着底	
12:46	854	1	256	A white echinoid on a float 丸太マーカーのブイに真っ白ウニ	
12:50	854	1	266	Observation of tube worms ハオリムシ観察中	
12:56	854	2	266	Landing Go around to back of the rock 離底 岩の裏側に回る	
12:58	853	2	16	Landing 着底	
13:00	852	1	11	Observsation of vestimentiferan tube worms on Oiwa	
13:05	852	2	27	Change the heading for collecting animals	
13:07	852	1	27	Sampling animals in a tube worm bush using slurp gun	
13:11	852	2	28	Sampling Alaysia tube worms in right side box	
13:34	852	2	20	Sampling Lamellibrachia tube worms in right side box	
13:41	852	2	20	Move to #4 Event mark	
13:45	855	1	309	Landing in front of experimantal box (#545-2) deployed in #545 Dive	
13:48	855	1	309	Observation of Calyptogena clams in the boxes	

Ship log

日付 Date	時間 Local Time	内容 Note	特記事項 Description	本船位置／気象／海象 Position/Weather/Wind/Sea condition
24-Jan-12		**Sail out, proceeding to research area**		01/24 12:00 (UTC+9h)
	11:45	boarded		26-14.3N,127-40.8E
	14:00	let go all shore line, left NAHA		Port of NAHA
	14:45-15:15	carried out education & training for scientists		Overcast
	16:40	kompira ceremony		East-2(Light breeze)
	18:00-18:50	scientific meeting		1 (Sea calm)
	21:30	arrived at Okinawa Trough Iheya Ridge research area		0 (No Sell)
	21:42	released XBT at (27-45.0397N, 126-54.7594E)		Visibly: 6'
	22:00-22:22	carried out MBES site survey		
25-Jan-12		**Suspended KAIKO7000II dive**		01/25 12:00 (UTC+9h)
	07:30	suspended KAIKO7000II submergence dueto large swell		27-02.6N,126-57.2E
	10:00-10:05	scientific seminar		East China Sea
				Overcast
				North-6(Strong breeze)
				5 (Sea rough)
				4 (Moderate average)
				Visibly: 6'
26-Jan-12		**KAIKO 7000II dive 537**		01/26 12:00 (UTC+9h)
	09:29	hoisted up KAIKO 7000II		27-47.3N,126-54.0E
	09:34	launched KAIKO 7000II, and started 7K#537 dive operation		East China Sea
	10:59	landed at sea bottom	depth = 1049m	Fine but cloudy
	15:06	left bottom	depth = 1032m	North-3 Gentle breeze)
	16:10	hoisted up KAIKO 7000II		3 (Sea slight)
	16:18	recovered		3 (Moderate short)
	18:30-18:40	scientific meeting		Visibly: 8'
27-Jan-12		**KAIKO 7000II dive 538**		01/27 12:00 (UTC+9h)
	08:32	hoisted up KAIKO 7000II		27-47.4N,126-54.0E
	08:37	launched KAIKO 7000II, and started 7K#537 dive operation		East China Sea
	10:10	landed at sea bottom	depth = 1059m	Rain
	14:58	left bottom	depth = 979m	SE-4 (Moderate breeze)
	16:00	hoisted up KAIKO 7000II		3 (Sea slight)
	16:07	recovered		1 (Low swell)
	18:00-18:15	scientific meeting		Visibly: 6'
28-Jan-12		**Arrived at NAHA-ko**		
	10:00	disembarked KAIREI at NAHA-ko		
		finished KR12-02 cruise		

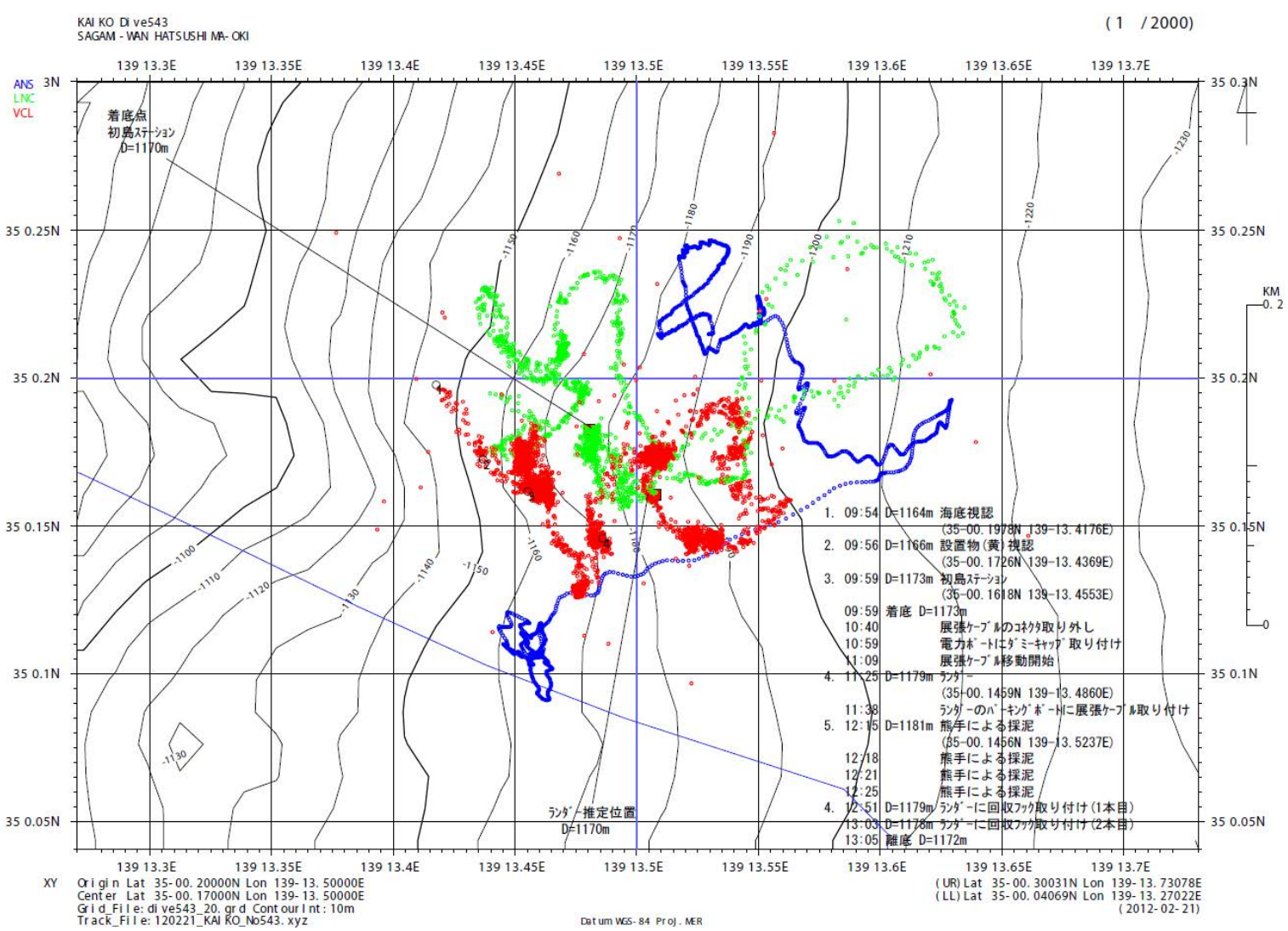
○ Research Information

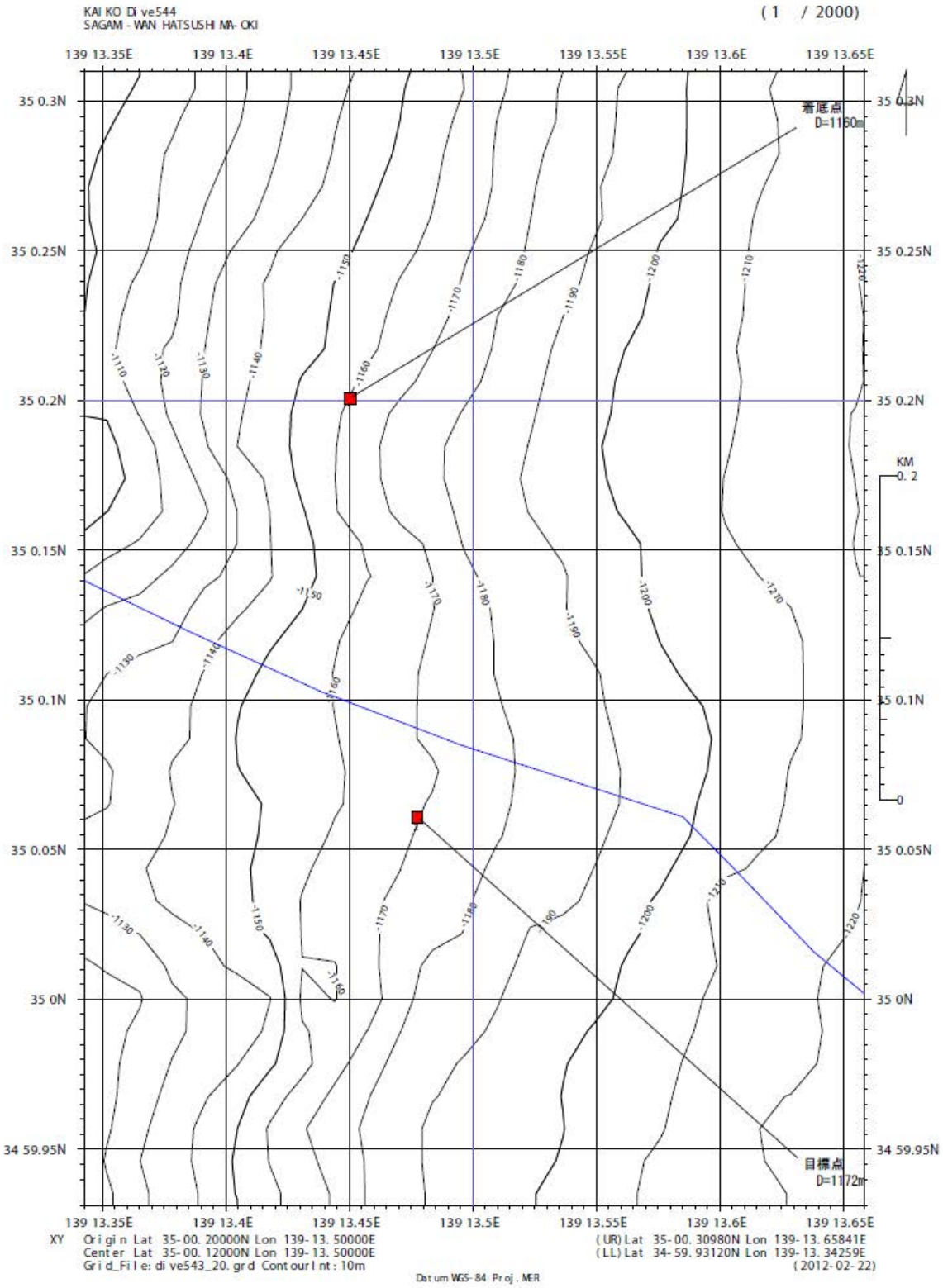
Research points



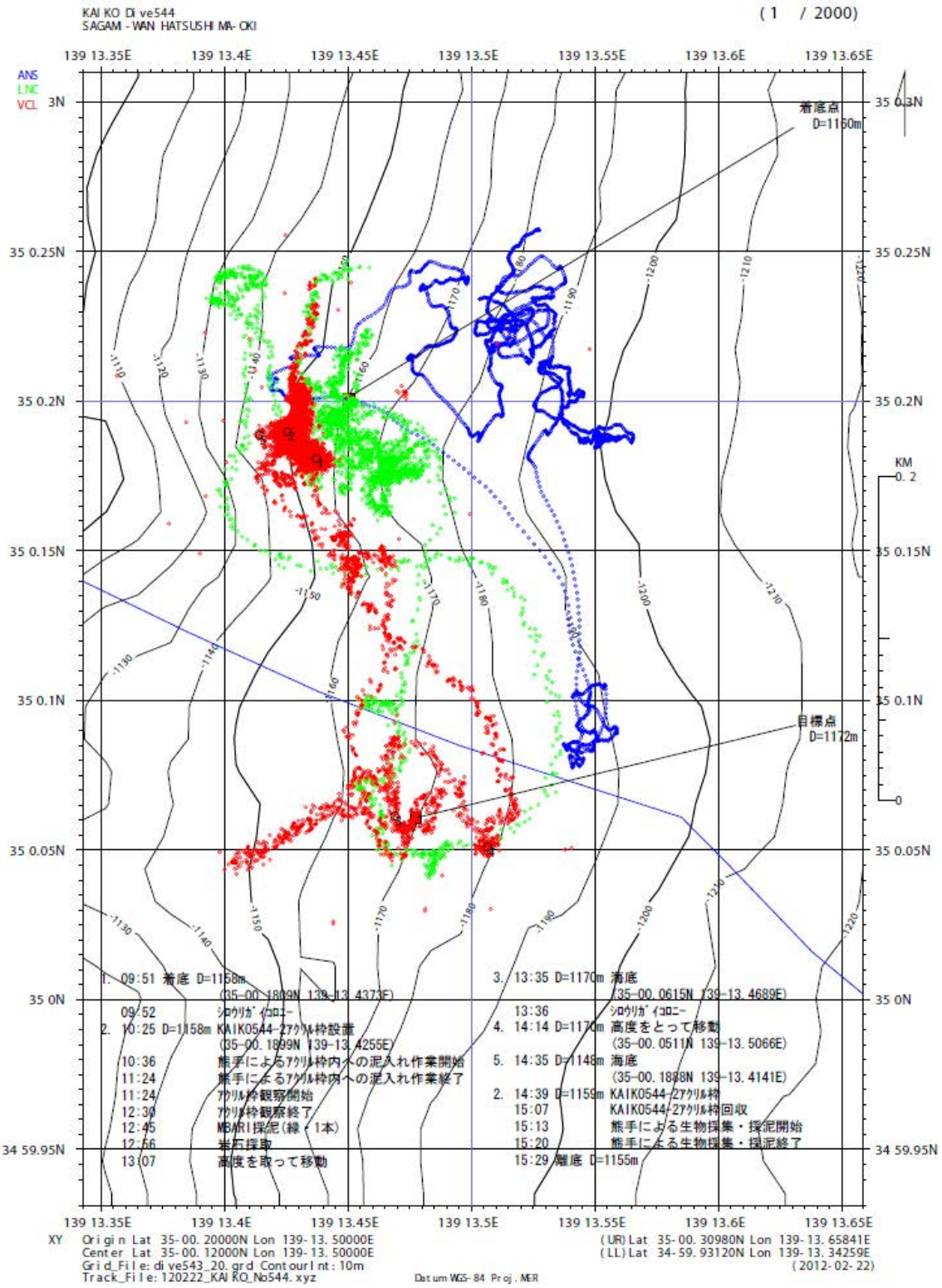
Dive #543 map

Dive #543 track chart



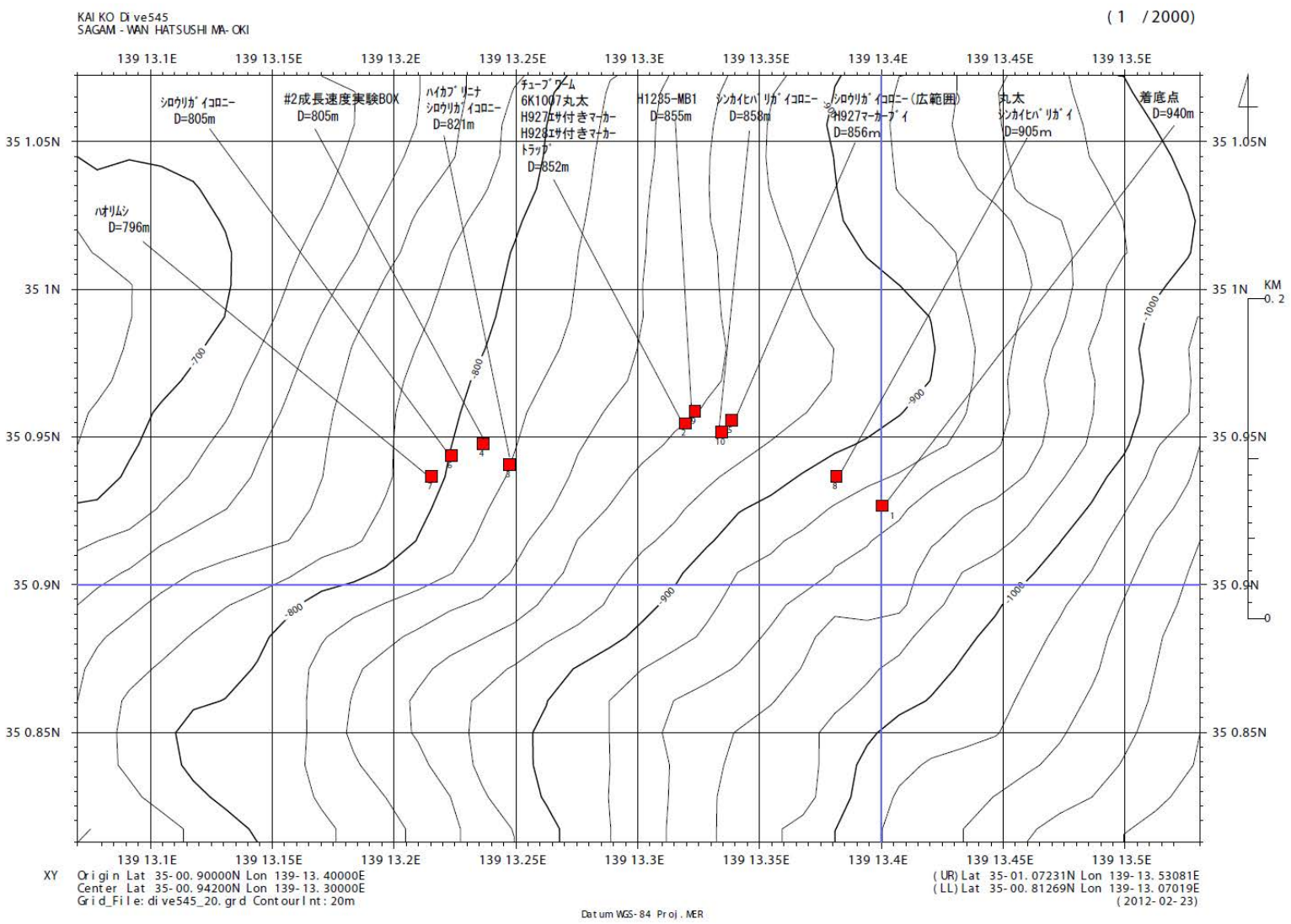

KAIKO Dive544
SAGAMI-WAN HATSUSHIMA-OKI
(1 / 2000)
139 13.35E
139 13.4E
139 13.45E
139 13.5E
139 13.55E
139 13.6E
139 13.65E
35 0.3N
35 0.25N
35 0.2N
35 0.15N
35 0.1N
35 0.05N
35 0N
34 59.95N
着底点
D=1160m
目標点
D=1172m
KM
0.2
0
XY Origin Lat 35-00.20000N Lon 139-13.50000E
Center Lat 35-00.12000N Lon 139-13.50000E
Grid_File: dive543_20.grd Contour Int: 10m
(UR) Lat 35-00.30980N Lon 139-13.65841E
(LL) Lat 34-59.93120N Lon 139-13.34259E
(2012-02-22)
Datum WGS-84 Proj. MER

Dive #544 map

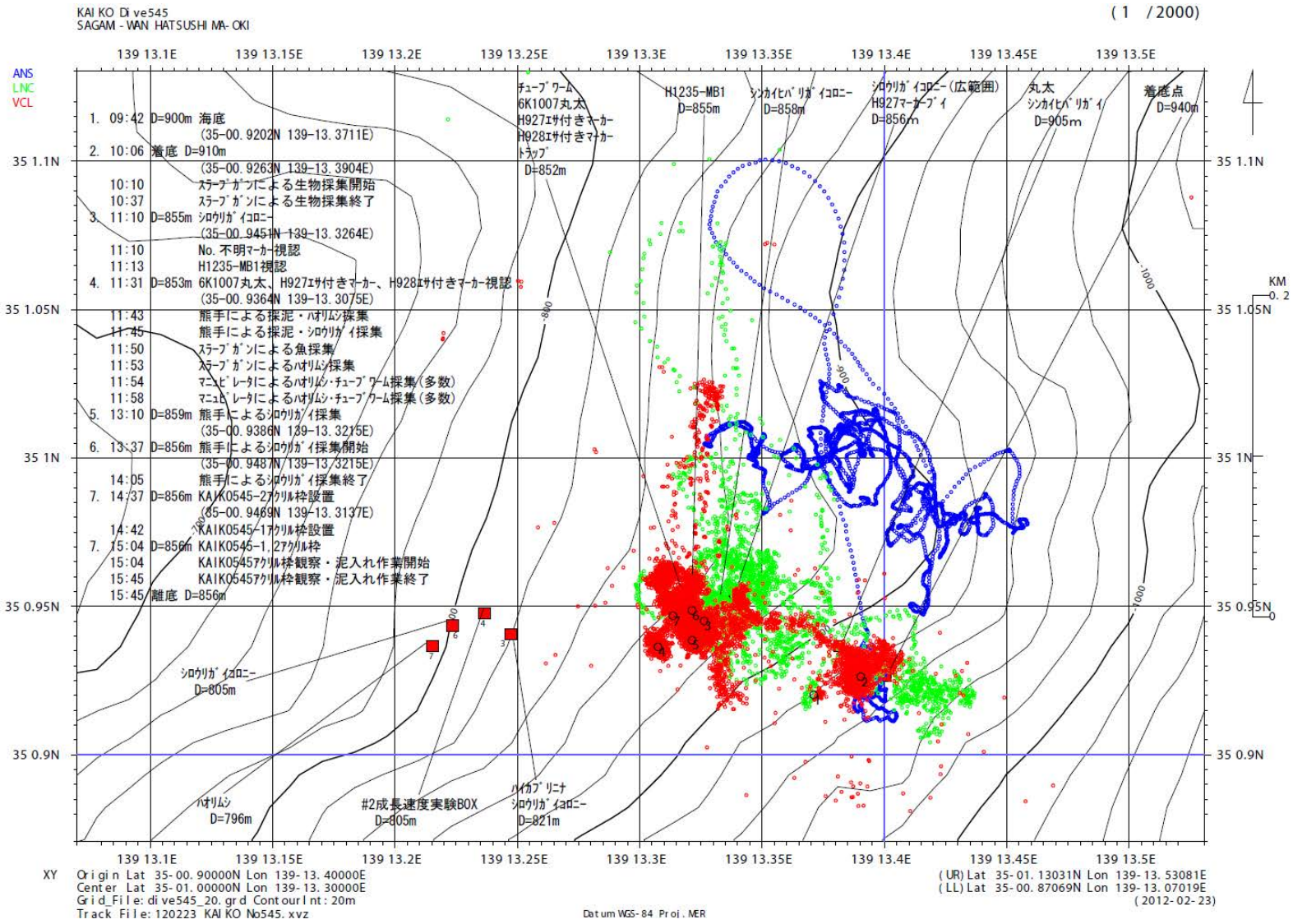


Dive #544 track chart

Dive #545 map


KAIKO Dive545
SAGAMI-WAN HATSUSHIMA-OKI
(1 / 2000)
139 13.1E
139 13.15E
139 13.2E
139 13.25E
139 13.3E
139 13.35E
139 13.4E
139 13.45E
139 13.5E
35 1.05N
35 1N
35 0.95N
35 0.9N
35 0.85N
シロウリガイコロニー
D=805m
#2成長速度実験BOX
D=805m
ハイカブリニナ
シロウリガイコロニー
D=821m
チューブワーム
6K1007丸太
H927エサ付きマーカー
H928エサ付きマーカー
トラップ
D=852m
H1235-MB1
D=855m
シンカイヒバリガイコロニー
D=858m
シロウリガイコロニー(広範囲)
H927マーカーブイ
D=856m
丸太
シンカイヒバリガイ
D=905m
着底点
D=940m
ハオリムシ
D=796m
-700
-800
-900
-1000
KM
0.2
0
XY Origin Lat 35-00.90000N Lon 139-13.40000E
Center Lat 35-00.94200N Lon 139-13.30000E
Grid_File: dive545_20.grd Contour Int: 20m
(UR) Lat 35-01.07231N Lon 139-13.53081E
(LL) Lat 35-00.81269N Lon 139-13.07019E
(2012-02-23)
Datum WGS-84 Proj. MER

Dive #545 track chart



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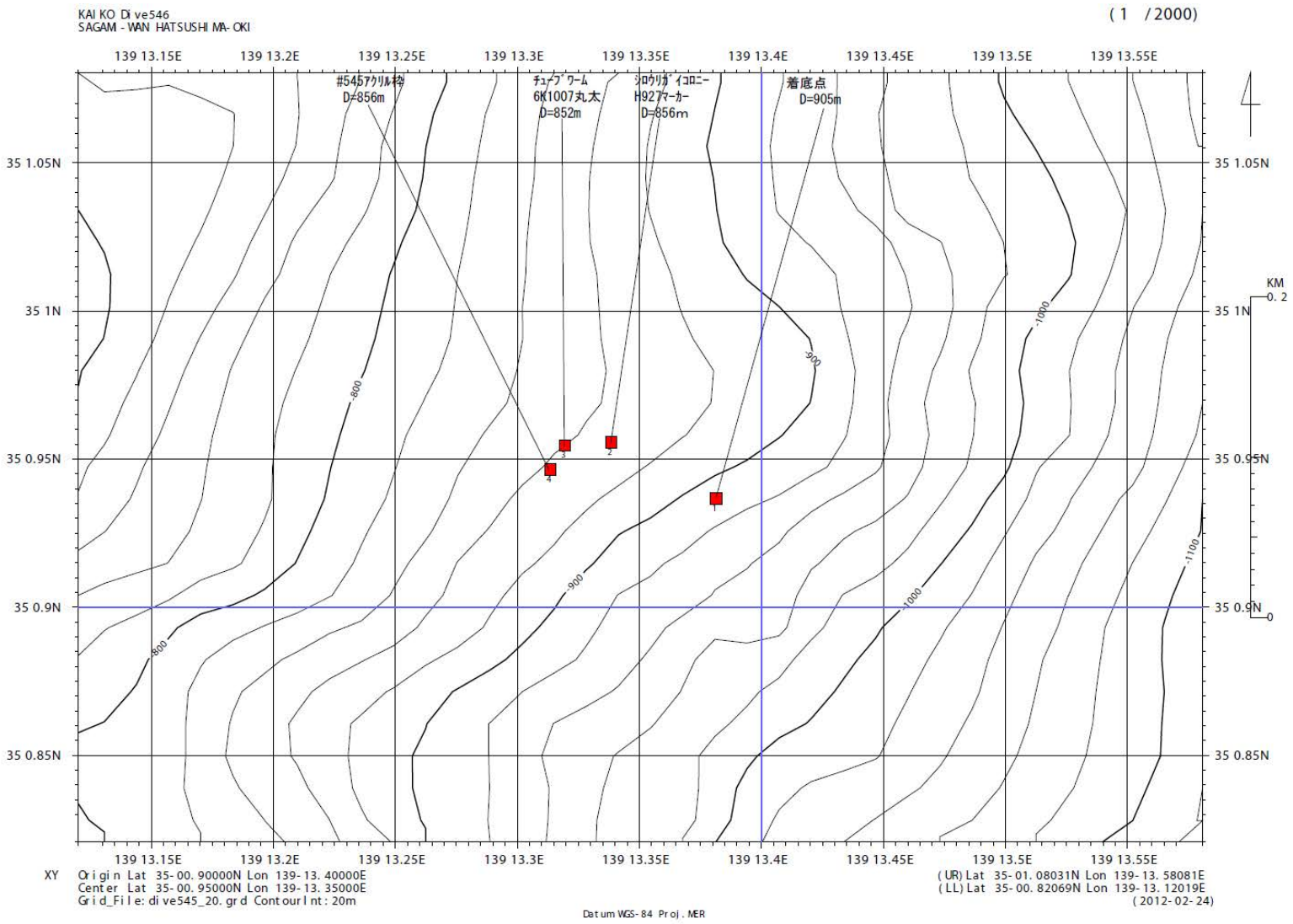
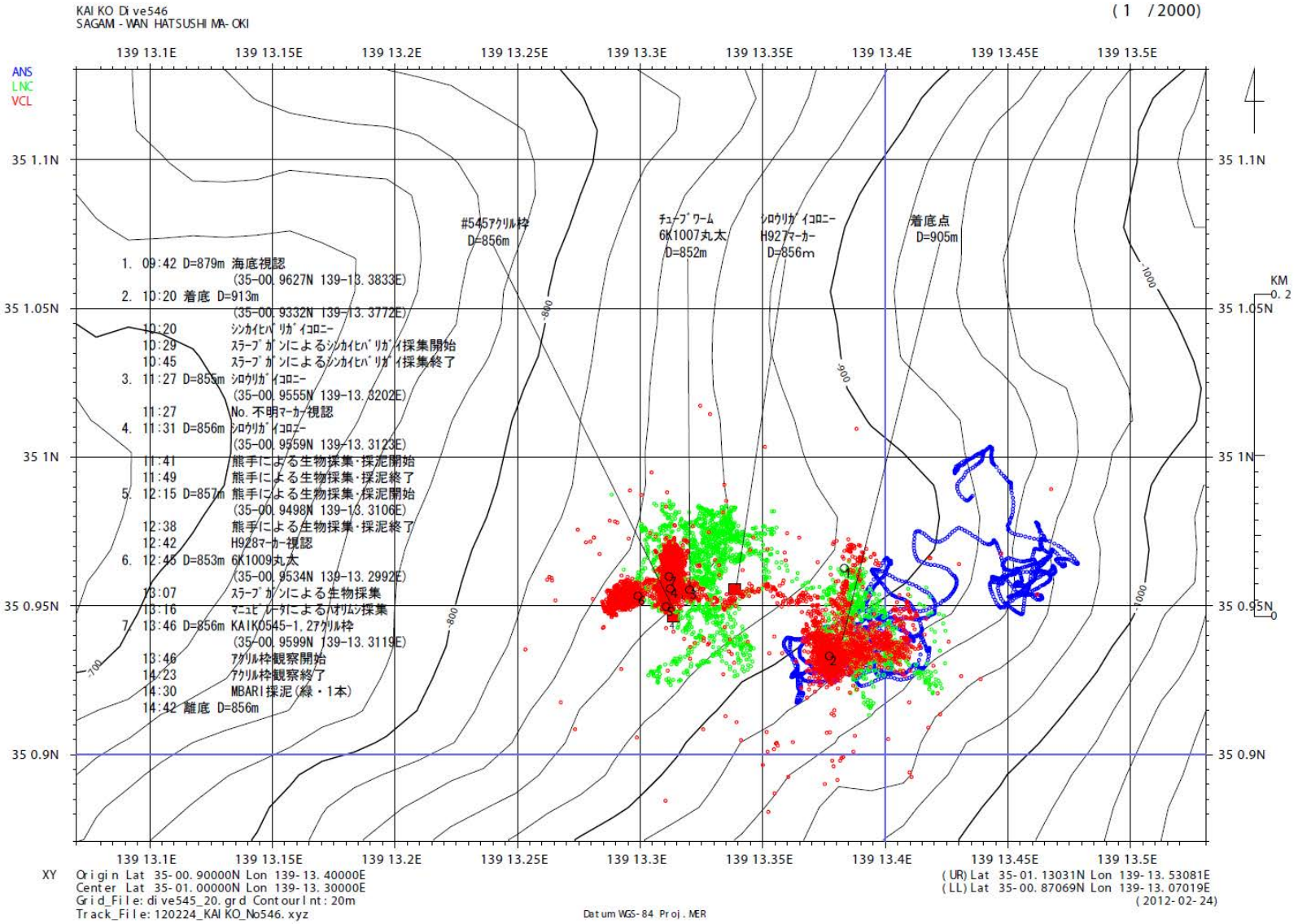

KAIKO Dive546
SAGAM - WAN HATSUSHIMA-OKI
(1 /2000)
#545アクリル枠
D=856m
チューブワーム
6K1007丸太
D=852m
シロウリガイコロニー
H927マーカー
D=856m
着底点
D=905m
139 13.15E
139 13.2E
139 13.25E
139 13.3E
139 13.35E
139 13.4E
139 13.45E
139 13.5E
139 13.55E
35 1.05N
35 1N
35 0.95N
35 0.9N
35 0.85N
-800
-900
-1000
-1100
KM
0. 2
0
XY Origin Lat 35-00.90000N Lon 139-13.40000E
Center Lat 35-00.95000N Lon 139-13.35000E
Grid_File: dive545_20.grd Contour Int: 20m
(UR) Lat 35-01.08031N Lon 139-13.58081E
(LL) Lat 35-00.82069N Lon 139-13.12019E
(2012-02-24)
Datum WGS-84 Proj. MER

Dive #546 track chart



Recovery information

Lander with planar O2 optode system and extension cable (dive #543)

○ About data

Include any information that may be necessary for analysis and QC planning and secondary use (publications, provisions, etc.)

4. Notice on Using

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