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"KAIMEI" Cruise Report

KM16-03

Training Cruise about GPC/DT

Sagami-Bay, Omuro-Dashi

Jun.3,2016-Jun.9,2016

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

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1. Cruise Information

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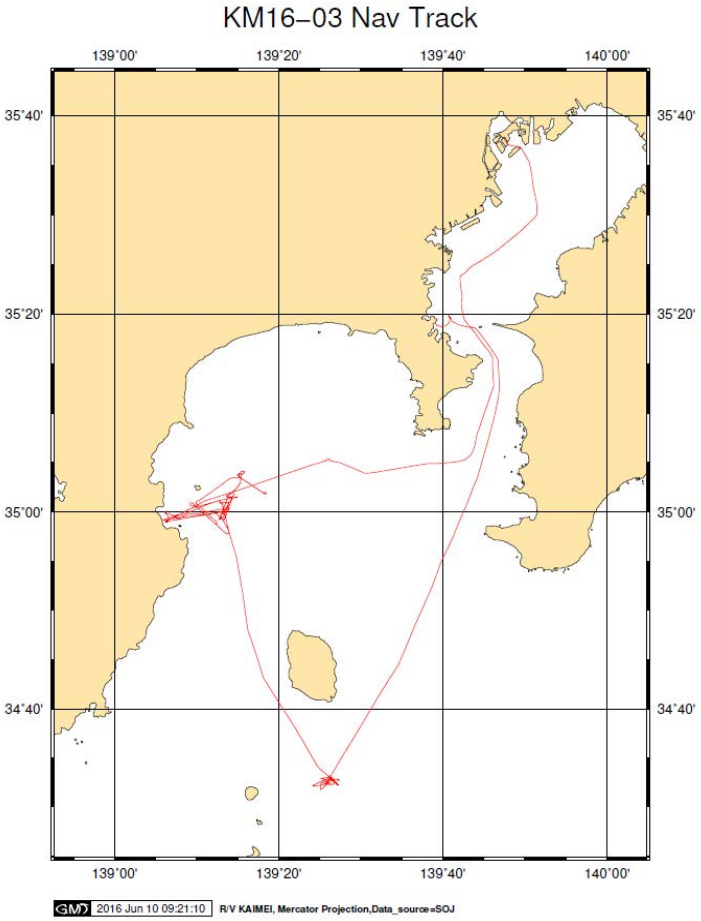
- Name of vessel R/V “KAIMEI”
- Title of the cruise Training Cruise about GPC/DT
- Title of proposal Training Cruise about GPC/DT
- Cruise period Jun.3,2016-Jun.9,2016
- Ports of departure / arrival Tokyo port / JAMSTEC Yokosuka port
- Research area Sagami-Bay, Omuro-Dashi
- Research Map



2. Researchers

● Chief scientist [Affiliation]

Mitsuru TORIGOE	[JAMSTEC]

● Science party (List) [Affiliation]

Tsuneyoshi YAMANISHI	[JAMSTEC]
Akira SO	[JAMSTEC]
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Hideaki MACHIYAMA	[JAMSTEC]
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Hiroaki MURAKI	[MWJ]
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Mitsuteru KUNO	[NME]
Ryo OYAMA	[NME]
Yasushi HASHIMOTO	[NME]
Hiroyuki HAYASHI	[NME]

3. Observation

● Observation

We carried out the following trainings.

(1) GPC : 1) Dismantling and assembling, 2) Launching and recovering, 3) Acoustic positioning.

(2) DT : 1) Launching and recovering, 2) Test tow (sonar system, camera system)

● Cruise log

2016/6/3 Sagami-Bay [Noon] bc, SSE, 5, 2, 1, 8

10:00	departure from Tokyo port
11:00	carried out education and training for scientist
14:30	arrived at research area
14:57-15:38	carried out training about GPC
16:00	departure from research area
17:30	scientists meeting
17:40	arrived at Ito port
18:00	KONPIRA-SAN

2016/6/4 Sagami-Bay [Noon] o, South, 5, 4, 2, 8

07:06	departure from Ito port
08:00	arrived at research area
08:46-11:37	carried out training about GPC
14:15	departure from research area
	arrived at Ito port
18:00	scientists meeting

2016/6/5 Sagami-Bay [Noon] o, North, 2, 1, 1, 7

07:00	departure from Ito port
08:00	arrived at research area
08:25-12:04	carried out training about GPC
13:19	released XBT
13:44-17:54	MBES test
	drift at Sagami Bay
18:00	scientists meeting

2016/6/6 Sagami-Bay [Noon] bc, NE, 3, 2, 1, 8

08:00	arrived at research area
08:55-14:29	carried out training about DT (6KS)
15:13-16:50	carried out training about DT (6KS)
17:00	departure from research area
17:40	arrived at Ito port

18:00 scientists meeting

2016/6/7 Sagami-Bay, Omuro-Dashi [Noon] o, ENE, 1, 1, 1, 6

07:00 departure from Ito port

08:00 arrived at research area

08:38-13:23 carried out training about DT (6KS)

16:00 departure from research area

18:00 scientists meeting

18:45 arrived at research area, Omuro-Dashi

released XBT

2016/6/8 Omuro-Dashi, YOKOSUKA [Noon] bc, NE, 3, 2, 1, 7

07:19-12:58 carried out training about DT (6KC)

13:30 departure from research area

17:50 arrived at YOKOSUKA No.4

18:00 scientists meeting

2016/6/9 YOKOSUKA [Noon] r, NNW, 3, 1, 0, 6

09:20 disembarked “KAIMEI”

3.1 GPC (Giant piston corer)

- Barrel length : Max 40m (5m x 8ea)
- Corer head weight : Max 6294kg
- Maximum water depth : 11,000m
- Core liner material : PVC (translucent, UV stabilized)
- Release type : 1) trigger arm with hydrostatic release, 2) acoustic release
- Sensors : Capable to azimuth clinometer

3.2 DT (Deep Tow)

3.2.1 6KSDT

- Frame size : 3.3x1.0x1.2m (LxWxH)
- Weight : 550kg (in air), 370kg (in water)
- Maximum operating depth : 6,000m
- Operating speed : ~3.0kt
- Side scan sonar (PORT:38kHz, STBD:42kHz)

  Range：250m, 500m, 1,000m, 1,500m, 2,000m
- HDTV camera x2 (Forward looking x1, Seafloor observation x1)
- LED light x3 (400W)

- Inertial navigation system : PhinsDVL (DVL : 300kHz)
- CTD (SBE49)

3.2.2 6KCDT

- Frame size : 3.8x1.1x1.6m (LxWxH)
- Weight : 1,00kg (in air), 850kg (in water)
- Maximum operating depth : ~6,000m
- Operating speed : ~1.0kt
- Color CCD camera x2
- Monochrome CCD camera x1
- Digital still camera x2
- Strobe light x2
- Halogen light x8
- CTD (SBE9plus)

3.3 Meteorological measurements

3 .3.1 Surface meteorological observations

(1) Personnel

Mitsuru TORIGOE (JAMSTEC)

(2) Objective

Surface meteorological parameters are observed as a basic dataset of the meteorology. These parameters bring us the information about the temporal variation of the meteorological condition surrounding the ship.

(3) Instruments and Methods

(i) Surface meteorological observation system

Surface meteorological parameters were observed throughout this cruise. Meteorological Instruments are listed in Table.6.1.1.

Table.6.1.1 Instruments and installations of KAIMEI Surface Meteorological observation system

Sensors	Type	Manufacture	Location (altitude from surface)
Anemometer	WMT700	Vaisala, Finland	foremast (22.9m), compass deck(27.7 m)
Tair/RH	HMP155	Vaisala, Finland	foremast (21.9m), compass deck(18.3 m)
With radiation shied	DTR13	Vaisala, Finland	
Barometer	PTB330	Vaisala, Finland	navigation bridge deck(14.9 m) at No.1 Lab.

Rain gauge	50202	R. M. Young, USA	compass deck (18.2 m)
Radiometer (short wave)	CMP-22	Kipp & Zonen, The Netherlands	fore mast (21.8 m)
Radiometer (long wave)	CGR-4	Kipp & Zonen, The Netherlands	fore mast (21.8 m)

(ii) PAR

Photosynthetically Available Radiation (PAR) and Ultra violet radiation (UV) were observed throughout this cruise. Instrument specification is as below;

Manufacturer:	Biospherical Instruments Inc.
Type:	PUV-2510
Measured frequency:	305, 313, 320, 380, 395, 400 - 700 [nm]
Sample rate:	1 sec
Sensor Location (altitude):	foremast (21.8 m)

(iii) ROSR

The Remote Ocean Surface Radiometer (ROSR) measured sea skin temperature. Instrument specification is as below;

Manufacturer:	RMR Co.
Sample rate:	10 min average skin temperature
Accuracy:	< 0.1 degree
Sensor Location (altitude):	foremast (21.3 m)

3.3.2 Ceilometer

(1) Personnel

Mitsuru TORIGOE (JAMSTEC)

(2) Objectives

Ceilometer is the system that measures cloud base height and backscatter profile. During this cruise, the ceilometer observation was carried out.

(3) Parameters

1. Cloud base height [m].
2. Backscatter profile, sensitivity and range normalized at 10 m resolution.
3. Estimated cloud amount [oktas] and height [m]; Sky Condition Algorithm.

(4) Instruments and Method

We measured cloud base height and backscatter profile using ceilometer (CL51, VAISALA, Finland) throughout this cruise. Major parameters for the measurement configuration are as below;

Laser source:	Indium Gallium Arsenide (InGaAs) Diode Laser
Transmitting center wavelength:	910±10 nm at 25 degC
Transmitting average power:	19.5 mW
Repetition rate:	6.5 kHz
Detector:	Silicon avalanche photodiode (APD)
Measurement range:	Back scatter; 0 ~ 15 km
	Cloud detection; 0 ~ 13 km
	Resolution: 10 meter in full range
Sampling rate:	36 sec
Sky Condition:	0, 1, 3, 5, 7, 8 oktas (9: Vertical Visibility)
	(0: Sky Clear, 1:Few, 3:Scattered, 5-7: Broken, 8: Overcast)

On the archive dataset, cloud base height and backscatter profile are recorded with the resolution of 10 m (33ft).

(6) Data archives

The raw data obtained during this cruise will be submitted to the Data Management Group of JAMSTEC and will be opened to public via web site of "Data Research for Whole Cruise Information in JAMSTEC".

3.3.3. GPS Meteorology

(1) Personnel

Mitsuru TORIGOE (JAMSTEC)

(2) Objective

Getting the GNSS satellite data to estimate the total column integrated water vapor content of the atmosphere.

(3) Instruments and Method

The GNSS satellite data was archived to the receiver with 1 sec interval. Analyzing the GNSS signal passing through the atmosphere, it estimates the radio wave propagation delay resulting from water vapor, to calculate the atmospheric delay.

Instrument specification is as below;

GNSS receiver:	NetR9 Ti-1 / Trimble
GNSS Antenna:	GNSS-Ti Choke Ring Antenna with radome / Trimble

Antenna location (altitude): compass deck (18.2m)

(4) Data archive

The raw data obtained during this cruise will be submitted to the Data Management Group of JAMSTEC and will be opened to public via web site of "Data Research for Whole Cruise Information in JAMSTEC".

3.3.4 TSG (Thermosalinograph)

(1) Personnel

Mitsuru TORIGOE (JAMSTEC)

(2) Objective

To obtain continuous measurement of the sea surface temperature, salinity and dissolved oxygen along the ship's track.

(3) Instruments and Method

Sea surface measurements were made in this cruise by using TSG system. This system is connected to No.1 seawater pump at bow-thruster room, now therefore TSG usually measure fresh seawater pumped up.

Instrument specification is as below.

1) Temperature and Conductivity sensor

Model:	SBE-45, SEA-BIRD ELECTRONICS, INC.
Measurement range:	Temperature -5 to +35 ^{o}C
	Conductivity 0 to 7 S m^{-1}
Initial accuracy:	Temperature 0.002 ^{o}C
	Conductivity 0.0003 S m^{-1}
Typical stability (per month):	Temperature 0.002 ^{o}C
	Conductivity 0.0003 S m^{-1}
Resolution:	Temperatures 0.0001 ^{o}C
	Conductivity 0.00001 S m^{-1}

2) Bottom of ship thermometer

Model:	SBE 38, SEA-BIRD ELECTRONICS, INC.
Measurement range:	-5 to +35 ^{o}C
Initial accuracy:	±0.001 ^{o}C
Typical stability (per 6 month):	0.001 ^{o}C

Resolution: 0.00025 ^{o}C

3) Dissolved oxygen sensor

Model: ARO-CAR, JFE Advantech Co., Ltd.

Measuring range: 0 – 20mg/L

Resolution: 0.001 – 0.004 mg/L

(4) Data archive

These data obtained in this cruise was submitted to the Data Management Group of JAMSTEC, and will be opened to the public via web site of "Data Research for Whole Cruise Information in JAMSTEC".

3.3.5 Shipboard ADCP

(1) Personnel

Mitsuru TORIGOE (JAMSTEC)

(2) Objective

To obtain continuous measurement of the current profile along the ship's track.

(3) Instruments and Method

Upper ocean current measurements were made in this cruise, using the hull-mounted Acoustic Doppler Current Profiler(ADCP) system. For most of its operation the instrument was configured for water-tracking mode. Bottom-tracking mode, interleaved bottom-ping with water-ping, was made to get the calibration data for evaluating transducer misalignment angle in the shallow water.

Instrument specification is as below.

Manufacturer:	Teledyne RD Instruments
System:	OS38 / OS150
Frequency:	38.4 kHz / 153.6 kHz
Configuration:	4-beam phased array
Beam angle:	30deg
Transducer Depth:	5.5m beneath calm water line
ADCP data logger:	VmDas 1.46.5, addedyne RD Instruments
Gyro & Motion:	PHINS, IXSEA BLUE
Navigation:	StarPack-D, Fugro

(4) Data archive

These data obtained in this cruise was submitted to the Data Management Group of JAMSTEC, and will be opened to the public via web site of "Data Research for Whole Cruise Information in

JAMSTEC".

3.3.6 Sea surface magnetic field

Three-component magnetometer

(1) Personnel

Mitsuru TORIGOE (JAMSTEC)

(2) Objective

Measurement of magnetic force on the ocean is required for the geophysical investigations of marine magnetic anomaly caused by magnetization in upper crustal structure. Thus, we measured geomagnetic field using a three-component magnetometer in this cruise.

(3) Instruments and method

A shipboard three-component magnetometer system is equipped on-board R/V KAIMEI. Three-axes flux-gate sensors with ring-cored coils are fixed on the compass deck. Instrument specification is as below.

Manufacturer:	Terra Technica
System:	SFG1216
Sampling rate:	8 Hz
Sensor location (altitude):	compass deck (19.2 m from sea surface)
Gyro & Motion:	PHINS, IXSEA BLUE
Navigation:	StarPack-D, Fugro

Principle of shipboard geomagnetic vector measurement. The relation between a magnetic-field vector observed on-board, **H**ob, (in the ship's fixed coordinate system) and the geomagnetic field vector, **F**, (in the Earth's fixed coordinate system) is expressed as:

Hob = **F** + **H**p (a)

Where, and are the matrices of rotation due to roll, pitch and heading of a ship, respectively. is a 3 x 3 matrix that represents magnetic susceptibility of the ship, and **H**p is a magnetic field vector produced by a permanent magnetic moment of the ship's body. Rearrangement of Eq. (a) makes

Hob + **H**bp = **F** (b)

Where = $^{-1}$, and **H**bp = - **H**p. The magnetic field, **F**, can be obtained by measuring, and **H**ob, if and **H**bp are known. Twelve constants in and **H**bp can be determined by measuring variation of **H**ob with , and at a place where the geomagnetic field, **F**, is known.

(4) Data Archives

These data obtained in this cruise was submitted to the Data Management Group of JAMSTEC, and will be opened to the public via web site of "Data Research for Whole Cruise Information in JAMSTEC".

(5) Remarks

1) For calibration of the ship's magnetic effect, we made a "figure-eight" turn (a pair of clockwise and anti-clockwise rotation) two times as follows;
   8th May. 2016, 19:06 - 19:31
   10th May 2016, 04:55 - 05:18

3.3.7 Swath Bathymetry

(1) Personnel

Mitsuru TORIGOE (JAMSTEC)

(2) Introduction

MultiBeam Echo Sounding system (MBES) is collecting continuous bathymetric data along ship's track to make a contribution to geological and geophysical investigations and global datasets.

(3) Specification and method

The "EM122" & "EM711" on R/V KAIMEI are multibeam echo sounder for bathymetry mapping. The system configuration and performance for EM122 (12 kHz system) and EM712 (40 ~ 100 kHz system) is listed below.

Deep multibeam echo sounder (Kongsberg / EM122)

Frequency:	12 kHz (10.5 ~ 13 kHz)
Beam width:	1 degree × 1 degree
Transmit pulse length:	CW; 3 to 15 msec. / FM chirp; 25 to 100msec (auto)
Depth range:	20 to 11,000 m
Number of beams:	288
Number of footprints:	432 (864; Dual swath mode)
Swath width:	150 degree (max)
Depth accuracy:	0.2 % of depth (swath width ± 45degree)
Gyro & Motion:	PHINS, IXSEA BLUE
Navigation:	StarPack-D (G2, XP2 and L1), Fugro

Shallow multibeam echo sounder (Kongsberg / EM712)

Frequency:	40 ~ 100 kHz
Beam width:	50 kHz; 1degree × 1 degree
	100kHz; 0.5 degree × 0.5 degree
Transmit pulse length:	CW; 0.2 to 2 msec., / FM chirp; 25 to 120 msec. (auto)
Depth range:	3 to 3,600 m
Number of beams:	256
Number of footprints:	400 (800; Dual swath mode)
Swath width:	140 degree (max)
Depth accuracy:	0.2 % of depth (swath width ± 45degree)
Gyro & Motion:	PHINS, IXSEA BLUE
Navigation:	StarPack-D, Fugro

To get accurate sound velocity of water column for ray-path correction of acoustic multibeam, we used Surface Sound Velocimeter (Smart SV/AML) data to get the sea surface (5.5 m) sound velocity, and the deeper depth sound velocity profiles were calculated by temperature and salinity profiles from CTD and XBT data during the cruise.

(4) Data Archive

These data obtained in this cruise was submitted to the Data Management Group of JAMSTEC, and will be opened to the public via web site of "Data Research for Whole Cruise Information in JAMSTEC".

3.3.8 Sub bottom profiler

(1) Personnel

Mitsuru TORIGOE (JAMSTEC)

(2) Introduction

Sub bottom profiler (SBP) is collecting continuous sub bottom data along ship's track to make a contribution to geological and geophysical investigations and global datasets.

(3) Specification and method

The "TOPAS PS18" on R/V KAIMEI is Sub bottom profiler for under bottom profiling. The system configuration and performance for TOPAS PS18 is listed below.

Depth range:	20 to 11,000 m
Pulse type:	CW, FM chirp

Frequency:	0.5 ~ 6 kHz (2^{nd}) 15 ~ 21 kHz (1^{st})
Beam width:	< 4.5 degree (2^{nd})
Resolution:	0.5 ~ 4 cm (depend on frequency)
Penetration depth:	more than 200m
Gyro & Motion:	PHINS, IXSEA BLUE
Navigation:	StarPack-D, Fugro

(4) Data Archive

These data obtained in this cruise was submitted to the Data Management Group of JAMSTEC, and will be opened to the public via web site of "Data Research for Whole Cruise Information in JAMSTEC".

● 4. Notice on Using

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

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) 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.
Users of data or results on this cruise report are requested to submit their results to the Data Management Group of JAMSTEC.