

MIRAI MR13-02B Leg1 Shipboard Three Component Magnetometer (STCM)

Last Modified: 2018-06-29

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Cruise ID: [MR13-02B 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

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Principal Investigator

Data Management Office

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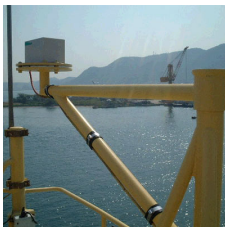
Period (UTC)

2013-05-09 21:49 – 2013-05-16 22:55

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

On this cruise

Date (UTC)

2013/05/12 03:29:00 - 2013/05/12 03:51:00

2013/05/14 11:13:00 - 2013/05/14 11:53:00

Data processing

The following corrections and calculations were performed.

(1) Ship magnetization correction

$Hob = AKPYF + Hp \text{ ---(i)}$
 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

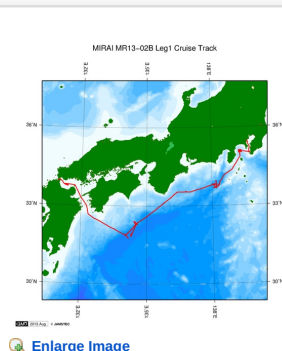
This coefficient was calculated from the above-mentioned Figure of 8 turn

	0.9937	0.0532	0.0199		2491.7160
B=	-0.0570	1.0584	-0.0083	Hbp=	0.7007
	0.0337	0.0064	0.8331		5421.8225

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



MR13-02B Leg1

Ship Name: MIRAI
 Period: 2013-05-09 - 2013-05-16
 Chief Scientist: Mari Inada (JAMSTEC)

Update History

2018-06-29	An observation data was registered.
2018-04-18	An observation data was registered.
2014-08-12	An observation data was registered.
2014-02-19	An observation data was registered.

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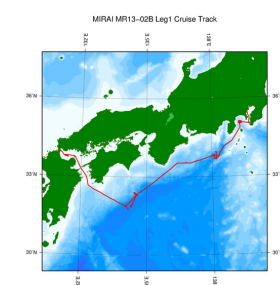
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STCM Corrected

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



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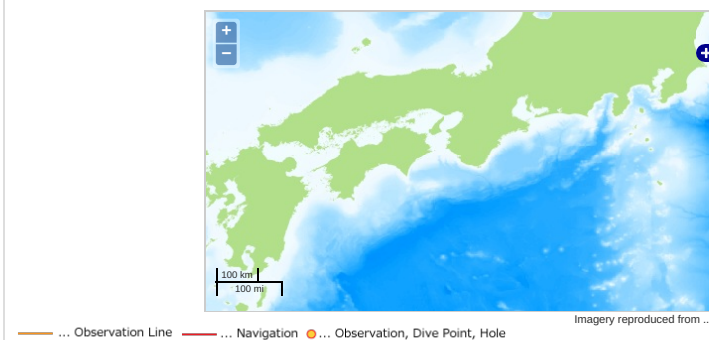
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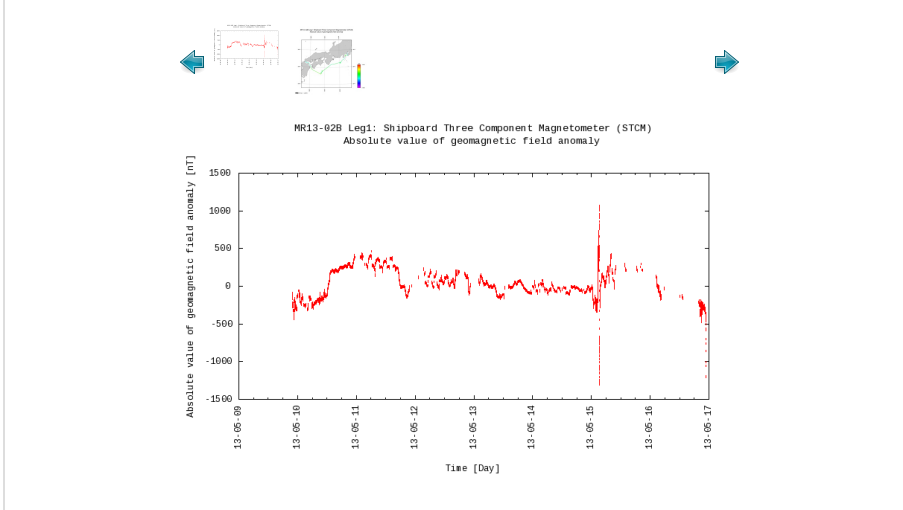
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Observation Map



Figures



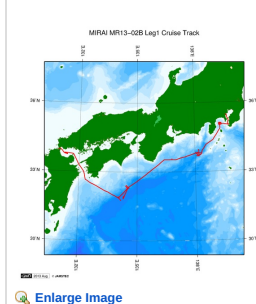
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File names

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