

## MIRAI MR18-05C Shipboard Three Component Magnetometer (STCM)

Last Modified: 2019-08-26

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Cruise ID: [MR18-05C](#)

Shipboard Three Component Magnetometer (STCM): Processed (DMO)-Corrected

Data Policy: [JAMSTEC](#)

Observation Items: X, Y and Z component of geomagnetic field anomaly, Absolute value of geomagnetic field anomaly

Science Keywords:

OCEANS > MARINE GEOPHYSICS > MARINE MAGNETICS  
SOLID EARTH > GEOMAGNETISM

Cruise Report

[http://www.godac.jamstec.go.jp/catalog/data/doc\\_catalog/media/MR18-05C\\_all.pdf](http://www.godac.jamstec.go.jp/catalog/data/doc_catalog/media/MR18-05C_all.pdf)

### For Using Data

#### Principal Investigator

Data Management Office

#### Use Constraints

See [Terms and Conditions](#) about constrain of use.

#### Data Citation

See [Terms and Conditions](#) about data citation.

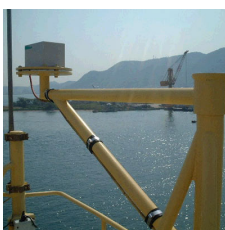
### Period (UTC)

2018-10-24 07:25 – 2018-12-06 23:23

### Instrument

Instrument:

Three component magnetometer



### Overview

The data provided is for corrected three component geomagnetic field anomalies. Three-axes flux-gate sensors with ring-cored coils were fixed on the roof of the bridge.

They measure the following items :

- h-component : along track line component, positive for the bow direction pitch.
- s-component : across track line component, positive for the starboard side roll.
- v-component : vertical component, positive for the downward direction.

The effect of ship motion was eliminated by roll and pitch data which was provided by a tilt sensor. The apparent magnetic influence can be detected through a "Figure of 8 turn"(a pair of clockwise and anti-clockwise turns) on each cruise. If no Figure of 8 turn on the cruise was completed, the latest Figure of 8 turn from the previous cruise was applied. As a quality control, data of low reliability was removed (see Data processing for quality control criteria). Synthetic geomagnetic field values were calculated from IGRF models.

### Measurement System

#### (1) Magnetometer

Manufacturer : Tierra Technica Ltd.  
Type : SFG1214  
Measurement range :  $\pm 100,000$  nT  
Accuracy : less than 100 nT  
Resolution : 1 nT  
Location : Dry Laboratory

#### (2) Magnetic Sensor

Manufacturer : Tierra Technica Ltd.  
Form : flux-gate sensors with ring-cored coils  
Location : Foremast

#### (3) Attitude sensor and Gyro compass

Manufacturer : IXBLUE  
Type : PHINS  
Accuracy(Roll, Pitch) : 0.01 degree  
Accuracy(Gyro) : 0.01 degree \*Secant(Lat.)  
Location : In the doppler radar dome

### Duration of the Figure of 8 turn

In MR18-05C cruise

Date (UTC)

2018/11/11 04:30:00 - 2018/11/11 04:55:00

2018/12/04 09:01:00 - 2018/12/04 09:26:00

### Data processing

The following corrections and calculations were performed.

- (1) Ship magnetization correction

#### Calculation of the geomagnetic field vector

$Hob = ARPYF + Hp$  ---(i)  
Hob : Observed magnetic field vector (Ship coordinates)  
A : Effect of induced magnetization of the ship  
R : Matrix of rotation due to the roll  
P : Matrix of rotation due to the pitch  
Y : Matrix of rotation due to the heading  
F : Geomagnetic field vector  
Hp : Ship's permanent magnetic moment

Following the equation(i), we calculate the geomagnetic field F.

$$RPYF = BHob + Hbp$$
 ---(ii)

B : coefficient of Figure of 8 turn

Hbp : Permanent magnetic field vector of the ship

Reference : Isezaki,N., A new shipboard three-component magnetometer, GEOPHYSICS. VOL.51,NO10(1986);P1992-1998

#### (2) International Geomagnetic Reference Field (IGRF)

Synthetic geomagnetic field values are calculated from IGRF 12th Generation models by using navigation data ; latitude, longitude and date.

Reference : IAGA Division V-MOD Geomagnetic Field Modeling[<http://www.ngdc.noaa.gov/IAGA/vmod/igrf.html>]

#### (3) Calculation of the geomagnetic field anomaly

$$An = F - Figrf$$

An : Geomagnetic field anomaly vector

F : Geomagnetic field vector

Figrf : Synthetic geomagnetic field vector from IGRF

#### (4) Quality control of data

Following criteria were used for removal of data of low reliability:

- Time error (inversion of time, continuation of same timestamps)
- Summation of the difference of heading by one second exceeding 20 degree per 5 minutes
- Ground speed of the ship below 3knot or exceeding 20knot
- X, Y, or Z component of geomagnetic field anomaly exceeding  $\pm 4000$ nT

#### (5) Filtering of the geomagnetic field anomaly

Due to the residual undulation of the ship, a 120 second length Gaussian filter was applied for each component of the geomagnetic field anomaly data.

#### (6) Output of the data

Time (UTC)

Latitude (degree)

Longitude (degree)

X : Northward (positive on the north) component of geomagnetic field anomaly (nT)

Y : Eastward (positive on the east) component of geomagnetic field anomaly (nT)

Z : Vertical (positive for downward) component of geomagnetic field anomaly (nT)

T : Absolute value of geomagnetic field anomaly (nT)

#### Coefficient of the Figure of 8 turn and Permanent magnetic field vector of the ship

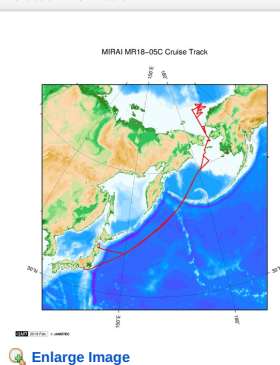
This coefficient was calculated from the above-mentioned Figure of 8 turn

	0.9954	0.0302	0.0407		3338.3300
B=	-0.0314	1.0521	-0.0102	Hbp=	-638.1280
	0.0389	0.0016	0.9923		46.7736

#### Note

- (1) File naming rule : Cruise ID\_corr.stcm
- (2) Sampling rate : 10 seconds
- (3) Geodetic system : WGS84
- (4) If you would like the raw data set, please contact us from "Contact Us" above.

#### Related Information



#### MR18-05C

Ship Name: MIRAI

Period: 2018-10-24 - 2018-12-06

Chief Scientist: Jun Inoue (National Institute of Polar Research)

Project Name: [Arctic Ocean Climate System Research]

Proposal ▶ Predictability study on weather and sea-ice forecasts linked with user engagement

Title:

#### Update History

2019-08-26	An observation data was registered.
2019-06-11	An observation data was registered.

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YOKOSUKA  
MIRAI  
KAIREI  
CHIKYU  
KAIMEI

#### Information of the Submersibles

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SHINKAI 2000  
SHINKAI 6500  
DEEP TOW  
HYPER-DOLPHIN  
URASHIMA

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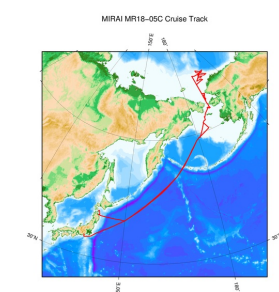
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### STCM Corrected

No.	Column	Content	Format	Unit	Remarks
1	1 - 8	Date	i4,i2,i2		YYYYMMDD (UTC)
2	10 -15	Time	i2,i2,i2		hhmmss (UTC)
3	17 -25	Latitude	f9.5	degree	No sign for the northern hemisphere. Negative for the southern hemisphere.
4	27 -36	Longitude	f10.5	degree	No sign for eastern hemisphere. Negative for the western hemisphere.
5	38 -43	X component of geomagnetic field anomaly	f6.0	nT	Positive on the north
6	45 -50	Y component of geomagnetic field anomaly	f6.0	nT	Positive on the east
7	52 -57	Z component of geomagnetic field anomaly	f6.0	nT	Positive for downward
8	59 -64	Absolute value of geomagnetic field anomaly	f6.0	nT	

### Related Information



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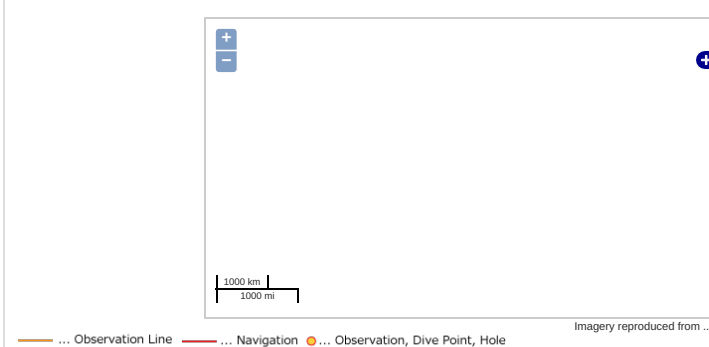
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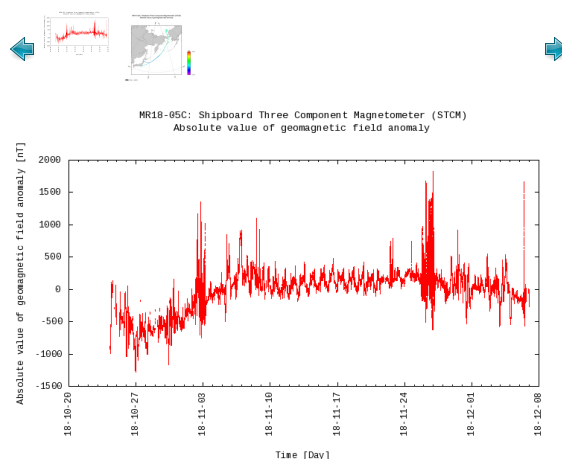
OCEANS > MARINE GEOPHYSICS > MARINE  
MAGNETICS

SOLID EARTH > GEOMAGNETISM

### Observation Map



### Figures



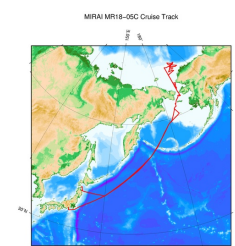
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File names

☐ MR18-05C\_corr.stcm

### Related Information



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