

## MIRAI MR12-E02 Leg3 Shipboard Three Component Magnetometer (STCM)

Last Modified: 2019-06-21

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Cruise ID: [MR12-E02 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/MR12-E02\\_leg3\\_all.pdf](http://www.godac.jamstec.go.jp/catalog/data/doc_catalog/media/MR12-E02_leg3_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)

2012-03-23 00:06 – 2012-03-29 00:39

### 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 MR11-08\_leg3 cruise

Date (UTC)

2012/01/24 12:10:00 - 2012/01/24 12:36:00

2012/02/06 01:11:00 - 2012/02/06 01:45:00

### 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.

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

- 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

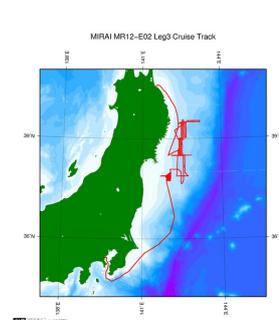
This coefficient was calculated from the above-mentioned Figure of 8 turn

	0.9930	0.0570	0.0311		2240.7615
B=	-0.0620	1.0581	0.0030	Hbp=	-152.5501
	0.0393	0.0060	0.9712		712.7126

#### 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



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#### MR12-E02 Leg3

Ship Name: MIRAI  
 Period: 2012-03-22 - 2012-03-30  
 Chief Scientist: Hidetaka Nomaki (JAMSTEC)  
 Project Name: [Tohoku Ecosystem-Associated Marine Sciences (TEAMS)]  
 Proposal Title: Marine Ecosystems Investigation, Impact by the mega-earthquake (the 2011 Earthquake of the Pacific coast of Tohoku) and Tsunami: For Recovery and Rebuilding of Sanriku Fisheries Activities

#### Update History

2019-06-21	An observation data was registerd.
2018-04-18	An observation data was registerd.
2014-08-12	An observation data was registerd.
2014-03-31	An observation data was registerd.
2013-07-18	An observation data was registerd.

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POWER GRAB SAMPLER (SHELL)  
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JAPAN AGENCY FOR MARINE-EARTH SCIENCE AND TECHNOLOGY

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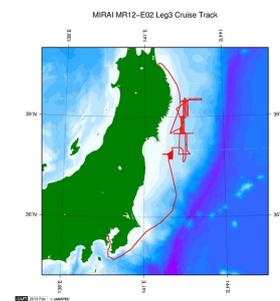
Shipboard Three Component Magnetometer (STCM): Processed (DMO)-Corrected

Data Policy: [JAMSTEC](#)

### 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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Period: 2012-03-22 - 2012-03-30

Chief Scientist: Hidetaka Nomaki (JAMSTEC)

Project Name: [Tohoku Ecosystem-Associated Marine Sciences (TEAMS)]

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Dive ID:

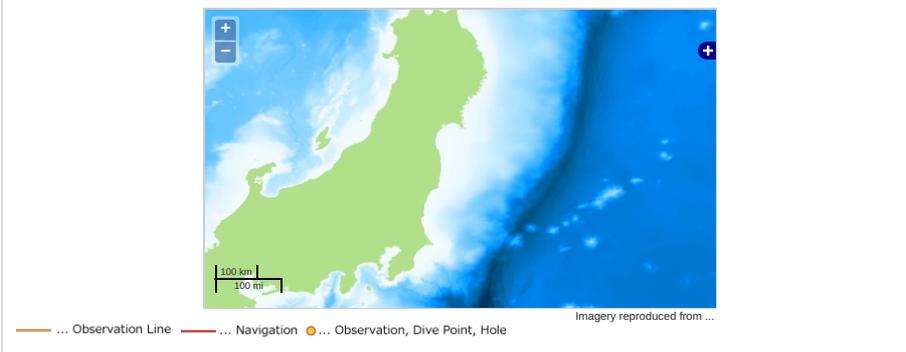
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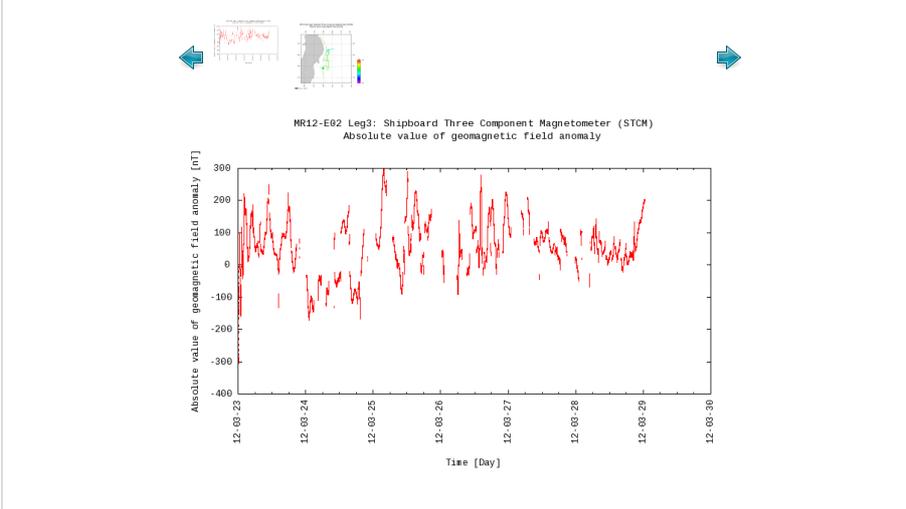
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**Observation Map**



**Figures**

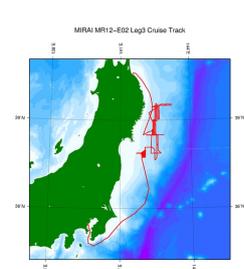


**Data List**

File names

MR12-E02\_leg3\_corr.stcm

**Related Information**



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