

## MIRAI MR16-09 Leg3 Shipboard Three Component Magnetometer (STCM)

Last Modified: 2019-06-21

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Cruise ID: [MR16-09 Leg3](#)

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/MR16-09\\_leg1-4\\_all.pdf](http://www.godac.jamstec.go.jp/catalog/data/doc_catalog/media/MR16-09_leg1-4_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.

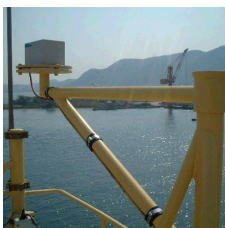
### Period (UTC)

2017-02-10 21:06 – 2017-03-03 06:59

### 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.

### Data overview

Data quality is not correct because machine trouble.

2017/02/18 10:47 - 2017/02/18 13:39

2017/02/25 20:49 - 2017/02/26 00:32

### 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 MR16-09\_leg3 cruise

Date (UTC)

2017/02/10 21:07:00 - 2017/02/10 21:41:00  
2017/03/03 00:57:00 - 2017/03/03 01:17:00

#### Data processing

The following corrections and calculations were performed.

(1) Ship magnetization correction

$$Hob = ARPYF + H_p \text{ ---(i)}$$

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

H<sub>p</sub>: Ship's permanent magnetic moment

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

$$RPYF = BHob + H_{bp} \text{ ---(ii)}$$

B: coefficient of Figure of 8 turn

H<sub>bp</sub>: 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[\[http://www.ngdc.noaa.gov/IAGA/vmod/igrf.html\]](http://www.ngdc.noaa.gov/IAGA/vmod/igrf.html)

(3) Calculation of the geomagnetic field anomaly

$$A_n = F - Figrf$$

A<sub>n</sub>: 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 ±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

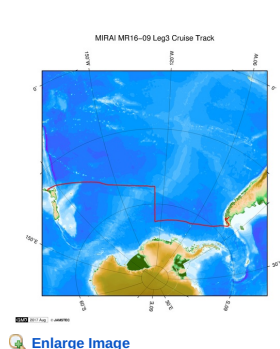
This coefficient was calculated from the above-mentioned Figure of 8 turn

	0.9946	0.0318	0.0306		2142.4675
B=	-0.0360	1.0602	-0.0124	H <sub>bp</sub> =	-175.2328
	0.0383	0.0044	0.9456		798.2194

#### 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



#### MR16-09 Leg3

Ship Name: MIRAI

Period: 2017-02-08 - 2017-03-04

Chief Scientist: Hiroshi Uchida (JAMSTEC)

Project Name: [POST-WOCE Hydrography]

Proposal ▶ Ship-borne measurements of aerosols in the marine atmosphere: Investigation of potential influence of marine aerosol particles on the climate;

Update History	
2019-06-21	An observation data was registerd.
2018-04-14	An observation data was registerd.
2017-12-27	An observation data was registerd.

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[6K Sonar DEEP TOW](#)  
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**JAMSTEC**  
 国立研究開発法人  
 海洋研究開発機構  
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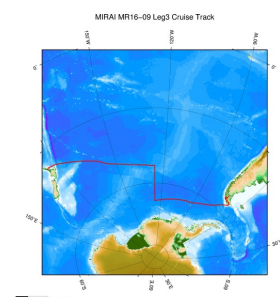
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### STCM Corrected

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



[Enlarge Image](#)

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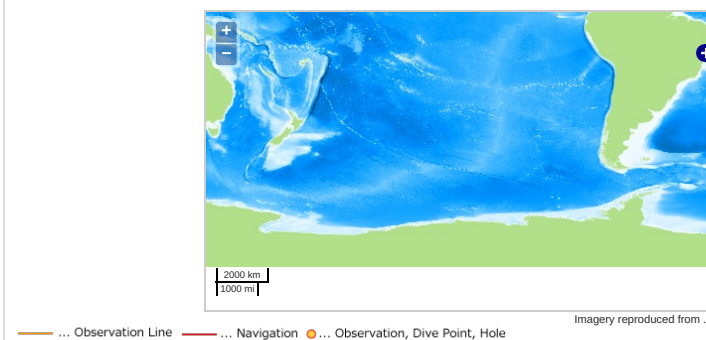
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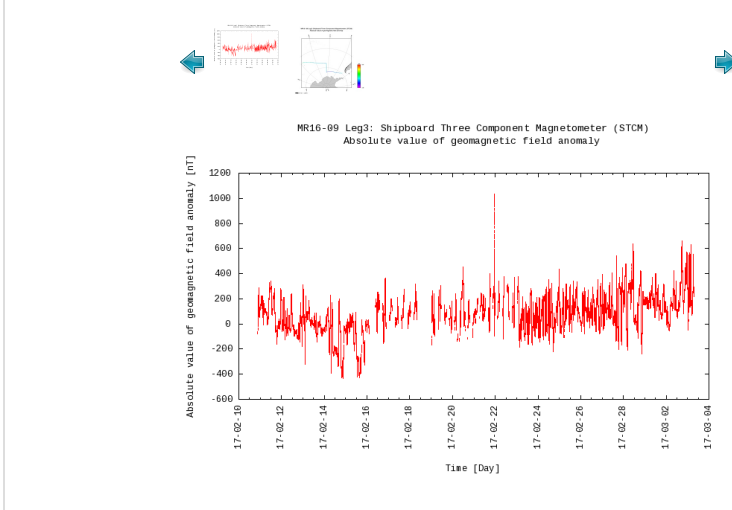
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### Observation Map



### Figures



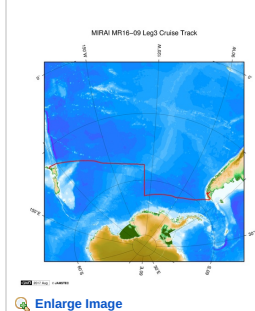
### Data List

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File names

☐ MR16-09\_leg3.corr.stcm

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