

SHINSEI MARU KS-19-20 Shipboard Three Component Magnetometer (STCM)

Last Modified: 2020-05-15

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Cruise ID: [KS-19-20](#)

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)

2019-10-08 05:19 – 2019-10-16 00:38

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 ± 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-19-J04 cruise

Date (UTC)

2019/12/10 19:01:00 - 2019/12/10 19:21:00

2019/12/12 18:30:00 - 2019/12/12 18:52:00

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

$An = F - Figrf$
 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

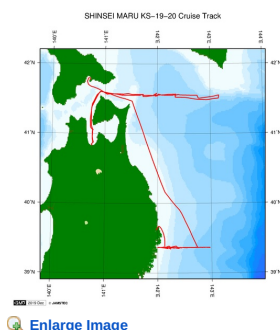
This coefficient was calculated from the above-mentioned Figure of 8 turn

	1.0707	-0.0022	-0.0104		-4101.4036
B=	-0.0050	1.1293	-0.0080	Hpb=	-450.8504
	0.0105	-0.0247	0.8246		-3386.7950

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-19-20

Ship Name: SHINSEI MARU
 Period: 2019-10-08 - 2019-10-16
 Chief Scientist: Toshi Nagata (The University of Tokyo)
 Project Name: [Tohoku Ecosystem-Associated Marine Sciences (TEAMS)]
 Proposal : Research on the disturbance and recovery process of the ecosystem in Sanriku coastal area
 Title: after the Tsunami

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2020-05-15 An observation data was registerd.

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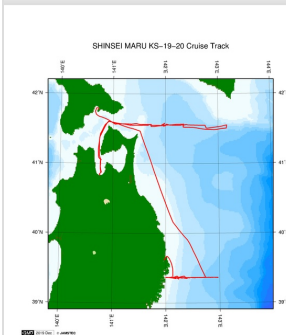
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STCM Corrected

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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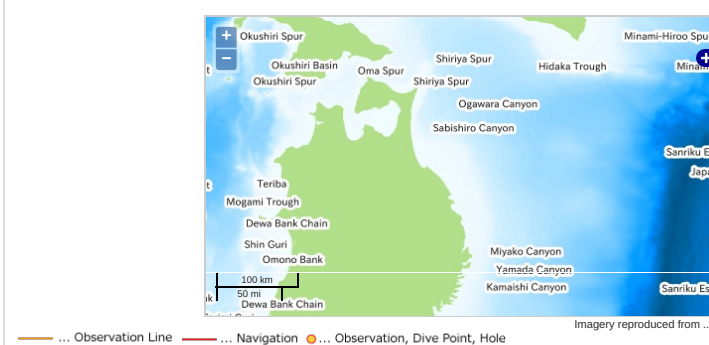
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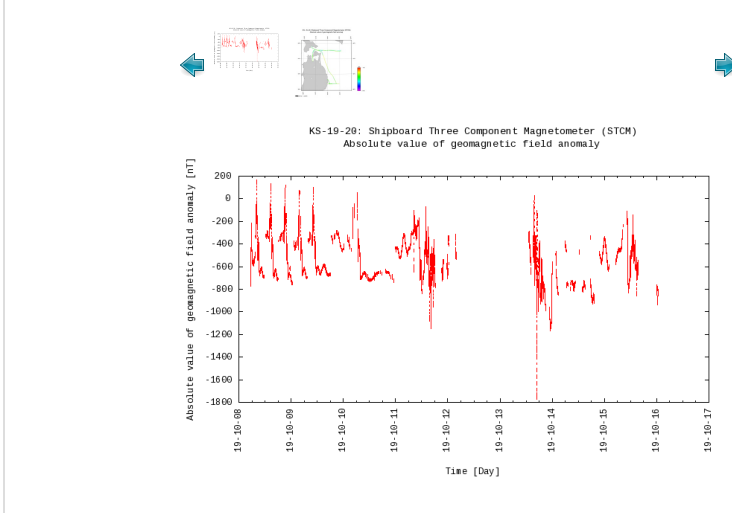
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MAGNETICS

SOLID EARTH > GEOMAGNETISM

Observation Map



Figures



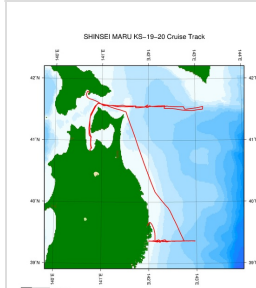
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File names

☐ KS-19-20_corr.stcm

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