

MIRAI MR10-05 Leg2 Shipboard Three Component Magnetometer (STCM)

Last Modified: 2019-06-22

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Cruise ID: [MR10-05 Leg2](#)

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/MR10-05_leg1-2_all.pdf

For Using Data

Principal Investigator

Data Management Office

Use Constraints

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Data Citation

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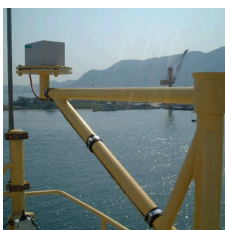
Period (UTC)

2010-10-12 08:52 – 2010-10-14 03:38
2010-09-04 14:50 – 2010-10-12 06:53

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 (see section 4.). As a quality control, data of low reliability was removed (see section 5. 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)

2010/09/06 00:57:00 - 2010/09/06 01:22:00
2010/09/11 13:33:00 - 2010/09/11 14:03:00
2010/09/16 00:27:00 - 2010/09/16 00:54:00

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.

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

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

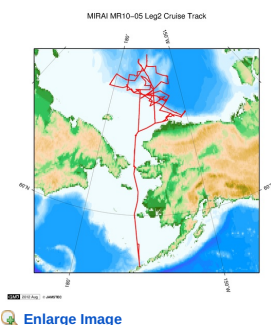
This coefficient was calculated from the Figure of 8 turn (see above)

| | | | | | |
|----|---------|--------|---------|------|------------|
| | 0.9936 | 0.0677 | -0.0080 | | 4255.0066 |
| B= | -0.0674 | 1.0585 | 0.0167 | Hbp= | -1445.8735 |
| | 0.0228 | 0.0055 | 0.7053 | | 15649.5562 |

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



MR10-05 Leg2

Ship Name: MIRAI
Period: 2010-09-02 - 2010-10-16
Chief Scientist: Motoyo Ito (JAMSTEC)
Project Name: [Arctic Ocean Climate System Reaserch]
Proposal ▶ Arctic Climate Oceanography
Title:

Update History

| | |
|------------|------------------------------------|
| 2019-06-22 | An observation data was registerd. |
| 2018-04-18 | An observation data was registerd. |
| 2014-08-07 | An observation data was registerd. |

2012-11-22

An observation data was registerd.

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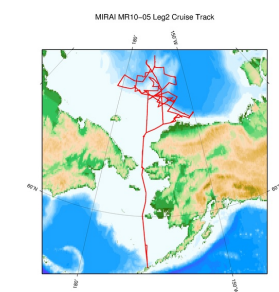
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Data Policy: [JAMSTEC](#)

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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MR10-05 Leg2

Ship Name: MIRAI

Period: 2010-09-02 - 2010-10-16

Chief Scientist: Motoyo Ito (JAMSTEC)

Project Name: [Arctic Ocean Climate System Research]

Proposal ▶ Arctic Climate Oceanography

Title:

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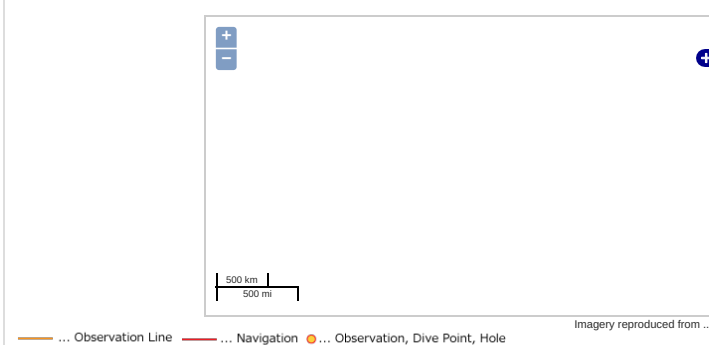
Data Policy: **JAMSTEC**

Observation Items: X, Y and Z component of geomagnetic field anomaly, Absolute value of geomagnetic field anomaly

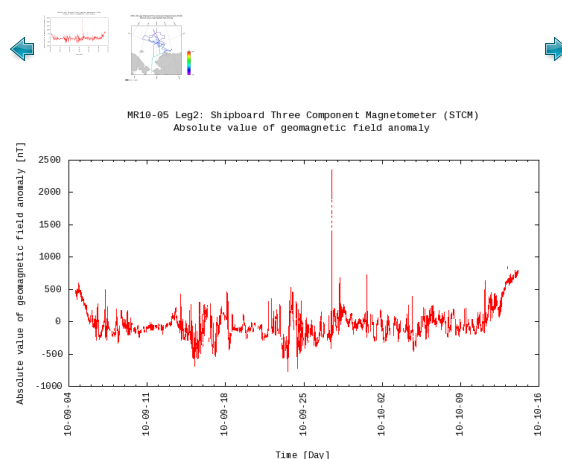
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Observation Map



Figures



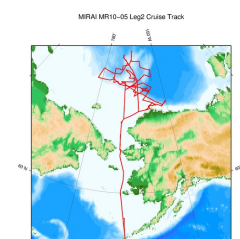
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Related Information



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Ship Name: MIRAI

Period: 2010-09-02 - 2010-10-16

Chief Scientist: Motoyo Ito (JAMSTEC)

Project Name: [Arctic Ocean Climate System Research]

Proposal ▶ Arctic Climate Oceanography

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