

## SHINSEI MARU KS-21-6 Shipboard Three Component Magnetometer (STCM)

Last Modified: 2021-10-29

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Cruise ID: [KS-21-6](#)

Shipboard Three Component Magnetometer (STCM): Processed (DMO)-Corrected

Data Policy: [JURCAOS-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

### 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)

2021-04-24 00:54 – 2021-04-29 08:39

2021-04-19 05:30 – 2021-04-24 00:08

2021-04-11 05:12 – 2021-04-19 04:55

### 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. 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

Accuracy(Gyro) : 0.01 degree \*Secant(Lat.)

Location : Gravity meter room

### Duration of the Figure of 8 turn

In KS-21-6 cruise

Date (UTC)

2021/04/12 20:05:00 - 2021/04/12 20:27:00

### Data processing

The following corrections and calculations were performed.

(1) Ship magnetization correction

$$\text{Hob} = \text{ARPYF} + \text{Hp} \text{ ---(i)}$$

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.

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

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

$$\text{An} = \text{F} - \text{Figrf}$$

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  $\pm 4000\text{nT}$

(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**

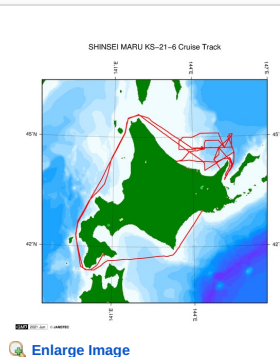
This coefficient was calculated from the above-mentioned Figure of 8 turn

	1.0717	-0.0042	0.0702		-8338.9793
B =	-0.0053	1.1257	0.1484	Hpb =	-9480.6839
	0.0127	-0.0240	0.8456		-3890.2828

**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**



**KS-21-6**

Ship Name: SHINSEI MARU

Period: 2021-04-11 - 2021-04-29

Chief Scientist: Jun Nishioka (Hokkaido University)

Proposal Title: Influence of sea ice melt water on physical and biogeochemical processes in the southern

Title: Sea of Okhotsk

**Update History**

2021-10-29 An observation data was registerd.

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Submersibles

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SHINKAI 2000

SHINKAI 6500

DEEP TOW

HYPER-DOLPHIN

URASHIMA

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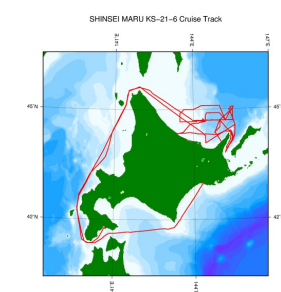
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### STCM Corrected

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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#### Go to a Cruise Information

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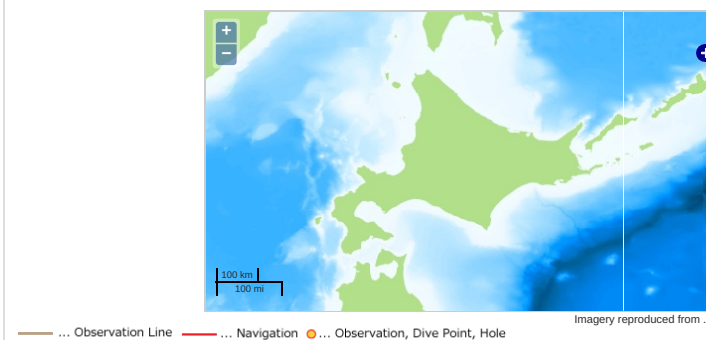
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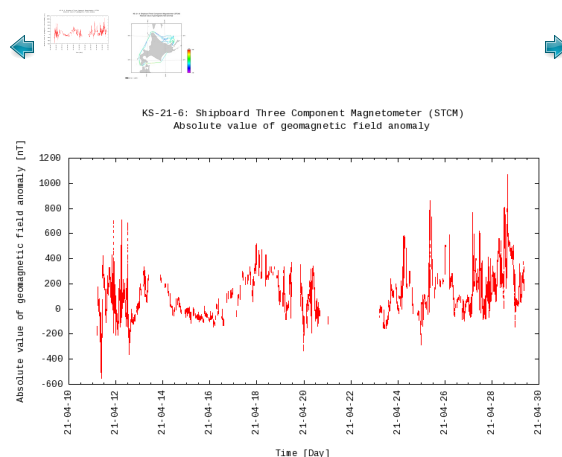
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### Observation Map



### Figures



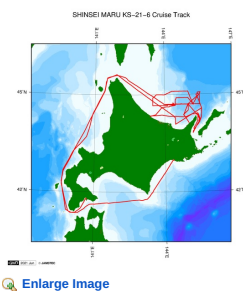
### Data List

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File names

☐ KS-21-6\_corr.stcm

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