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 :	SFG1214
Measurement range :	±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 :	Honeywell	
Type :	DRUH	
Accuracy :	Roll, Pitch :	less than ±0.03 degree
	Gyro :	less than ±0.06 degree
Location :	In the doppler radar dome	

Duration of the Figure of 8 turn

In MR00-K03 cruise
Date (UTC)
 2000/06/02 11:19:00 - 2000/06/02 11:51:00

Data processing

The following corrections and calculations were performed.

1) Ship magnetization correction

  Hob = ARPYF + Hp ··· (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 ±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

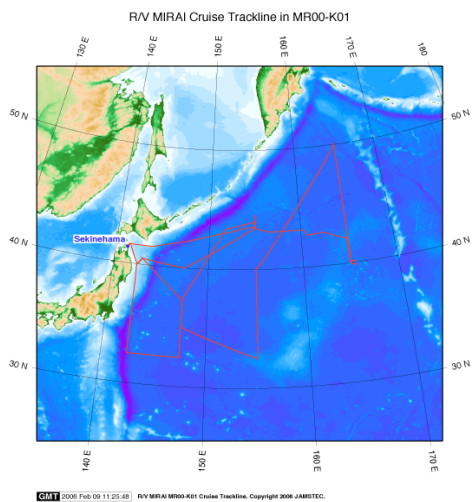| B			Hpb
0.9919	0.0042	0.0141	2917.0962
-0.0074	1.0535	-0.0014	321.0755
0.0307	-0.0062	0.8411	6508.4022

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

R/V MIRAI Cruise Trackline in MR00-K01

MR00-K01

Ship Name:	MIRAI
Period:	2000/01/05 - 2000/02/06
Chief Scientist:	Makio Honda (JAMSTEC)
Project Name:	[Station KEO,Station KNOT]

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	