

For Using Data

| | |
|------------------------|--|
| Data Policy | JAMSTEC |
| Principal Investigator | Data Management Office |
| Use Constraints | See Terms and Conditions about constrain of use. |
| Data Citation | See Terms and Conditions about data citation. |

Quality

DMO-Processed

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 foremast. 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 : | Honeywell |
| Type : | DRUH |
| Accuracy : | Roll, Pitch : less than ± 0.03 degree |
| | Gyro : less than ± 0.06 degree |
| Location : | In the doppler radar dome |

Duration of the Figure of 8 turn

In MR99-K02 and MR99-K04 cruise

Date (UTC)

1999/05/20 23:07:00 - 1999/05/20 23:35:00

1999/08/14 22:00:00 - 1999/08/14 22:45:00

Data processing

The following corrections and calculations were performed.

1) Ship magnetization correction

$$Hob = ARPYF + Hp \cdots (i)$$

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.

$$RPYF = BHob + Hpb \cdots (ii)$$

B : coefficient of Figure of 8 turn

Hpb : 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 13th 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

$$An = F - Figf$$

An : Geomagnetic field anomaly vector

F : Geomagnetic field vector

Figf : 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 3 knot or exceeding 20 knot
- X, Y, or Z component of geomagnetic field anomaly exceeding $\pm 4000\text{nT}$

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

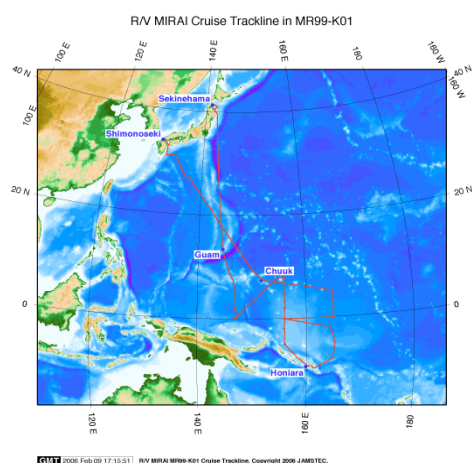
This coefficient was calculated from the above-mentioned Figure of 8 turn

| B | | | Hpb |
|---------|---------|--------|-----------|
| 0.9859 | 0.0084 | 0.0215 | 2277.8548 |
| -0.0104 | 1.0489 | 0.0099 | -223.2553 |
| 0.0342 | -0.0047 | 0.9300 | 2241.7999 |

Note

- 1) File naming rule : Cruise ID_corr.stcm
- 2) Data interval : 10 seconds
- 3) Geodetic system : WGS84
- 4) If you would like the raw data set, please contact DMO at "dmo@jamstec.go.jp".

Related Information



MR99-K01

| | |
|------------------|---------------------------------------|
| Ship Name: | MIRAI |
| Period: | 1999/02/07 - 1999/03/31 |
| Chief Scientist: | Yoshifumi Kuroda (JAMSTEC) |
| Proposal: | [Tropical Ocean Climate Study (TOCS)] |

Format Description for 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 | |