

## For Using Data

Data Policy	JURCAOS-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 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 :	SFG-2009
Measurement range :	$\pm 100,000$ nT
Accuracy :	less than $\pm 200$ nT
Resolution :	0.01 nT
Location :	No.1 Laboratory

## 2) Magnetic Sensor

Manufacturer :	Tierra Technica Ltd.
Form :	flux-gate sensors with ring-cored coils
Location :	Compass deck

## 3) Attitude sensor and Gyro compass

Manufacturer :	IXBLUE
Type :	PHINS
Accuracy :	Roll, Pitch : 0.01 degree
	Gyro : 0.01 degree *Secant (Lat.)
Location :	Gravity meter room

## Duration of the Figure of 8 turn

In KS-24-5 cruise

Date (UTC)

2024/03/24 22:02:00 - 2024/03/24 22:24:00

## 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.

$$RPF = BHob + Hpb \dots(ii)$$

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

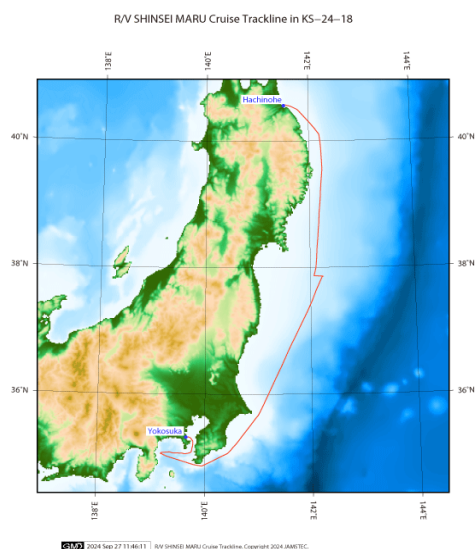
B			Hpb
1.0743	0.0023	-0.0253	-2988.3871
-0.0083	1.1327	0.0095	-1684.4269
0.0111	-0.0282	0.9364	-8096.0526

## 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

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### KS-24-18

Ship Name:

SHINSEI MARU

Period:

2024/09/13 - 2024/09/17

Chief Scientist:

Junichiro Kuroda (AORI, The University of Tokyo)

Proposal:

Operational performance verification test of observation equipments for the Joint Usage/Joint Research Expeditions

## 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	