

## MIRAI MR03-ENG Shipboard Three Component Magnetometer (STCM)

Last Modified: 2019-06-25

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Cruise ID: [MR03-ENG](#)

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

### 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)

2003-05-04 00:06 – 2003-05-13 07:40

### 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 : Honeywell

Type : DRUH

Accuracy(Roll, Pitch) : less than  $\pm 0.03$  degree

Accuracy(Gyro) : less than  $\pm 0.06$  degree

Location : In the doppler radar dome

### Duration of the Figure of 8 turn

In MR03-ENG cruise

Date (UTC)

2003/05/05 08:59:00 - 2003/05/05 09:36:00

### Data processing

The following corrections and calculations were performed.

#### (1) Ship magnetization correction

$H_{ob} = ARPYF + H_p \dots(i)$

$H_{ob}$ : Observed magnetic field vector (Ship coordinate)

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.

$$RPFY = BHob + Hbp \text{ ---(ii)}$$

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 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  $\pm 4000nT$

(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**

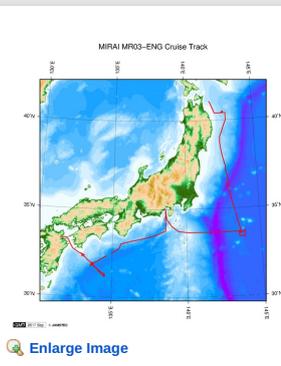
This coefficient was calculated from the above-mentioned Figure of 8 turn

	0.9932	0.0337	0.0052		3082.9512
B=	-0.0357	1.0582	0.0030	Hbp=	-268.6526
	0.0292	0.0072	0.7004		9271.9693

**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**



**MR03-ENG**  
 Ship Name: MIRAI  
 Period: 2003-05-03 - 2003-05-13

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**Update History**

2019-06-25	An observation data was registered.
2018-06-29	An observation data was registered.
2018-06-01	An observation data was registered.
2018-05-29	An observation data was registered.

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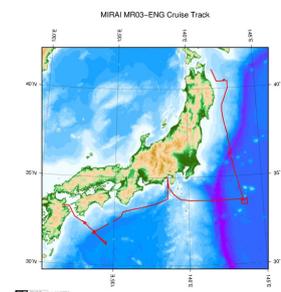
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### STCM Corrected

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



#### MR03-ENG

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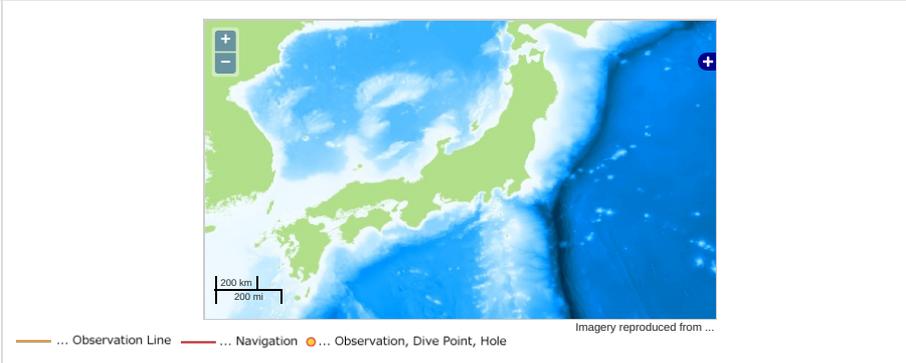
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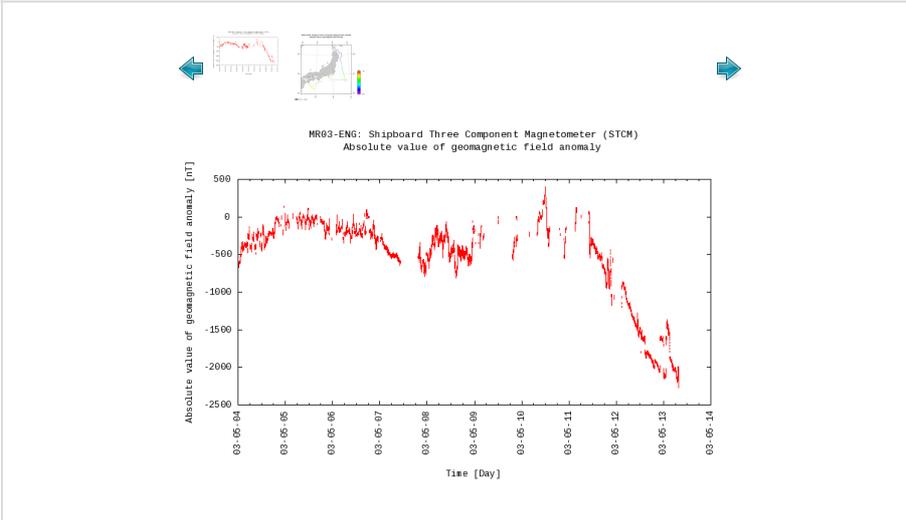
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**Observation Map**



**Figures**



**Data List**

File names

MR03-ENG\_corr.stcm

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