

R/V Yokosuka “Cruise Report”

YK25-06C

In-situ monitoring and long-term explosion test of cement  
mortar specimen at a deep sea condition and fundamental  
strength evaluation of sub-seafloor

April 27<sup>th</sup> –30<sup>th</sup>, 2025

Nankai Trough Northern Margin

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

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# 1. Participants aboard

## 1-1. Research group

Chief Scientist	Takafumi Kasaya
Deputy scientist	Shun Nomura
Scientist	Takeshi Kawano
Scientist	Toshihiro Yamanaka
Scientist	Hiroko Makita
Scientist	Mana Yasui
Scientist	Hinata Isaka
Scientist	Miki Takagaki
Scientist	Yuta Igarashi
Scientist	Souta Suzuki
Marine Technician	Hisanori Iwamoto

## 1-2. SHINKAI6500 Operation Team

Submersible Operation Manager	CHIBA Kazuhiro
Deputy Submersible Operation Manager	KONDO Tomoe
1st Submersible Staff	UEKI Mitsuhiro
1st Submersible Staff	ISHIKAWA Akihisa
1st Submersible Staff	ONISHI Takuma
2nd Submersible Staff	SUZUKI Keigo
2nd Submersible Staff	SAIGO Ryo
2nd Submersible Staff	IJJIMA Satsuki
2nd Submersible Staff	MATSUSAKA Motohiro
2nd Submersible Staff	SATO Kaisei
3rd Submersible Staff	SASAKI Haruka
3rd Submersible Staff	EDA Tomoka

## 1-3. Captain and crew of the R/V Yokosuka

Captain	NAKAMURA Yoshiyuki
Chief Officer	CHIBA Masato
1st Officer	KIMURA Naoto
2nd Officer	MATSUDA Riku
Jr.2nd Officer	NOZAWA Tatsuya

3rd Officer	KOYAISHI Yuki
Chief Engineer	GIBU Daisuke
1st Engineer	SHIRAKATA Kenichi
2nd Engineer	SHIMIZU Koki
3rd Engineer	FURUYAMA Yuji
Jr.3rd Engineer	OCHIAI Takamasa
Chief Electronic Op.	KOMAKI Yosuke
2nd Electronic Op.	MABARA Takayuki
BoatSwain	IWASAKI Naoki
Quarter Master	ISHIZUKA Nao
Quarter Master	UENO Shinya
Quarter Master	TANAKA Taisei
Sailor	MATSUDA Taisei
Sailor	INOUE Shinnosuke
Sailor	NAKANO Mizuki
No.1 Oiler	UEDA Masanori
Oiler	FUJISHIMA Tamaki
Oiler	SATO Daiki
Assistant Oiler	DANTSUKA Aoi
Assistant Oiler	OCHIAI Kenzo
Chief Steward	ABE Takahiro
Steward	SHIRAISHI Tatsuya
Steward	SATO Jun
Steward	TANAKA Tsugumi
Steward	SATO Keito

## 2. Cruise Summary

### 2-1. Cruise Information

- Cruise ID: YK25-06C
- Name of vessel: S/V Yokosuka
- Chief Scientist: Takafumi Kasaya (JAMSTEC)
- Title of cruise proposal:

In-situ monitoring and long-term explosion test of cement mortar specimen at a deep sea condition and fundamental strength evaluation of sub-seafloor
- Cruise period: April 27th –30th 2025
- Ports of departure /arrival: Shimizu port / JAMSTEC-Yokosuka
- Research area: Northern area of Nankai trough and Off Shimizu
- Research area and track map: Fig. 1

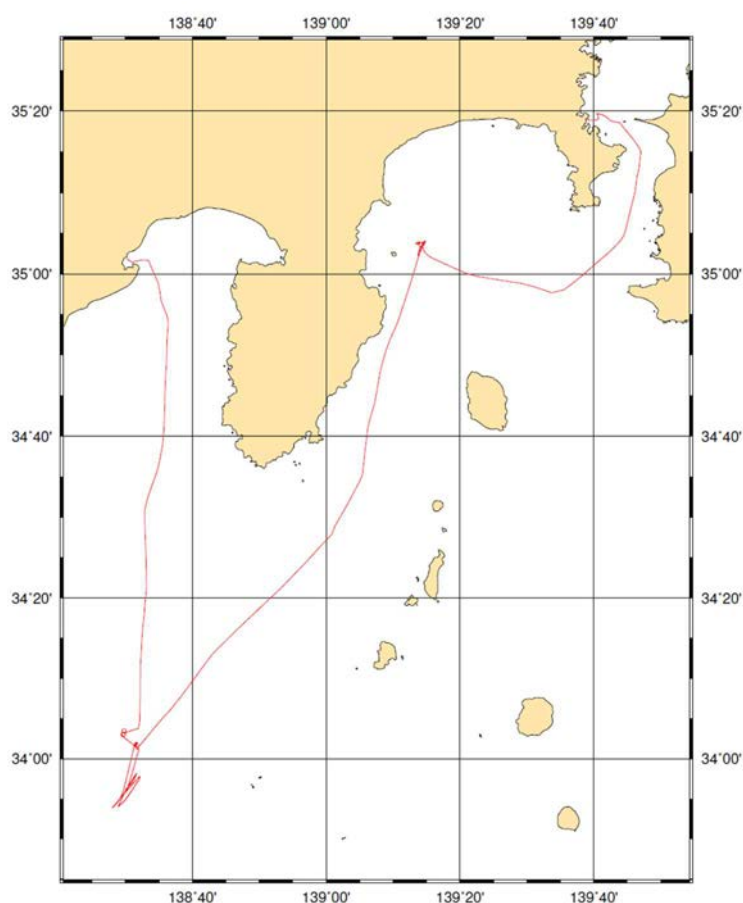


Fig. 1 Track map of YK25-06C Cruise.

## 2-2. Overview of the cruise

Since 2018, we have been conducting on-site measurements and long-term exposure tests on concrete materials in deep-sea environments at a location 3,516 meters deep along the northern margin of the Nankai Trough. As the joint research project is set to conclude in the 2025 fiscal year, this expedition was undertaken to recover all remaining specimens at the experimental site. Many specimens were still left on the platform and its surroundings (Fig. 2).

Originally, we planned to retrieve the specimens in two Shinkai 6500 dives. However, due to forecasts of deteriorating sea conditions, we had to complete the recovery in a single dive. To prevent damage from specimen degradation, we ensured that the specimen sets were recovered without stacking.

Before recovery operations, water and sediment samples were collected were conducted to assess the surrounding environment. After sampling operations, recovery operations and visual observations were then carried out. No significant changes in the seafloor were identified through visual observation, and all test specimens were successfully recovered in baskets. We will continue to analyze new collected samples to elucidate the deterioration process of concrete test specimens.

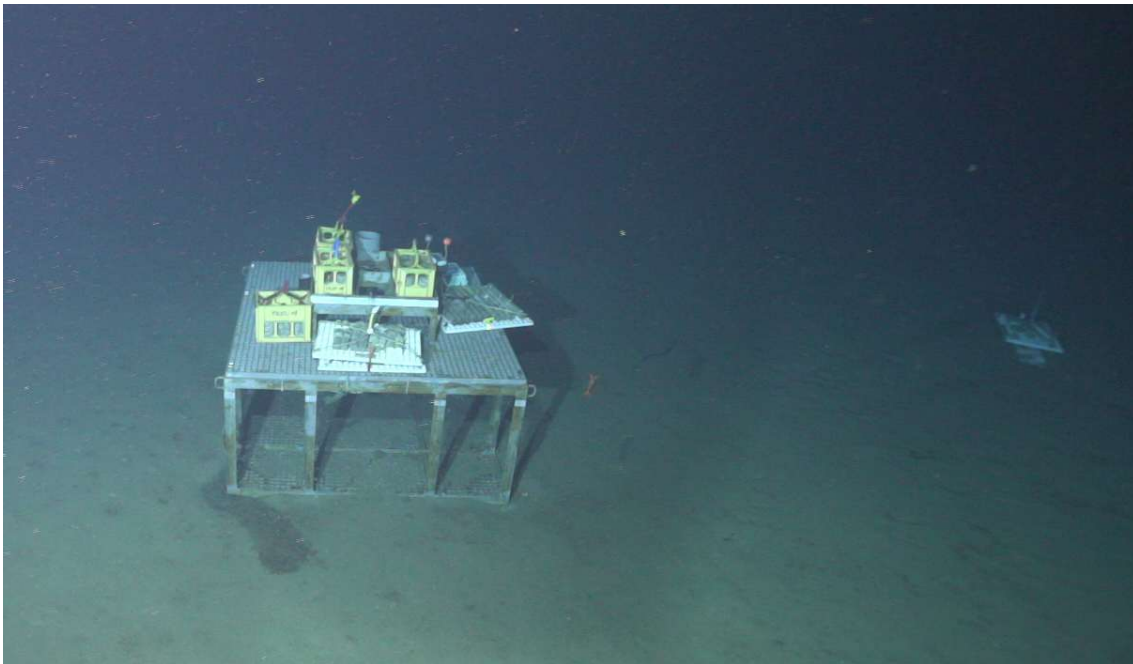


Fig. 2 Photo showing the condition of installed specimens on and around the platform

### 3. Cruise 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
27-Apr-25	11:30	Scientists onboarded.		12:00 (UTC+9h)
	13:00	Let go all share line and left Sodeshi quay No.11 for research area.		35-01.9N,138-30.3E
	13:00-13:25	6K team and scientists meeting.		Sodeshi quay No.11
	13:40-14:05	6K briefing.		Weather:bc
	15:00-15:40	Carried out education and training for scientists.		Wind:South-4
	18:00-18:20	Scientists meeting.		Wave scale:3
	18:08-18:28	Eight figure turns.		Swell scale:1
				Visibly: 8'
28-Apr-25	08:45	Hoisted up "SHINKAI6500".		12:00 (UTC+9h)
	08:52	Launched "SHINKAI6500".		34-01.8N,138-31.5E
	09:00	"SHINKAI6500" dive and started her operation dive No.1850.		Nrothern end of Nankai trough
	10:41	"SHINKAI6500" landed at the sea bottom.	D=3,516m	Weather:bc
	15:06	"SHINKAI6500" left the sea bottom.	D=3,515m	Wind:South-3
	16:25	Refloated "SHINKAI6500"		Wave scale:2
	16:55	Recovered "SHINKAI6500" and finished above operation.		Swell scale:2
				Visibly: 8'

29-Apr-25	09:00-09:15	Scientists meeting.		12:00 (UTC+9h)
	11:40	Let go anchor Yokosuka No. 4		35-19.7N,139-40.6E
				Yokosuka No.4
				Weather:BC
				Wind:ESE-3
				Wave scale:2
				Swell scale:1
				Visibly: 8'
30-Apr-25	09:00	Arrived at JAMSTEC Yokosuka. Finished YK25-06C cruise.		
	14:00	All scientists disembarked.		

## 4. Dive summary

Dive No.: # 1850

Date: 29/4/2025

Dive area: Nankai Trough North Edge (34°1.8'N, 138°31.6'E, 3516 m in depth)

Time of arriving at the bottom: 10:41 (JST)

Time of leaving the bottom: 15:06 (JST)

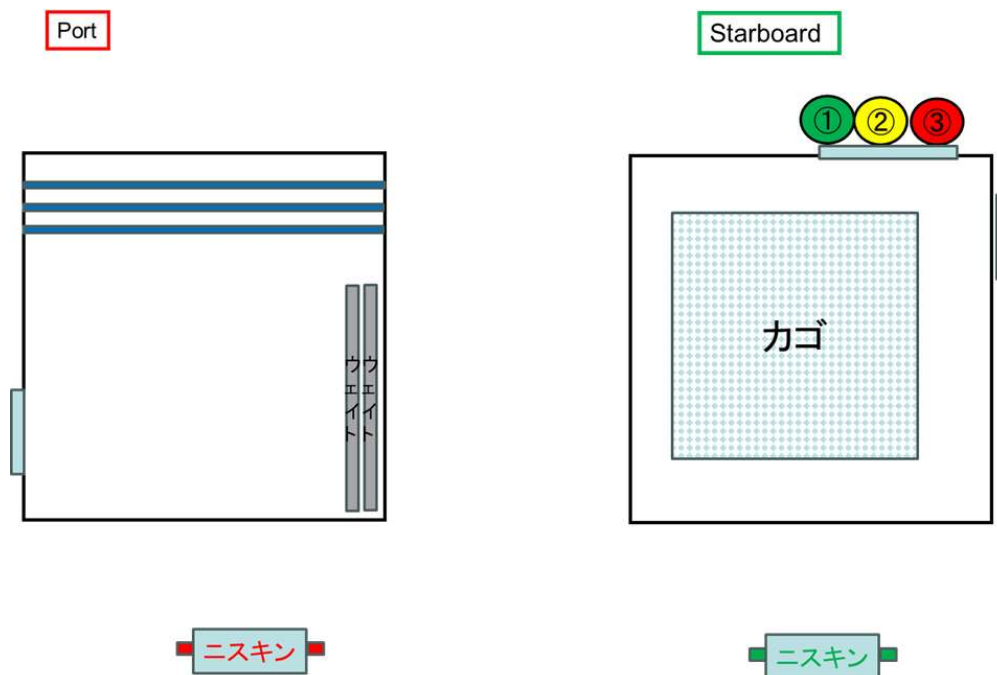
Observer: Keisuke Takahashi

Pilot: Onishi, Kondo

Purpose of dive:

1. Retrieval of concrete specimens
2. Sampling of bottom seawater and sediment cores

Payload:



Dive summary:

Before just landing on seafloor bottom seawater was sampled using Niskin bottles at about 30 m height from the seafloor. After water sampling, we reached the seafloor, and the first mud core sample was collected. Finishing the sampling operation, we approached the platform. Before conducting operations of the concrete specimens, visual observation was carried out to confirm the condition of

all specimens (Fig. 3). To recover all specimens in single dive, initial sets of specimens were first retrieved and temporarily placed on the seafloor. Subsequently, the second sediment core sampling was conducted beside the platform. For visual observations of the surrounding area, the vehicle cruised approximately 400 meters on a 90-degree course, then adjusted to a 300-degree course and cruised at the point 300 meters north of the platform area. Finally, we returned to the platform and corrected the final core sampling at the point 50 meters north of the platform area (Fig. 4).

After returning to the platform, we began recovery operation of all specimen sets. We paid close attention to specimen's conditions, and some sets of specimens were temporarily placed on the seafloor during the recovery process. Ultimately, all specimen sets were successfully retrieved into baskets, and the vehicle started to ascent to the sea surface at 15:05.



Fig.3 Photo of the condition of all specimens on the platform before the recovery operation.

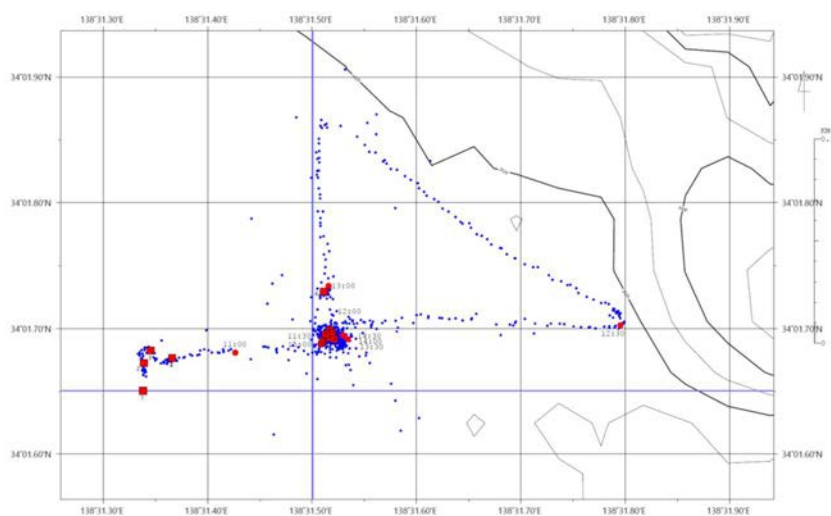


Fig. 3 Track and points of operation:

## 5. Acknowledgements

I am deeply thanking for the captain and all ship crews of S/V Yokosuka. We are grateful to the SHINKAI 6500 operation team and marine technicians of NME for their operation. We are pleased to MarE3 staff for their special supports.

## 6. Notice on Using

This cruise report is a preliminary documentation as of the end of the cruise.

This report may not be corrected even if changes on contents (i.e. taxonomic classifications) maybe found after its publication. This report may also be changed without notice If you are going to use or refer to the data written on this report, please ask the Chief Scientist for latest information. This cruise was carried out under the joint research programs. Therefore, these data use is limited under the members of these joint research programs without some shipboard data.

Users of other shipboard data or results on this cruise report are requested to submit Publication Report to JAMSTEC.

<https://www.godac.jamstec.go.jp/darwin/en/note.html#report>

E-mail: [submit-rv-cruise@jamstec.go.jp](mailto:submit-rv-cruise@jamstec.go.jp)

## Appendix 1

### SHINKAI 6500

SHINKAI 6500 is Human Operated Vehicle (HOV). The HOV navigation consists of two sub-system, SSBL(Super Short Base Line) and LBL(Long Base Line).

INS and DVL data logged in slc format include status of HOV, there are acoustic sonar equipments, temperature gauge and CTD sensor.

#### The general specifications of SHINKAI 6500

Length	9.7 m
Width	2.7 m
Height	4.1 m
Weight	27 t
Maximum operation depth	6,500 m
Speed(Cruising)	- 2.7kt
Speed(Seafloor Observation)	- 1.0knot
Positioning	SSBL/LBL

#### **Forward Looking sonar**

Frequency	105~120kHz
Detection range	6,20,60,200,600,1000m
Angle of traverse	360°

#### **CTD/DO**

##### The general specifications of SeaBird Electronics SBE19/SBE43

Measurement range	-5 to + 35 °C
	0 to 70 mS/cs
Initial accuracy	0 to 15,000 psia
	0.01 °C
	0.01 mS/cm
	0.015% full scale
	0.01 ml/l

#### **INS (Inertial Navigation System)**

Measurement range	$\pm 180^\circ (\Phi)$ 、 $\pm 90^\circ (\theta)$
Initial accuracy	$0.1^\circ \times 1/\text{COS}(\text{Lat})$

#### **Current Direction / Speed Meter**

Measurement range (Speed)	0 – 6 kt
(Direction)	0 – 360°
Initial accuracy (Speed)	2cm/sec (0-40 cm/sec)、5% FS(40-300 cm/sec)
(Direction)	5° (22.5-300m/sec)

#### **Depth meter**

Type	Crystal oscillator
Measurement range	0 – 133.8MPa
Initial accuracy	0.01 FS

#### **Altimeter**

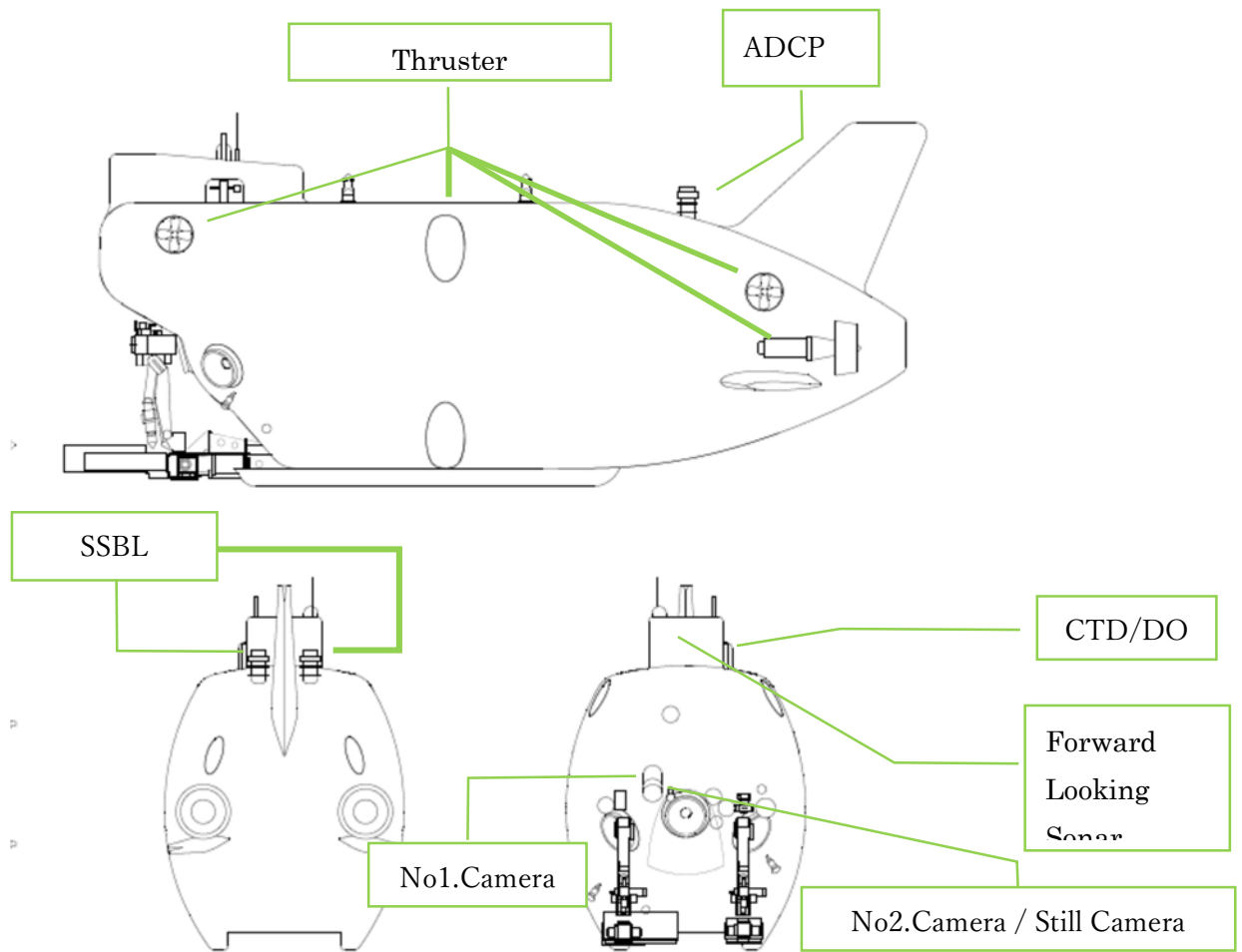
Frequency	14.829 kHz
Measurement range	2 – 1000m

#### **ADCP**

Frequency	300 kHz
Measurement range	– 128m

#### **Temperture gauge**

Measurement range	0 – 400 °C
Initial accuracy	0.15 °C (0 – 100°C)
	0.03 °C (100 – 400°C)



## Appendix 2

### Research Vessel YOKOSUKA

R/V YOKOSUKA was originally designed to serve as the mother vessel for SHINKAI 6500. Since the construction of an autonomous underwater vehicle (AUV), URASHIMA, YOKOSUKA has been shared by SHINKAI and URASHIMA. It has silent engine, an advanced acoustic navigation system and an underwater telephone for its state of the art operations. There are 5 laboratories on Yokosuka, No.1-No.4 laboratories and No.1 Study room. No.1 Lab. has dry space. The permanent installations are PC and a printer. No.2 Lab. has semi-dry and wet space. There are two freezers (-40 & -80 deg.C), an incubator, a Milli-Q, and a fumigation chamber at dry one, and wet one. No.3 Lab. has dry space with storage. No.4 Lab. has semi-dry and wet space. There are a rock saw and a Milli-Q. No.1 Study room has dry space, there are a gravity meter, a data acquisition system of gravity meter, a three-axis fluxgate magnet-meter and also a proton magnet-meter, a work station for data processing, and a A0 size plotter.

#### The general specifications of R/V YOKOSUKA

Length overall	105.2 m
Beam overall	16.0 m
Depth	7.3 m
Draft	4.5 m
Gross tonnage	4,439 tons
Service speed	16knot
Main propulsion system Diesel engines	2,206kW x 2
Main propulsion method	Controllable pitch propeller x 2

#### Complement

Crew	28 persons
Submersible operation staff	8 persons
Researchers	15 persons
	Total 51 persons

## R/V YOKOSUKA MBES / SBP / magnetometers / gravity meter

YOKOSUKA is equipped with various kinds of underway geophysical equipment, a multi narrow beam echo sounder (EM122, Kongsberg Maritime, Inc.), a gravity meter (Type S-63, LaCoste & Romberg Gravity Meters Inc.), a ship borne three-axis magnet-meter (Type SFG-1212, Tierra Technica Inc.), and a proton magnet meter (Type STC 10, Kawasaki Geological Engineering Co., Ltd.). The specifications of these instruments are listed below.

### The specifications of Multi-Beam Echo Sounder (EM122, Kongsberg Maritime, Inc.)

Measurement depth (m)	20 ~ 11,000
Measurement frequency (kHz)	12
Measurement method	cross fan beam style
Beam numbers	288
Mesurement point	432
Pulse lengths	2/5/15msec CW (~2000m) 100msec FM(2000m~)
Beam width (deg.)	2
Beam interval (deg.)	2
Swath width (deg.)	150 (Max)
Sampling rate (msec.)	0.33
Roll (deg.)	± 15
Pitch (deg.)	± 10
Yaw (deg.)	± 10

### The specifications of Sub-Bottom Profiler (3300-HM, EdgeTec Inc.)

Transducers	4 × 4 plane array
Center frequency (kHz)	2 ~ 16
Type of pulse	FM
Band width (kHz)	2 ~ 16
Length of pulse (ms)	5 ~ 100
Resolution	8cm, for 2 ~ 12 kHz
Penetration (m)	6 for sand 80 for soft clay
Width of beam (using 4 × 4 array)	33° for 3.5 kHz 24° for 4.5 kHz 20° for 6 kHz

### The specifications of Gravity meter

Measurement range (m Gal)	12,000
Drift	3mGal per month or less
<u>Stabilized platform</u>	
Platform pitch(deg.)	± 22
Platform roll(deg.)	± 25
Platform period(min.)	4 to 4.5
Beam interval(deg.)	1
<u>Control system</u>	
Recording rate(Hz)	1
Serial out put	RS-232
<u>System performance</u>	
Resolution (mGal)	0.01
Static repeatability (mGal)	0.05
50,000m Gal horizontal acceleration (mGal)	0.25
100,000m Gal horizontal acceleration (mGal)	0.50
100,000m Gal vertical acceleration (mGal)	0.25
Dimension (cm)	71 × 56 × 84
Weight (kg)	Meter:86, UPS:30

### The specifications of three-axis magnet meter

System	ring core fluxgate
Number of component directly	3 axes
Cable length (m)	50
Sensor dimension (mm)	φ 280 × 130H
Measurement range (nT)	± 100,000
Resolution (nT)	1

### The specifications of Proton magnet meter

Measurement range (nT)	3 ~ 7 x 10**4
Resolution (nT)	0.01
Sampling rate	10sec, 20sec, 1min, manual, external
Time of applying field(sec.)	3 to 10
Sensor dimension (mm)	φ 200 × 1050
Weight (kg)	28.6(in the air), 6.2(in the sea)