

MIRAI MR09-03 Leg3 Shipboard Three Component Magnetometer (STCM)

Last Modified: 2019-06-22

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Cruise ID: [MR09-03 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/MR09-03_leg1-3_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)

2009-10-16 05:06 – 2009-10-24 23:35

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

In MR09-03_leg2 cruise

Date (UTC)

2009-09-20 03:27:00 - 2009-09-20 04:02:00

2009-10-06 03:02:00 - 2009-10-06 03:29:00

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[\[http://www.ngdc.noaa.gov/IAGA/vmod/igrf.html\]](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

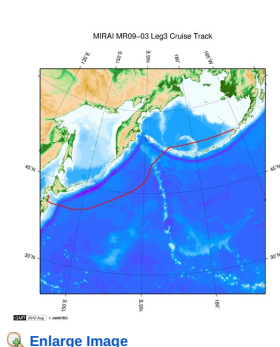
This coefficient was calculated from the Figure of 8 turn (see section 4.)

	1.0077	0.0337	0.0542		849.6711
B=	-0.0361	1.0699	-0.0015	Hbp=	-342.3806
	0.0320	0.0048	0.9794		18.1025

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



MR09-03 Leg3
 Ship Name: MIRAI
 Period: 2009-10-16 - 2009-10-25
 Chief Scientist: Shigeto Nishino (JAMSTEC)
 Project Name: [Arctic Ocean Climate System Reaserch]
 Proposal ▶ Multi-disciplinary observation cruise for the Arctic Ocean
 Title:

Update History

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

2012-09-28

An observation data was registerd.

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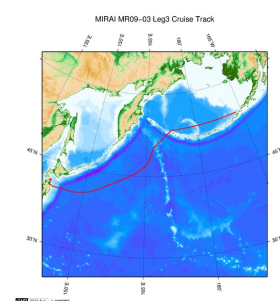
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STCM Corrected

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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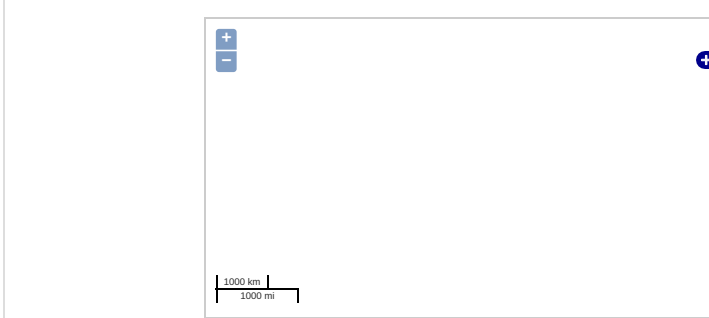
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Observation Map

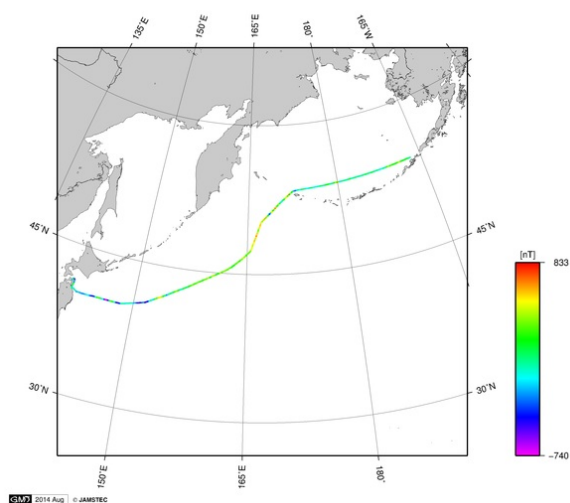


... Observation Line ... Navigation ... Observation, Dive Point, Hole

Figures



MR09-03 Leg3: Shipboard Three Component Magnetometer (STCM)
Absolute value of geomagnetic field anomaly



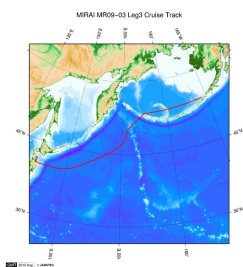
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File names

☐ MR09-03_leg3_corr.stcm

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