

KAIREI Cruise Report

KR08-05

Leg1: Sea Trials of the Deep Ocean ROV ABISMO

2008/05/26 – 2008/06/06

Leg2: 11,000m class Free Fall Mooring System

2008/06/07 – 2008/06/14

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

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1. Relation of Cruise

- (1) *Cruise Number/vessel's name* : KR08-05 / KAIREI
- (2) *Cruise Name* :
 - Leg1: Sea Trials of the Deep Ocean ROV ABISMO
 - Leg2: 11,000m class Free Fall Mooring System
- (3) *Cruise Period* :
 - Leg1: 2008/05/26 – 2008/06/06
 - Leg2: 2008/06/07 – 2008/06/14
- (4) *Departure ground - port of call - returning to port (yyyy/mm/dd)* :
 - Leg1: Yokosuka (2008/05/26) - Apra Harbor, Guam(2008/06/05)
 - Leg2: Apra Harbor, Guam(2008/06/07) - Yokosuka (2008/06/14)
- (5) *Sea area of research* : Sagami Bay, Izu-Ogasawara Trench and Mariana Trench

2. Researchers

(1) Leg1

Top of Researchers (affiliation) :

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Boarding Researchers :

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Junichi Miyazaki, Takuro Nunoura, Yuki Morono, Fumio Inagaki,
Toru Kikuchi, Osamu Koide(JAMSTEC),
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Michinari Sunamura (University of Tokyo)

(2) Leg2

Top of Researchers (affiliation) :

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Boarding Researchers :

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3. Body of the work

(1) Purpose

A) Leg1

The 11,000-meter class remotely operated vehicle (ROV) “*KAIKO*” (Kyo, Miyazaki, Tsukioka and Ochi, 1995) which was owned by Japan Agency for Marine-earth Science and Technology (JAMSTEC), had shown successful results on scientific research of the deepest sea. However in 2003, the vehicle of *KAIKO* was lost by the break of the secondary cable that connected the launcher and the vehicle. JAMSTEC have developed the alternate ROV *KAIKO7000*. Later, *KAIKO7000* was re-constructed to *KAIKO7000II*.

The other side there is strong demand for exploring of the deepest parts of the ocean. Especially the old *KAIKO* showed excellent result on the field of the bacteria. Many bacteria had been found in the mud sampled from the Challenger Deep of the Mariana Trench by the old *KAIKO*. In JAMSTEC an 11,000 meters class ROV called “*ABISMO*” (Automatic Bottom Inspection and Sediment Mobile) is being developed. The main purpose of *ABISMO* is the sediment sampling in the deepest sea bottom.

The fourth sea trial examined Performance confirmation examination in 10,000m in depth class sea area in Mariana Trench, extraction of sediment with bottom sampler, and Perpendicular multipoint obtaining water with sampling bottles.

B) Leg2

JAMSTEC has developed another deep sea observing system which is 11,000m class free fall mooring system. It aimed to take video images and sediment samplings. The purpose of KR08-05 sea trial was to take video images and sediment samplings at Mariana Trench (almost 11,000m depth) by 11,000m class free fall mooring system.

(2) Execution points

- A) Adjustment of docking-undocking system (Sagami bay)
- B) Extraction of sediment with bottom sampler (Sagami bay, Izu-Ogasawara Trench and Mariana Trench Challenger Deep)
- C) Obtaining water test (Izu-Ogasawara Trench, Mariana Trench Challenger Deep and TOTO caldera)
- D) Test of 11,000m class free fall mooring system (Mariana Trench Challenger Deep)

(3) agenda

Completion time	works	location
Leg1		
first 2008/05/26 (Mon)	Sail in Sagami Bay	-
Second 05/27 (Tue)	Underwater test (water depth: 1,200m) Adjustment of docking-undocking system Bring a ship to Izu-Ogasawara Trench	Sagami Bay
Third 05/28 (Wed)	Underwater test (water depth: 1,200m) Obtaining water test and Extraction of sediment with bottom sampler Bring a ship to Mariana Trench	Izu-Ogasawara Trench Beyonnaise Rocks
Fourth 05/29 (Thu)	Bring a ship to Mariana Trench	-
Fifth 05/30 (Fri)	Bring a ship to Mariana Trench	-
Sixth 05/30 (Sat)	Bring a ship to Mariana Trench	-
Seventh 06/01 (Sun)	Underwater test (water depth: 10,350m) Obtaining water test and Extraction of sediment with bottom sampler	Mariana Trench Challenger Deep
Eighth 06/02 (Mon)	Underwater test (water depth: 10,350m) Obtaining water test and Extraction of sediment with bottom sampler	Mariana Trench Challenger Deep
Ninth 06/03 (Tue)	Underwater test (water depth: 10,350m) Obtaining water test and Extraction of sediment with bottom sampler	Mariana Trench Challenger Deep
Tenth 06/04 (Wed)	Underwater test (water depth: 2,900m) Obtaining water test Bring a ship to Apra Harbor, Guam	Mariana Trench TOTO caldera
Eleventh 06/05 (Thu)	Leg1 unrig a ship	Apra Harbor, Guam
Twelfth 06/06 (Fri)	Leg1 unrig a ship, Leg1 researchers leave a ship	Apra Harbor, Guam

Completion time		works	location
Leg2			
Thirteenth	2008/06/07 (Sat)	Sail for Mariana Trench	-
Fourteenth	06/08 (Sun)	Sea trial of 11,000m class free fall mooring system (water depth: 10,895m)	Mariana Trench Challenger Deep
Fifteenth	06/09 (Mon)	Sea trial of 11,000m class free fall mooring system (water depth: 10,895m)	Mariana Trench Challenger Deep
Sixteenth	06/10 (Tue)	Bring a ship to Yokosuka	-
Seventeenth	06/11 (Wed)	Bring a ship to Yokosuka	-
Eighteenth	06/12 (Thu)	Bring a ship to Yokosuka	-
Nineteenth	06/13 (Fri)	Bring a ship to Yokosuka	-
Twentieth	06/14 (Sat)	Sail into Yokosuka Harbor (JAMSTEC)	Yokosuka Harbor (JAMSTEC)

(4) *Sea area of KR08-05*

1) Sagami bay (section B) (fig.1)

35°12.0'N 139°30.0'E, 34°55.0'N 139°30.0'E

34°55.0'N 139°10.0'E, 35°00.0'N 139°07.0'E

35°08.0'N 139°07.0'E, 35°08.0'N 139°10.0'E

35°12.0'N 139°10.0'E, Sea area enclosed in weft longitude line

2) Izu-Ogasawara Trench (section C) (fig.1)

31°00'N 139°00'E, 33°00'N 139°00'E

31°00'N 142°00'E, 33°00'N 142°00'E, Sea area enclosed in weft longitude line

3) Mariana Trench (fig.2)

12°40'N 143°30'E, 12°40'N 143°35'E

12°46'N 143°30'E, 12°46'N 143°35'E

Sea area enclosed in weft longitude line (Area1)

11°10'N 141°50'E, 11°30'N 141°50'E

11°10'N 143°00'E, 11°30'N 143°00'E

Sea area enclosed in weft longitude line (Area2)

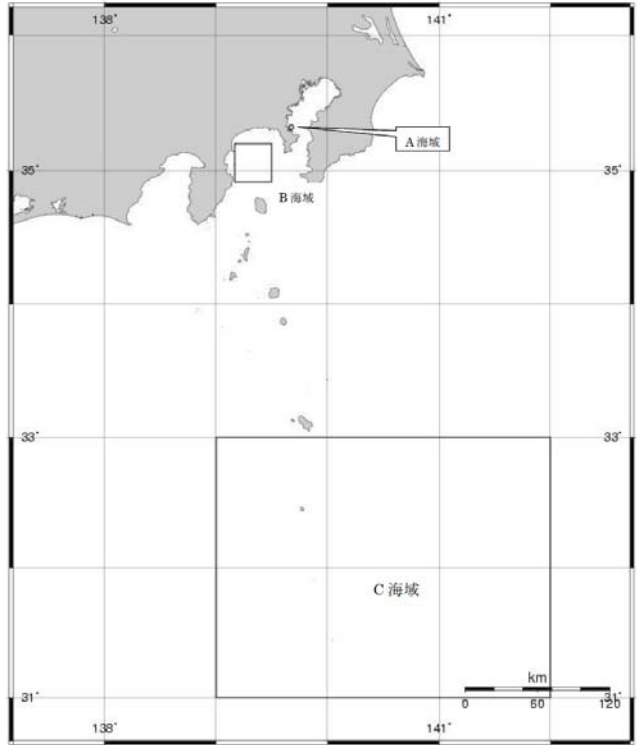


Fig.1 Sagami bay and Izu-ogasawara Trench

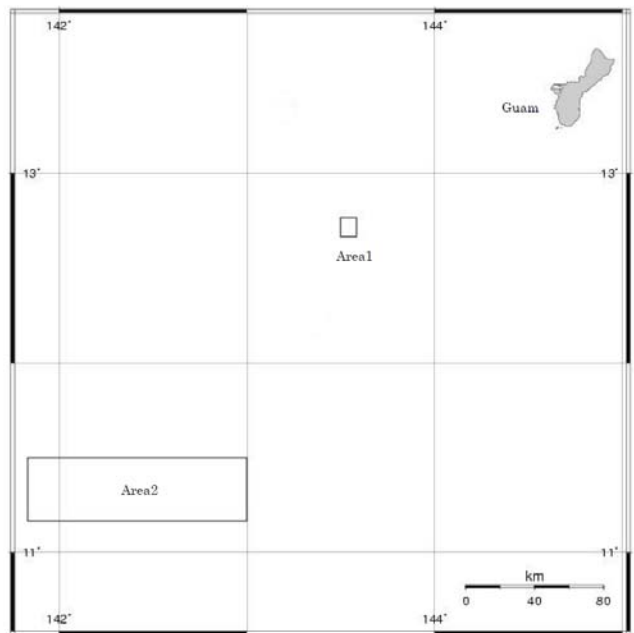


Fig.2 mariana Trench

(5) *Compendium of instrumental technique used*

- A) ABISMO (Automatic Bottom Inspection and Sediment Mobile)
- B) bottom sampler
- C) sampling bottles
- D) 11,000m class free fall mooring system

(6) *Test results of Leg1*

The sea trials aimed at Confirmation of resisting pressure performance by 10,000m class, Confirmation of turning round of ABISMO being able to control and Confirmation of docking-undocking system of launcher and vehicle.

The operation test, the function test of ABISMO, and the sampling test with the bottom sampler and the sampling bottle were done.

(6)-1 Sea trial of Sagami bay (2008/05/26) (34-59.9N 139-13.6E)

It aimed at docking-undocking system of launcher and vehicle in Sagami Bay. The vehicle is separate from the launcher. The vehicle reached at the seabed.

(6)-2 Sea trial of Beyonnaise Rocks (2008/05/27) (31-54.2N 139-57.6E)

Sampling test combine with operation test of sampling bottle in Beyonnaise Rocks.

(6)-3 Sea trials of Mariana trench Challenger Deep (2008/06/01 – 2008/06/03) (11-22.15N 142-42.75E)

Function test, Confirmation of docking-undocking system and performance test of individual equipments were done in Mariana Trench Challenger Deep.

It dove three times every three days and ABISMO reached respectively by 10,000m. 10,258m in attainment depth of the launcher was recorded in the sea area of 10,350m in depth on June 3.

Moreover, the collection of the core of the marine sediment with the bottom sampler and the perpendicular multipoint obtaining water with the sampling bottle were done. A mud sample (length = 1600 mm) was taken from the sea bottom in the depth of 10,350m

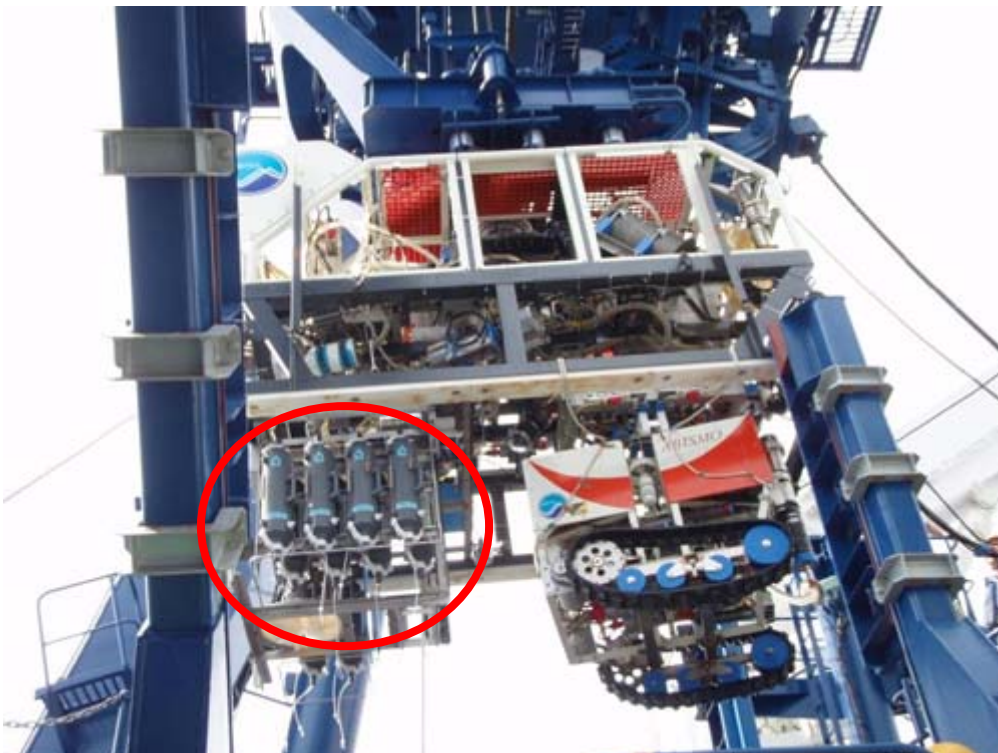
(6)-4 Sea trial of Mariana trench TOTO caldera (2008/06/04)

The perpendicular multipoint obtaining water with the sampling bottle was done in the hydrothermal area of TOTO caldera. In addition, the bottom sampler is not installed.

(7) *Figure of Leg1*



A mud sample (length = 1600 mm) was taken from the sea bottom in the depth of 10,350m



Perpendicular multipoint obtaining water with the sampling bottle

Table 1 Equipped devices on the launcher

ITEMS	SPECIFICATION
Thrusters	1,000W x 2 set on afterward.
Sampling	Gravity core sampler: 2m, 90kg Grab sampler (Smith-McIntyre Type)
Light	Halogen light: 500W LED lights arrays
Camera	One stationary One with pan-tilt ability HDTV
Sensors	CTD Sound velocity meter for the positioning of the probe
Navigation devices	Altimeter: 200kHz, 300m range Depth meter Gyro
Responder	Around 7kHz SSBL processed on the ship.

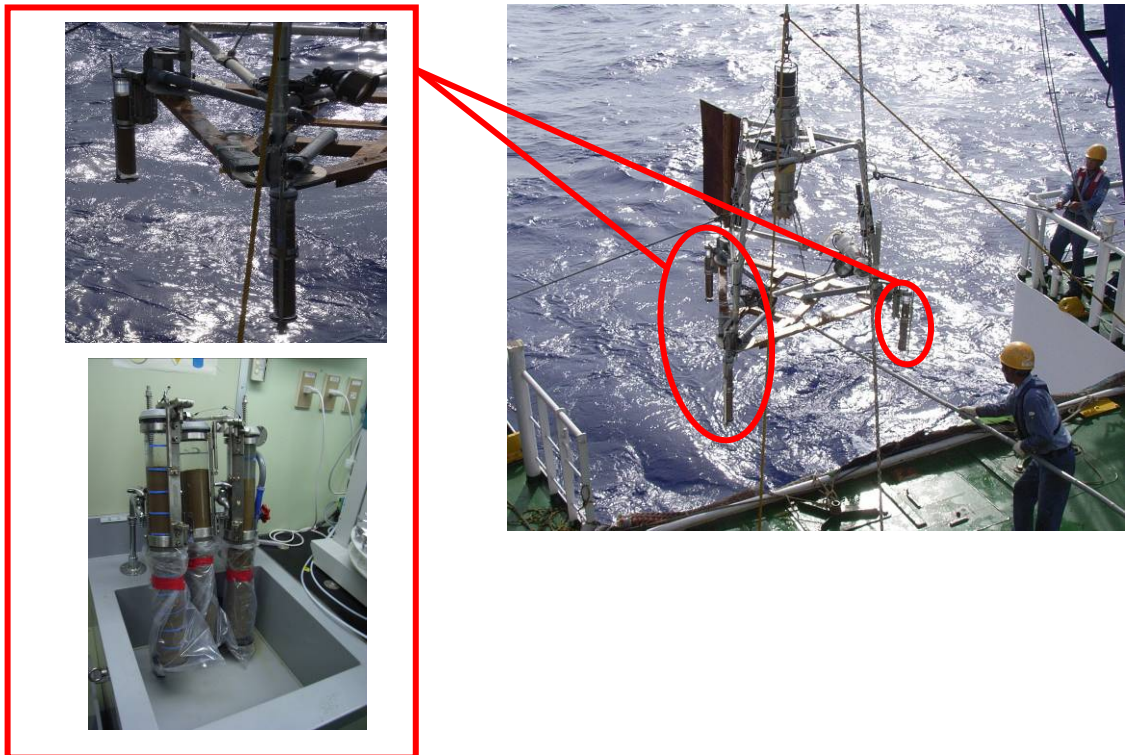
Table 2 Equipped devices on the vehicle

ITEMS	SPECIFICATION
Thrusters	Horizontal: 400W x 2 Vertical: 400W x2
Crawler	400W x 2 Speed: 5km/h
Sampling	Mini manipulator (in future)
Light	Halogen light: 500W LED lights array
Camera	With pan-tilt ability
Navigation devices	Depth meter Gyro
Transponder 1	21.3kHz, bandwidth: 4.3kHz BPSK mod. with M-sequence Transducer: ITC-3019
Transponder 2	Around 14kHz SSBL processed on the ship (in future)
Other	Flasher

(8) *Test results of Leg2*

The sea trial of 11,000m class free fall mooring system was held at Challenger Deep in Marina Trench (11-22.14N 142-25.76E). To take sediment sampling and video image has been succeeded.

(9) *Figure of Leg2*



11,000m class free fall mooring system after sediment sampling



Video image of 10,895m

4. Attention

This cruise report is a preliminary documentation as of the end of the cruise. It may not be corrected even if changes on content (i.e. taxonomic classifications) are found after publication. It may also be changed without notice. Data on the cruise report may be raw or not processed. Please ask the PI(s) for the latest information before using.

Users of data or results of this cruise are requested to submit their results to Data Integration and Analysis Group (DIAG), JAMSTEC.