

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 :	SFG-2018
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
	Gyro : 0.01 degree *Secant (Lat.)
Location :	In the doppler radar dome

Duration of the Figure of 8 turn

In MR23-07 cruise

Date (UTC)

2023/10/10 16:42:00 - 2023/10/10 17:05:00

2023/10/21 21:30:00 - 2023/10/21 21:51:00

2023/10/30 17:45:00 - 2023/10/30 18:07:00

2023/11/06 04:59:00 - 2023/11/06 05:22:00

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

$$An = F - Figrf$$

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 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

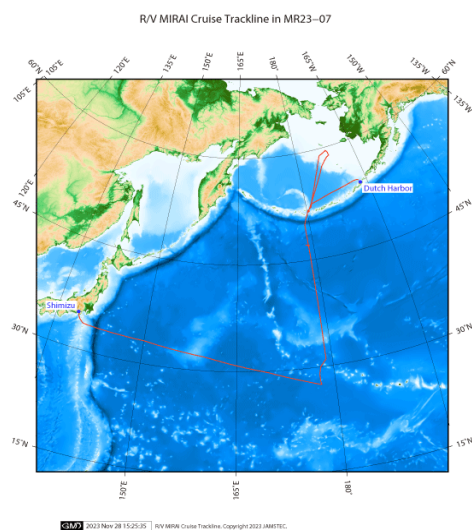
This coefficient was calculated from the above-mentioned Figure of 8 turn

B			Hpb
0.9945	0.0291	0.0302	3551.3426
-0.0308	1.0492	-0.0063	-816.5526
0.0374	0.0017	0.9714	818.0139

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



MR23-07

Ship Name:	MIRAI
Period:	2023/10/06 - 2023/11/08
Chief Scientist:	Katsuro Katsumata (JAMSTEC)
Proposal:	Quantitative observation experiment in the North Pacific subarctic gyre — GO-SHIP Observation P14
	Organic alkalinity
	Float Deployments with GO-BGC
	Biology Observation with GO-SHIP
	Distribution of Iodine and Iodites in the North Pacific Ocean
	Biogeography of Plankton in the North Pacific Ocean
	Vertical mixing and transport of heat and material in the North Pacific Ocean and Bering Sea
	Float Deployments to Capture Environmental Changes in the North Pacific Ocean
	Polycyclic Aromatic Hydrocarbons, Radium, Cesium
	Multifaceted Observation of Cloud and Rain System in the North Pacific
	Speciation of Iodine, Ammonia, Nitrite in the North Pacific Ocean
	Deployment of EM-APEX floats as part of US Partnership Project
	Experiment on DFMC SBASS from QZSS

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	