

YOKOSUKA YK21-10 Shipboard Three Component Magnetometer (STCM)

Last Modified: 2021-12-25

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Cruise ID: [YK21-10](#)

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

Data Policy: [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)

2021-06-12 00:17 – 2021-06-24 23:44

Instrument

Instrument:

3 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 : SFG1212

Measurement range : $\pm 100,000$ nT

Accuracy : less than 100 nT

Resolution : 1 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 : OCTANS

Accuracy(Roll, Pitch) : 0.01 degree

Accuracy(Gyro) : 0.05 degree *Secant(Lat.)

Location : Tank top(on the bottom of ship)

Duration of the Figure of 8 turn

In YK21-10 cruise

Date (UTC)

2021/06/12 09:57:00 - 2021/06/12 10:18:00

2021/06/16 11:56:00 - 2021/06/16 12:17:00

2021/06/21 08:46:00 - 2021/06/21 09:08:00

Data processing

The following corrections and calculations were performed.

(1) Ship magnetization correction

Hob = ARPYF + Hp ---(i)

Hob : Observed magnetic field vector (Ship coordinate)

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

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

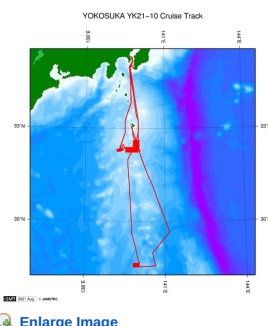
	1.0821	0.0044	-0.0215		-23.9807
B =	-0.0001	1.2132	0.0599	Hpb =	6003.8168
	0.0158	0.1239	0.8706		-3746.2664

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

☒ Cruise Data ☐ Dive Data



YK21-10

Ship Name: YOKOSUKA
Period: 2021-06-12 - 2021-06-25
Chief Scientist: Hidenori Kumagai (JAMSTEC)
Proposal Scientific research toward sustainable utilization of marine resources
Title:

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POWER GRAB SAMPLER
(SHELL)
POWER GRAB SAMPLER
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BMS

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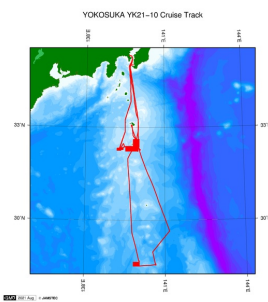
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STCM Corrected

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

☒ Cruise Data ☐ Dive Data



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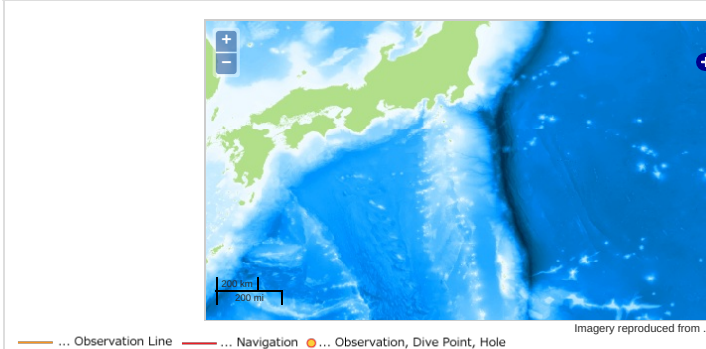
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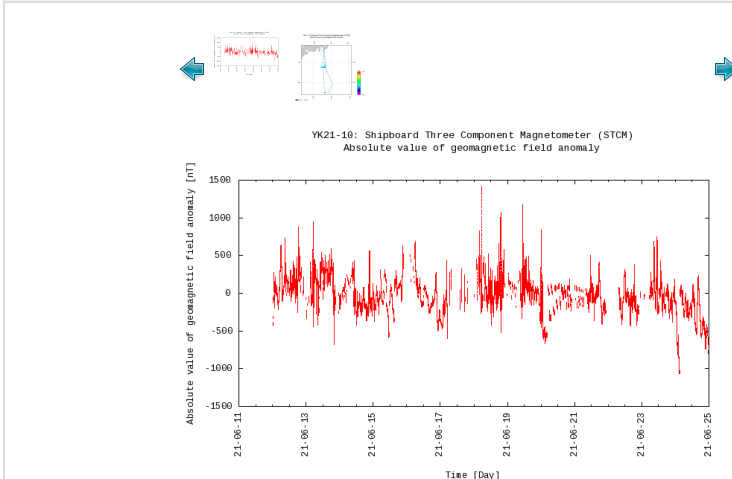
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SOLID EARTH > GEOMAGNETISM

Observation Map



Figures



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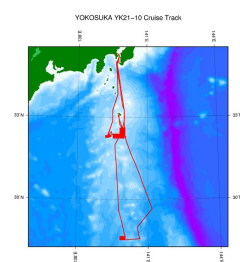
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File names

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