

## MIRAI MR10-05 Leg1 Shipboard Three Component Magnetometer (STCM)

Last Modified: 2019-06-22

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Cruise ID: [MR10-05 Leg1](#)

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/MR10-05\\_leg1-2\\_all.pdf](http://www.godac.jamstec.go.jp/catalog/data/doc_catalog/media/MR10-05_leg1-2_all.pdf)

### For Using Data

#### Principal Investigator

Data Management Office

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#### Data Citation

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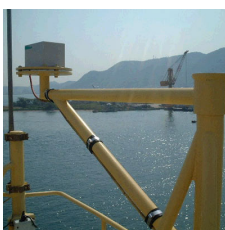
### Period (UTC)

2010-08-24 07:14 – 2010-09-01 17:22

### 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 (see section 4.). As a quality control, data of low reliability was removed (see section 5. 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 MR10-04\_leg1 cruise

Date (UTC)

2010/08/07 21:32:00 - 2010/08/07 21:52:00

2010/08/08 15:11:00 - 2010/08/08 15:35:00

2010/08/09 04:35:00 - 2010/08/09 04:58:00

### Data processing

The following corrections and calculations were performed.

- (1) Ship magnetization correction  
 $Hob = ARPYF + Hp \text{ ---(i)}$   
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.  
 $RPYF = BHob + Hbp \text{ ---(ii)}$   
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 11th 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  $\pm 4000nT$

- (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

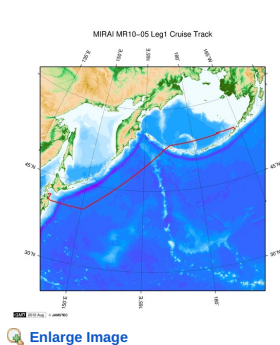
This coefficient was calculated from the Figure of 8 turn (see above)

|    |         |        |         |      |           |
|----|---------|--------|---------|------|-----------|
|    | 0.9936  | 0.0583 | 0.0186  |      | 2435.0795 |
| B= | -0.0618 | 1.0585 | -0.0072 | Hbp= | -54.0846  |
|    | 0.0352  | 0.0066 | 0.8477  |      | 4334.3914 |

#### 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



**MR10-05 Leg1**  
Ship Name: MIRAI  
Period: 2010-08-24 - 2010-09-01  
Chief Scientist: Motoyo Ito (JAMSTEC)  
Project Name: [Arctic Ocean Climate System Reaserch]  
Proposal ▶ Arctic Climate Oceanography  
Title:

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#### Update History

|            |                                    |
|------------|------------------------------------|
| 2019-06-22 | An observation data was registerd. |
| 2018-04-18 | An observation data was registerd. |
| 2014-08-07 | An observation data was registerd. |
| 2012-10-25 | An observation data was registerd. |

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SHINSEI MARU  
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SHINKAI 6500  
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HYPER-DOLPHIN  
URASHIMA  
YOKOSUKA DEEP TOW  
6K Camera DEEP TOW  
6K Sonar DEEP TOW  
KM-ROV  
POWER GRAB SAMPLER  
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POWER GRAB SAMPLER  
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BMS

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海洋研究開発機構  
JAPAN AGENCY FOR MARINE-EARTH SCIENCE AND TECHNOLOGY

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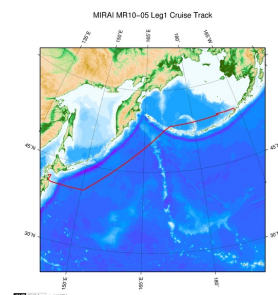
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### STCM Corrected

| 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.<br>Negative for the southern hemisphere. |
| 4   | 27 -36 | Longitude                                   | f10.5    | degree | No sign for eastern hemisphere.<br>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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#### MR10-05 Leg1

Ship Name: MIRAI

Period: 2010-08-24 - 2010-09-01

Chief Scientist: Motoyo Ito (JAMSTEC)

Project Name: [Arctic Ocean Climate System Research]

Proposal ▶ Arctic Climate Oceanography

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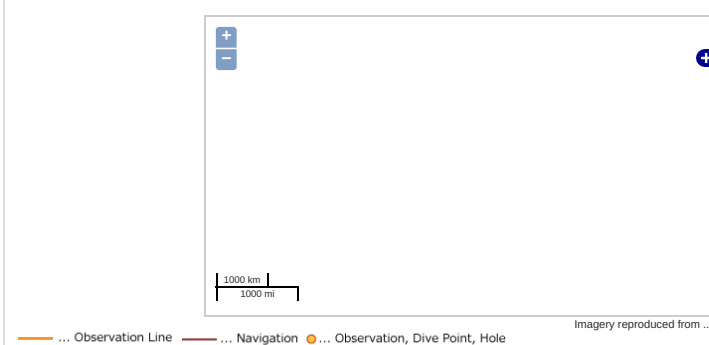
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Science Keywords:

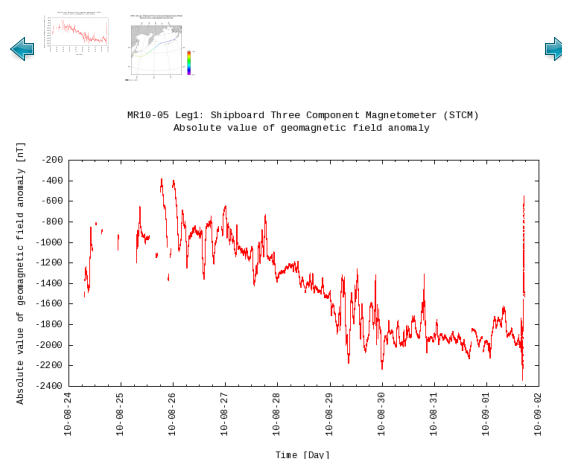
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MAGNETICS

SOLID EARTH > GEOMAGNETISM

### Observation Map



### Figures



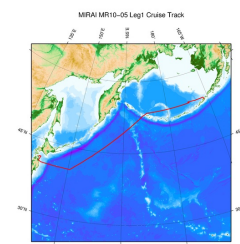
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Chief Scientist: Motoyo Ito (JAMSTEC)

Project Name: [Arctic Ocean Climate System Research]

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