

MIRAI MR16-06 Shipboard Three Component Magnetometer (STCM)

Last Modified: 2018-04-14

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Cruise ID: [MR16-06](#)

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/MR16-06_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)

2016-08-22 00:09 – 2016-10-04 23:38

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 MR16-06 cruise

Date (UTC)

2016-09-08 16:50:00 - 2016-09-08 17:10:00

2016-10-03 02:41:00 - 2016-10-03 03:03:00

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 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

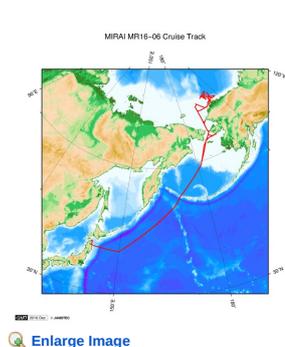
This coefficient was calculated from the above-mentioned Figure of 8 turn

	1.0017	0.0309	0.0327		2192.1398
B=	-0.0341	1.0652	-0.0093	Hbp=	236.8409
	0.0374	0.0046	0.9648		578.6310

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



MR16-06

Ship Name: MIRAI
 Period: 2016-08-22 - 2016-10-05
 Chief Scientist: Shigeto Nishino (JAMSTEC)
 Project Name: [Arctic Ocean Climate System Reaserch]
 Proposal ▶ Predictability study on weather and sea-ice forecasts linked with user engagement
 Title:

Update History

- | | |
|------------|------------------------------------|
| 2018-04-14 | An observation data was registerd. |
| 2017-04-21 | An observation data was registerd. |

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[Data Tree](#)
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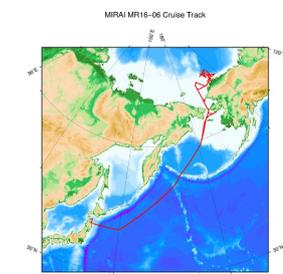
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STCM Corrected

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



MR16-06

Ship Name: MIRAI

Period: 2016-08-22 - 2016-10-05

Chief Scientist: Shigeto Nishino (JAMSTEC)

Project Name: [Arctic Ocean Climate System Research]

Proposal ▶ Predictability study on weather and sea-ice forecasts linked with user engagement

Title:

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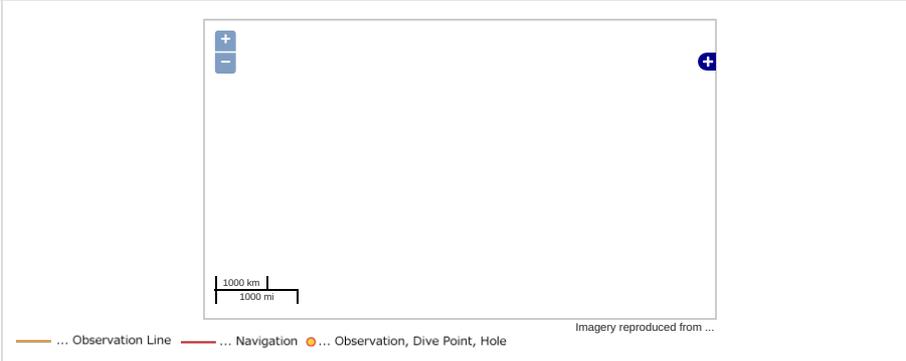
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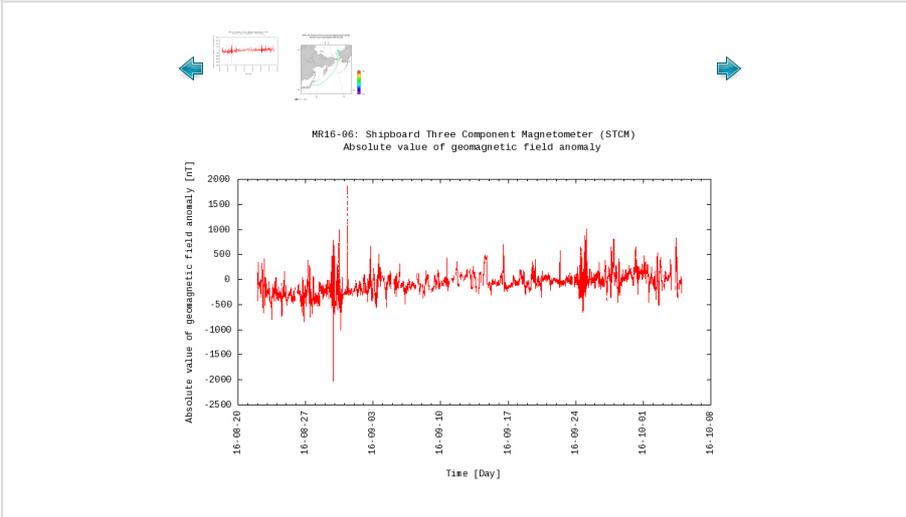
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Observation Map



Figures



Data List

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File names

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Related Information

MIRAI MR16-06 Cruise Track

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Chief Scientist: Shigeto Nishino (JAMSTEC)
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[Update History](#)

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