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“MIRAI” Cruise Report

MR16-02

Experiments of underwater acoustic technology,

Suruga-Bay and North part of Nankai Trough

17/March/2016 – 22/March/2016

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

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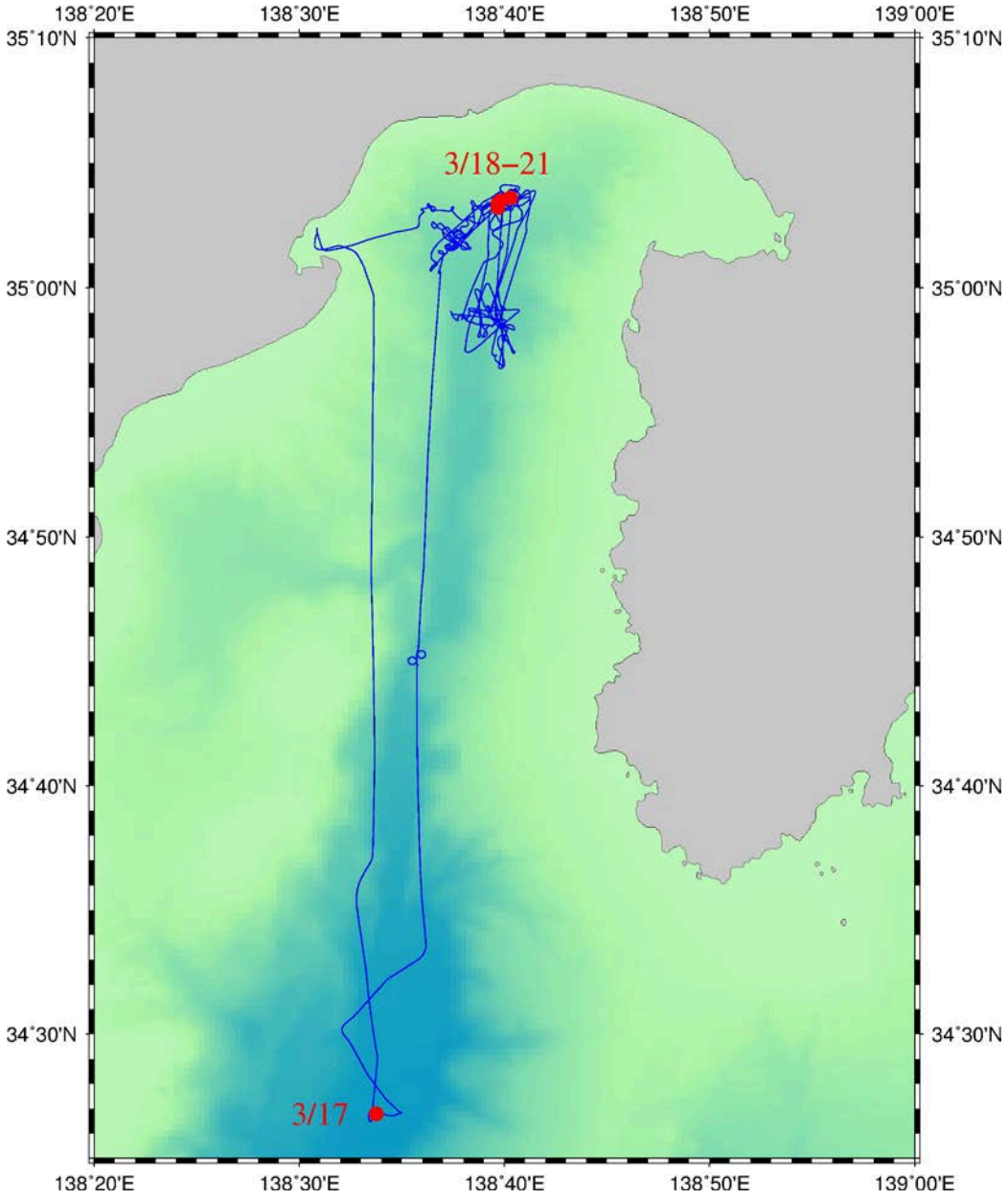
1. Cruise Information

- Cruise ID: MR16-02
- Name of vessel R/V MIRAI
- Title of the cruise Experiments of underwater acoustic technology.
- Title of proposal Research for multi-user underwater acoustic communication.
- Cruise period 17/March/2016 – 22/March/2016
- Ports of departure / arrival Shimizu
- Research area Suruga-Bay and North part of Nankai Trough
- Research Map



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3. Purpose

Our group is researching and developing acoustic communication system for AUV-ASV communication and positioning. In this cruise, our purpose is to obtain data of acoustic communication for vertical direction.

4. Experiments

4.1. Overview

The experiments of acoustic communication for vertical direction were carried out at Suruga-bay. Those tests were executed to acquire data for acoustic multi/single user communication and positioning.

4.1.1. First day (17/March/2016)

Transducer performance test were carried out between a transducer suspended from “MIRAI” and a hydrophone array mounted at the bottom of “MIRAI”.

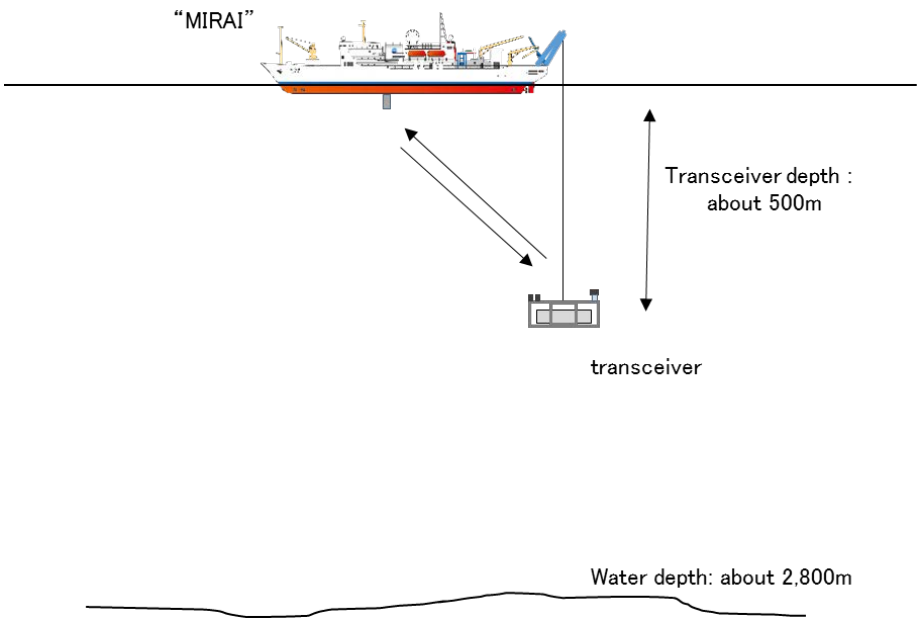

Fig.1 Configuration of first day's experiment.

4.1.2. Second day (18/March/2016)

Multiuser acoustic communication test was carried out between moored two transmitters and ship bottom mounted hydrophone.

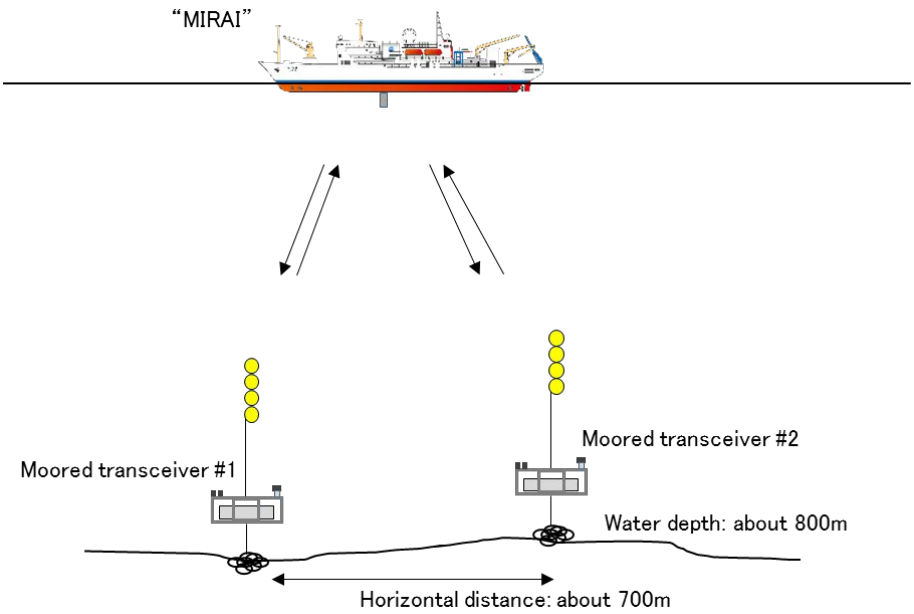

Fig.2 Configuration of second day's experiment.

4.1.3. Third day (19/March/2016)

Acoustic communication test was carried out between moored one transmitter and floating

surface station.

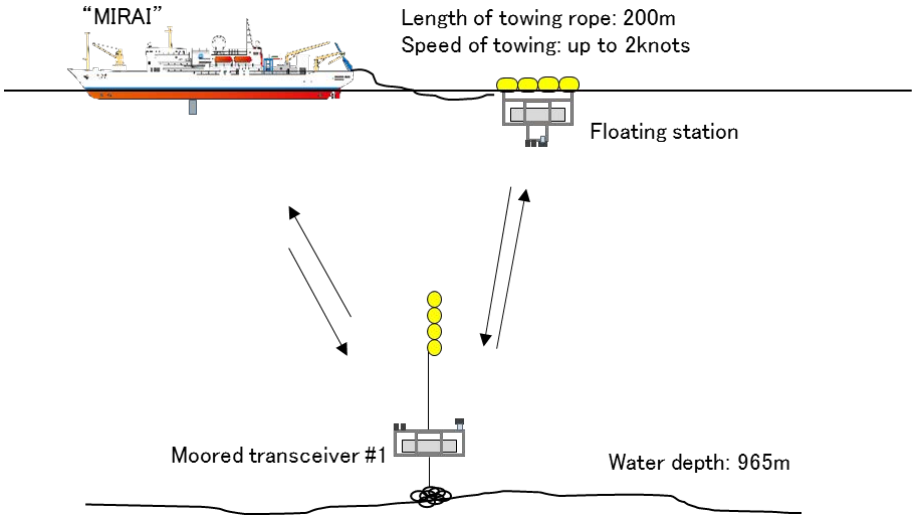

Fig.3 Configuration of third day's experiment.

4.1.4. Fourth day (20/March/2016)

Multiuser acoustic communication test was carried out between moored one transmitter / suspended one transmitter and ship bottom mounted hydrophone.

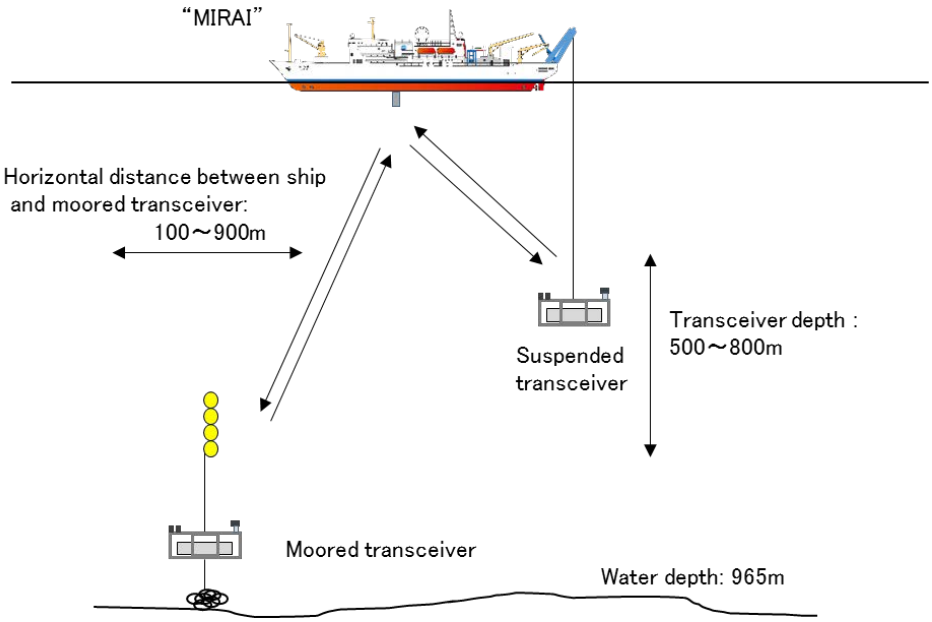

Fig.4 Configuration of fourth day's experiment.

4.1.5. Fifth day (21/March/2016)

Multiuser acoustic communication test was carried out between moored one transmitter and towed floating surface station / ship bottom mounted hydrophone.

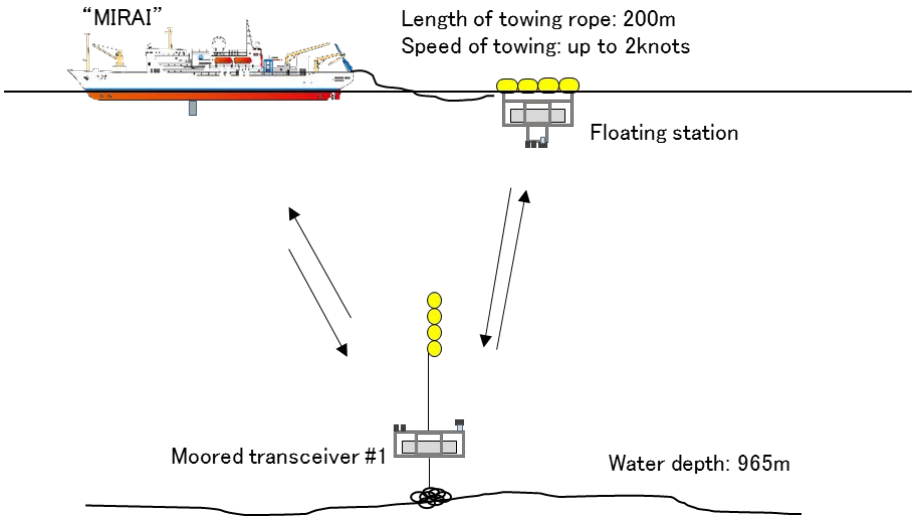

Fig.5 Configuration of fifth day's experiment.

4.2. Experimental setup and results

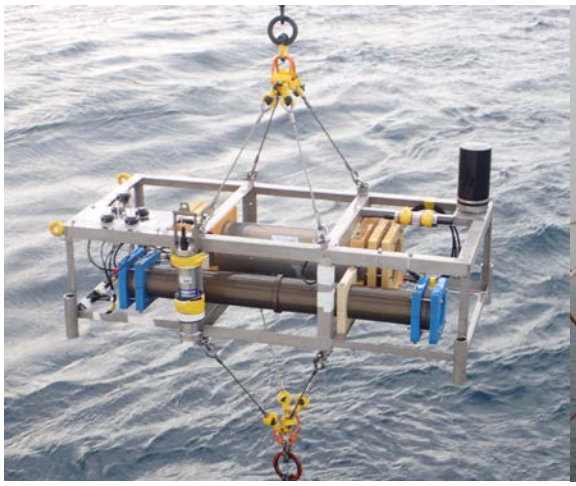

Fig.6 A transceiver for mooring.

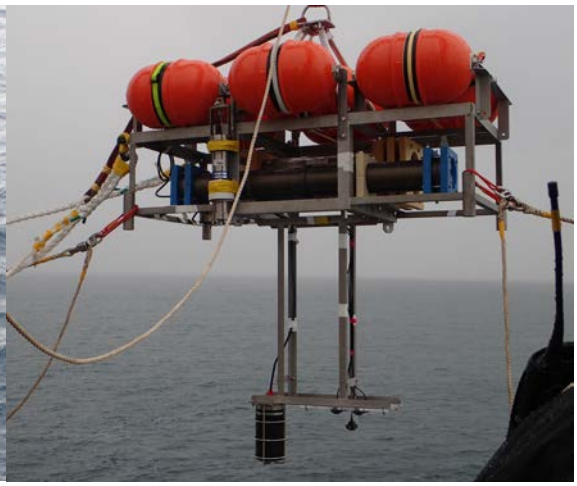

Fig.7 A transceiver for surface station.

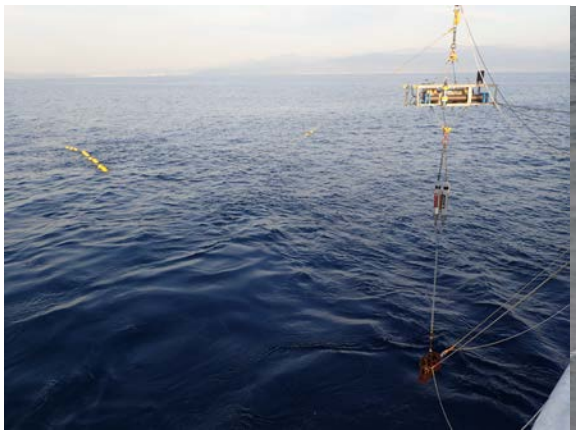

Fig.8 Photo of working on mooring.

Fig.9 Photo of towing surface station.

In this experiment, propagated acoustic signal from sea bottom to surface and from surface to sea bottom were recorded. The new transducers were used for signal transmission, which were developed as wideband transducer. Fig.6-7 show transceiver for mooring and towing. Fig.8 shows just before release a mooring transceiver system. Fig.9 shows towing view from “MIRAI”. Fig.10-13 show mooring points and ship track in each day.

All obtained data are now processing, and those data and results will be applied for new acoustic multiuser communication and positioning system.

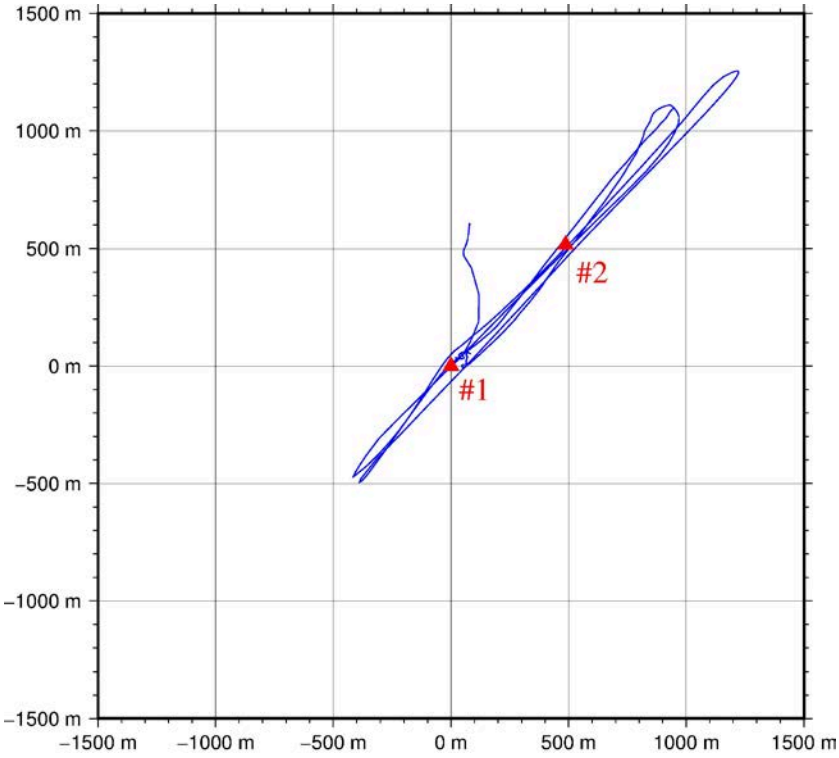

Fig.10 Ship track for acoustic communication test at 2016/03/18.
#1 and #2 indicate positions of each mooring system.

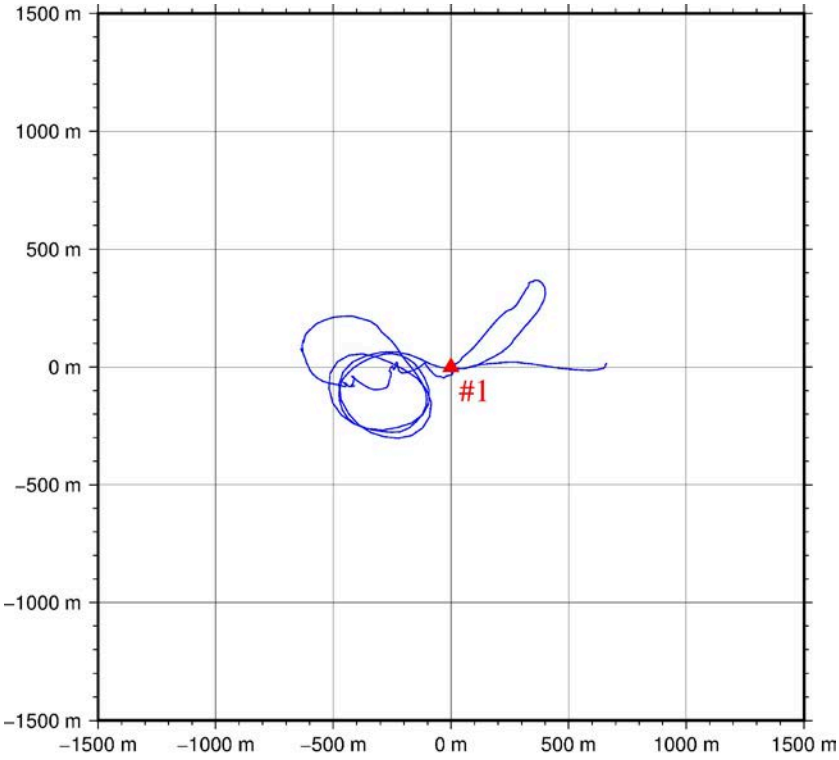

Fig.11 Ship track for acoustic communication test at 2016/03/19.
#1 indicates position of mooring system.

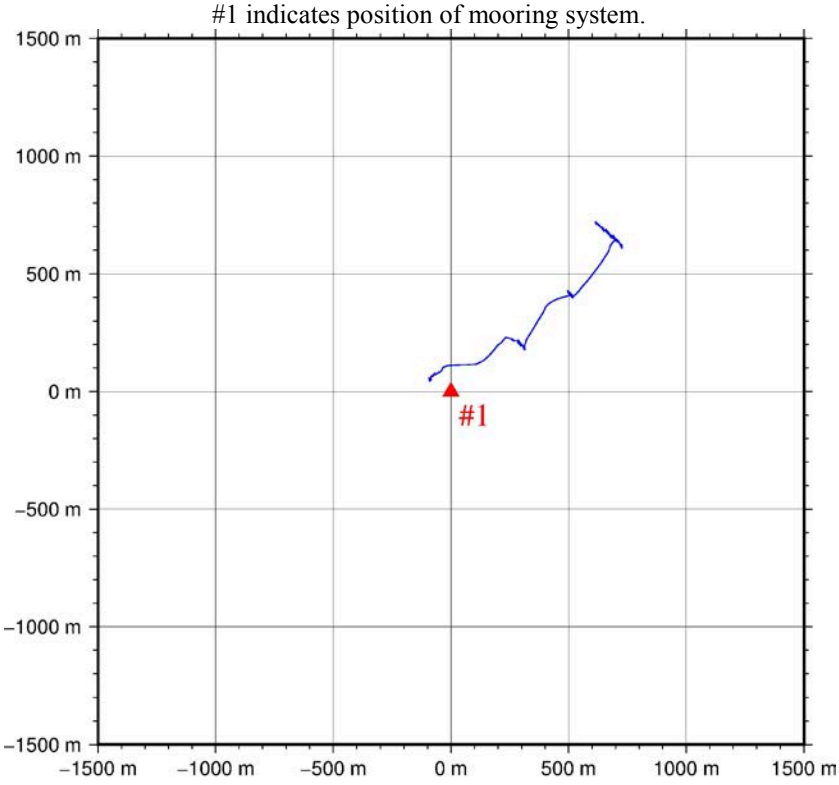

Fig.12 Ship track for acoustic communication test at 2016/03/20.
#1 indicates position of mooring system.

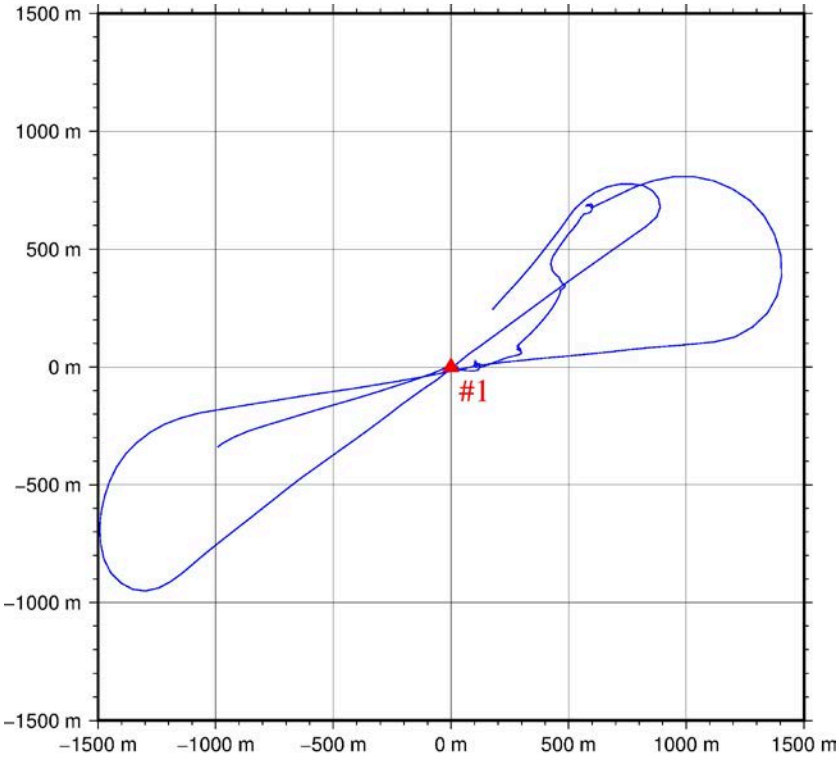

Fig.13 Ship track for acoustic communication test at 2016/03/21
#1 indicates position of mooring system.

4.3. Cruise log (Date-time: JST)

2016/Mar./17	06:30	Departure from Shimizu
	10:01	XBT
	14:12-14:40	Suspend #2 transmitter unit from “MIRAI”
	14:41-16:40	Measurement of SPL of #2 transducer at 500, 1,000 and 1,500 m depth.
	16:40-17:02	Recover #2 transmitter unit
	14:12-14:40	Suspend #1 transmitter unit from “MIRAI”
	14:41-16:40	Measurement of SPL of #1 transducer at 500, 1,000 and 1,500 m depth.
	16:40-17:02	Recover #1 transmitter unit
2016/Mar./18	05:41	XBT
	06:35-06:55	Mooring #1 transceiver unit. (Moored number: #01)
	07:12	#1 transceiver unit was moored at 967 m depth.
	07:25-07:44	Mooring #2 transceiver unit. (Moored number: #02)
	around 08:00	#2 transceiver unit was moored at about 920 m depth.
	09:30	Start acoustic signal transmission from two moored transceiver unit to “MIRAI”.
	09:30-13:30	“MIRAI” running on the line along two mooring positions with

		recording acoustic propagation signals on mooring two transceivers from “MIRAI”.
	13:30	Stop acoustic signal transmission from two moored transceiver unit.
	13:32	Start acoustic signal transmission from “MIRAI” to two moored transceiver unit.
	14:02	Stop acoustic signal transmission from “MIRAI”.
	14:13-14:17	Abridged survey run for calibration of #1 transceiver unit.
	14:28	#1 transceiver unit was released.
	14:43	#1 transceiver unit was surfaced.
	15:50	Finish recovery of #1 transceiver unit.
	16:03-16:07	Abridged survey run for calibration of #2 transceiver unit.
	16:16	#2 transceiver unit was released.
	16:31	#2 transceiver unit was surfaced.
	17:22	Finish recovery of #2 transceiver unit.
2014/Mar./19	05:46	XBT
	06:34-06:47	Mooring #2 transceiver unit. (Moored number: #03)
	07:07	#2 transceiver unit was moored at 960 m depth.
	07:08-08:07	Survey run for calibration of #2 transceiver unit.
	08:30-08:35	Deploying #1 transceiver unit and start towing at 200m after “MIRAI”.
	09:30	Start transmitting acoustic signal from #1 transceiver unit and “MIRAI”.
	09:55-10:25	Measuring at just over #2 transceiver.
	10:30-11:00	Measurement at 200m of horizontal distance from the mooring point.
	11:10-11:40	Measurement at 400m of horizontal distance from the mooring point.
	11:50-12:20	Measurement at 600m of horizontal distance from the mooring point.
	12:20-14:10	Measurement with towing in 1 knot around the mooring point (circle radius is 150 m).
	14:11-14:21	Recover #1 transceiver unit.
	15:15	#2 transceiver unit was released.
	15:29	#2 transceiver unit was surfaced.
	16:30	Finish recovery of #2 transceiver unit.
2014/Mar./20	05:45	XBT
	06:30-06:41	Mooring #1 transceiver unit. (Moored number: #04)
	06:59	#1 transceiver unit was moored at 960 m depth.
	07:04-07:46	Survey run for calibration of #1 transceiver unit.
	08:35-08:58	Suspending #2 transceiver unit at 600 m depth.
	09:00	Start acoustic signal transmission from #1 and #2 transceivers.

	09:00-09:20	Measurement at HR=100 m, Z=600 m.
		HR: horizontal range between #1 moored transceiver and “MIRAI”.
		Z: suspended depth of #2 transceiver.
	09:24-09:44	Measurement at HR=100 m, Z=700 m.
	09:48-10:08	Measurement at HR=100 m, Z=800 m.
	10:35-10:55	Measurement at HR=300 m, Z=800 m.
	11:01-11:21	Measurement at HR=300 m, Z=700 m.
	11:26-11:46	Measurement at HR=300 m, Z=600 m.
	12:06-12:26	Measurement at HR=600 m, Z=600 m.
	12:31-12:51	Measurement at HR=600 m, Z=700 m.
	12:55-13:15	Measurement at HR=600 m, Z=800 m.
	13:32-13:52	Measurement at HR=900 m, Z=800 m.
	13:57-14:17	Measurement at HR=900 m, Z=700 m.
	14:21-14:41	Measurement at HR=900 m, Z=600 m.
	14:45-15:00	Measurement at HR=900 m, Z=500 m.
	15:00	Stop acoustic signal transmission from #1 and #2 transceivers.
	15:00-15:18	Recover #2 transmitter unit
	15:38	#1 transceiver unit was released.
	15:51	#1 transceiver unit was surfaced.
	16:36	Finish recovery of #1 transceiver unit.
2014/Mar./21	05:45	XBT
	06:25-06:37	Mooring #2 transceiver unit. (Moored number: #05)
	06:52	#2 transceiver unit was moored at 947 m depth.
	06:58-07:09	Abridged survey run for calibration of #2 transceiver unit.
	08:02-08:03	Deploying #1 transceiver unit.
	08:12	Set #1 transceiver unit 200 m afterward from “MIRAI”.
	08:30	Start acoustic signal transmission from #2 transceiver.
	08:50-09:10	Measurement at just over the #2 transceiver unit..
	09:17-09:37	Measurement at HR=100 m.
		HR: horizontal range between #2 moored transceiver and “MIRAI”.
	09:50-10:10	Measurement at HR=300 m.
	10:27-10:47	Measurement at HR=600 m.
	11:04-11:24	Measurement at HR=900 m.
	11:45-12:08	Measurement at 3 knots of speed of “MIRAI” and #1 transceiver moving along the straight line of about 1 NM passing mooring position.
	12:30-13:05	Measurement at 2 knots of speed of “MIRAI” and #1 transceiver

		moving along the straight line of about 1 NM passing mooring position.
	13:19-13:30	Measurement at 1 knots of speed of “MIRAI” and #1 transceiver moving along the straight line of about 0.5 NM heading for mooring position.
	13:30	Stop acoustic signal transmission from #2 transceivers.
	13:32-13:47	Recover #1 transmitter unit
	13:55	#2 transceiver unit was released.
	14:09	#2 transceiver unit was surfaced.
	14:47	Finish recovery of #2 transceiver unit.
	15:00	Head for Shimizu
2014/Mar./22	09:00	Arrive at Shimizu

4.4. Research Information

- Deployment and recovery information

Moored number	Moored date	Moored point		Depth	Recovery date
		Latitude	Longitude		
#01	2016/03/18	35-03.3174N	138-39.7880E	975m	2016/03/18
#02	2016/03/18	35-03.5962N	138-40.1089E	925m	2016/03/18
#03	2016/03/19	35-03.4524N	138-40.2437E	965m	2016/03/19
#04	2016/03/20	35-03.3809N	138-39.9972E	965m	2016/03/20
#05	2016/03/21	35-03.4215N	138-39.8377E	952m	2016/03/21

- XBT

No.	Date [JST]]	Time [JST]	Latitude [degN]	Longitude [degE]	Depth [m]
1	2016/03/17	10:01	34-26.5293	138-33.4081	2786
2	2016/03/18	05:41	35-03.1186	138-38.9769	1019
3	2016/03/19	05:46	35-01.8921	138-38.9769	1254
4	2016/03/20	05:45	35-02.7313	138-39.2337	1099
5	2016/03/21	05:45	35-03.2722	138-39.9353	995

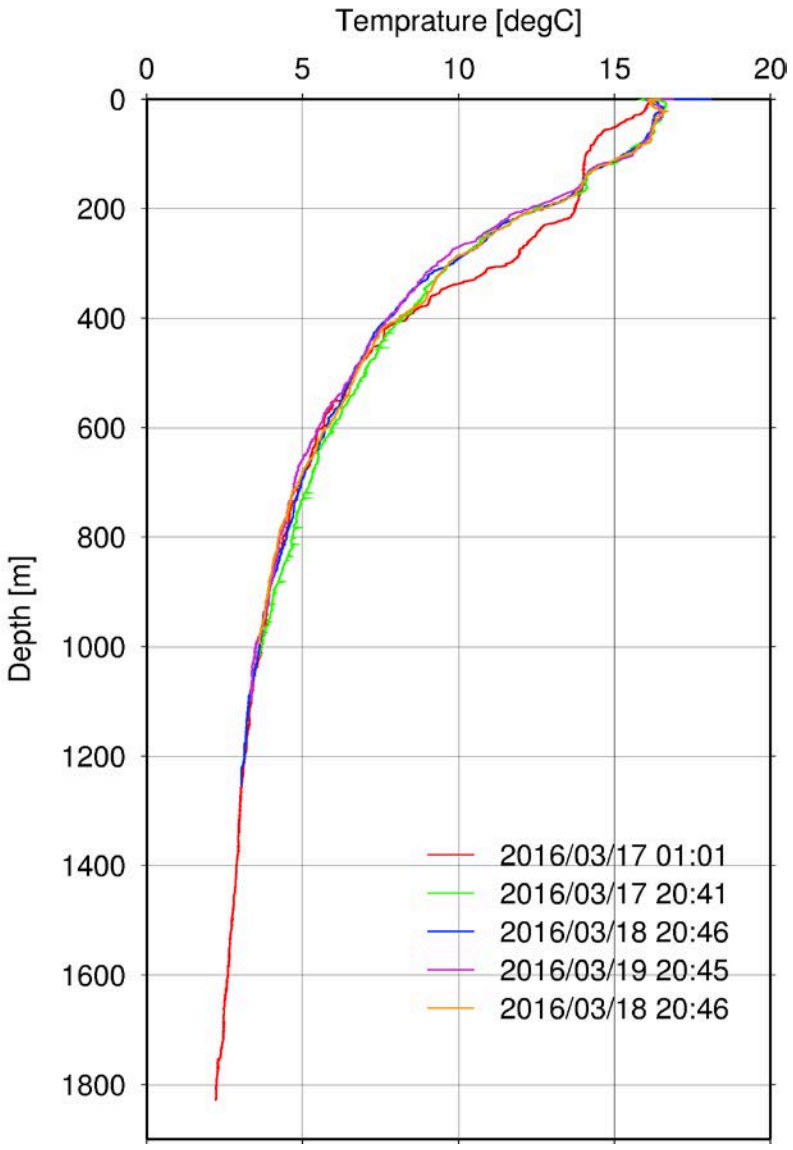

Fig.14 XBT profile. (UTC)

5. Notice on Using

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This report may not be corrected even if changes on contents (i.e. taxonomic classifications) may be found after its publication. This report may also be changed without notice. Data on this cruise report may be raw or unprocessed. If you are going to use or refer to the data written on this report, please ask the Chief Scientist for latest information.
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