Lamont-Doherty Earth Observatory of Columbia University

EW9901 DATA REDUCTION CRUISE SUMMARY

January 30, 1999 - February 24, 1999

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Data Collected During Cruise

All times are specified in GMT.

Data Files

The data delivered to the research consists of the following subdirectories:

File/Directory Name	Description
Processed	Processed data
Hs	Processed and raw hydrosweep

The processed directory consists of the following files for each day of data:

n. - 1 minute navigation from the "x." file and "fu.s" file

```
yy+ddd:hh:mm:ss.mmm N 12 12.1234 E 123 12.1234   gp1 123.1 12.1
yr day  time                lat              lon              id    set   drift
```

id strings: "gp1" = GPS Trmble NT200D
"gp 2"=GPS Trimble NT200D
"gp3" = GPS Magnavox MX4200D Receiver #1
"dr" = Dead Reckoned position

vt.n - merged BGM-3 gravity with final nav.

```
yy+ddd:hh:mm:ss.mmm N 16  0.4273 W  73 20.3055  1980   -4.1
yr   day  time              lat              lon              theog  FAA

978416.9   27.6   9.9   13.2    -2.7   3.9     -2.8   3.8
 raw_grav eotvos drift   dc       raw_vel     smooth_vel
                         shift     N     E       N    E
```

mg.n - merged Magnetics with final nav.

```
yy+ddd:hh:mm:ss.mmm N 16  0.4273 W  73 20.3055  35123.3    43.2
yr   day  time              lat              lon      observed   local anomaly
                                                      total magnetic
                                                        field
```

hb.n - interpolated center beam merged with navigation

```
yy+ddd:hh:mm:ss:mmm N 12 12.1234 E 123.1234  2222.0
yr day  time              lat              lon      depth (meters)
```

m. - merged bathy, maggie, gravity with final nav.

```
yy+ddd:hh:mm:ss.mmm N 14  9.0555 W  67  2.3969   gp3 276.9  0.2
yr   day  time              lat          lon            id     set    drift

5034.9   37401.8   17.2         -1.6    978349.0   13.1     9.1   13.2
depth    mag tot    mag          grv.    raw_grv    eotvos    tot   dc
           intensity  anomaly  faa                            drift  shift
```

Instruments

True Time Clock

Instrument Kinemetric/TrueTime Division Model GPS-DC GPS Synchronized Clock
Logging 1 minute intervals
Science Data None

The True Time clock is used to adjust the CPU clock of the logging computer. The logging computer captures the continuous time records from the clock and provides these as a service to the rest of the network via a UDP broadcast. This enables the computers on the network to adjust their CPU times to UTC time.

Day	Time	Comments
030	0900	Data logging/processing begins
047-048	2355 - 0025	Acquisition stopped due to power failure
048	1543-1620	Acquisition stopped, rebooting system
055	1200	Acquisition is Off

Speed and Heading

Instrument Furuno CI-30 2-axis Doppler speed log, Sperry MK-27 gyro
Logging 3 second intervals
Processing The raw Furuno data is processed by taking the mean of all values within the even minute range and outputting the speed and heading on the even minute. All values taken during the 30 seconds before and after the even minute are used to calculate the median.

Science Data: None

Day	Time	Comments
030	1800	Data logging/processing begins
047-048	2355 - 0025	Acquisition stopped due to power failure
048	1543-1620	Acquisition stopped, rebooting system
055	1200	Acquisition is Off

GPS SATELLITE FIXES:

Instruments gp1: GPS Trimble NT200D Pcode
gp2: GPS Trimble NT200D
gp3: Magnavox MX-4200 Global Positioning System

Logging 10 second intervals on all receivers

Checking

gp3: Minimum number of SATs: 3
Dilution of precision maximum: north = 4.0, east = 4.0
Speed maximum: 20.0

Reject fixes with high drifts in navigation

Processing **See Navigation Processing Pipeline**

Science Data *n.*

Day	Time	Comments
030	0900	Data logging/processing begins
047-048	2355 - 0025	Acquisition stopped due to power failure
048	1543-1620	Acquisition stopped, rebooting system
055	1200	Acquisition is Off

BATHYMETRY:

Instrument Krupp Atlas Hydrosweep Center Beam

Logging Each Hydrosweep Ping is logged, and center beam data is extracted and logged separately.

Processing Raw data is checked to process only good centerbeam records that were acquired in *survey* mode.
This data is then processed to produce a median value for each even minute. The median is the median of all records 30 seconds before and after the even minute.

Final Data The median is merged with the one-minute navigation fixes to provide the final centerbeam data.

Notes During the cruise, hydrosweep data was occasionally turned off while coring. The following chart shows all breaks greater than 5 minutes.

Science Data: *hb.n*

Day	Time	Comments
030	0900	Data logging/processing begins
030-031	2315 - 1450	Logging is off; software failure
031-032	1450 – 1320	Data logging
032 – 032	1320 – 1520	Acquisition is off, software failure
032 - 035	1520 – 2305	Data logging
035 - 037	2305 – 0000	Acquisition is on; no data collected due to logger failure
040-041	2330 – 0005	Acquisition stopped due to
047-048	2355 - 0025	Acquisition stopped due to power failure
048	1543-1620	Acquisition stopped, rebooting system
050	1620-1659	Logger failure
055	1200	Acquisition is Off

SEA TEMPERATURE:

Instrument Omega DP10 Series
Logging 1 minute intervals
Checking none
Smoothing none
Science Data none

Day	Time	Comments
038	0130	Data logging/processing begins
047-048	2355 - 0025	Acquisition stopped due to power failure
048	1543-1620	Acquisition stopped, rebooting system
055	1200	Acquisition is Off

WEATHER STATION:

Instrument R.M./. Young Precision Meteorological Instruments 26700 Series
Logging 1 minute interval
Final Data raw.
Notes Bird 2 is no longer used
Science Data none

Day	Time	Comments
035	2111	Data logging/processing begins
047-048	2355 - 0025	Acquisition stopped due to power failure
055	1200	Acquisition off

BGM-3 GRAVITY:

Instrument Bell Aerospace BGM-3 marine gravity meter
Logging 1 second intervals

Science Data *vt.n (Observed, Eotvos, Free Air Anomaly value at 00 seconds of each minute)*
m.n (merged bathy, maggie, gravity with final nav.)

Merge with navigation calculate Eotvos correction and Free Air Anomaly.
Checking Visual check of plot of data to determine satisfactory Eotvos corrections, reject spikes of data at turns.
Velocity smoothing 5 point running average throughout the cruise.
Processing

Since current BGM-3 output has double counts every few minutes the following scheme has been implemented until the hardware and interface code has been fixed:

1. Run a 1 minute Gaussian filter through the data. This will narrow the output spikes and make them stand out better. Output interval has been hard-wired to every 15 seconds.
2. Pass the output through filter1d (see gmtsystem) using -FG480 (an 8 minute Gaussian filter with robust option, i.e., ignore "outlier" points (i.e. the spikes).

Calculations

eotvos_corr = 7.5038 * vel_east * cos(lat) + .004154 * vel*vel
corrected_grv = raw_grv + eotvos_corr - drift - dc_shift
faa = corrected_grv - theoretical_grv

1980 theoretical gravity formula

$Y_0 = 978.0327 \times (1 + .0053024 \times \sin(\square) \times \sin(\square) - .0000058 \times \sin(2 \times \square) \times \sin(2 \times \square))$

Day	Time	Comments
046	1800	Data logging/processing begins
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EW-9901 Bridgetown, Barbados, West Indies *OFFICIAL*

Pier/Ship	Latitude	Longitude	Reference	Latitude	Longitude
	13 06.06	N 59 37.77 W		13 06.4	N 59 37.9 W

Middle of the pier in front of customs buildin
same as pier reference

Bollard 34. 3rd Bollard from north end of breakwa
at the deep water harbor; 2 meters from the ed

	Id	Date	Mistie	Drift/Day	DC Shift
Pre Cruise	EW9809	10/16/98	-0.34	-0.1000	9.79
Post Cruise	EW9901	2/27/99	-0.39	-0.0029	-0.34
Total Days		134.00			

Time	Entry	Value	
22:08	CDeck Level BELOW Pier	0.75	meters
22:39	Pier 1 L&R Value	1969.56	L&R
22:53	Reference L&R Value	1970.73	L&R
23:07	Pier 2 L&R Value	1969.47	L&R
Feb-72	Reference Gravity	978294.44	mGals
22:08	Gravity Meter Value (BGM Reading)	978294.70	mGals
	Potsdam Corrected	0	1 if corrected

*Gravity meter is **5.5** meters below CDeck*

Difference in meters between Gravity Meter and Pier: 6.25 meters

Height Cor = Pier Height * FAA Constant

6.25 × 0.31 = 1.94 mGals/min

Difference in mGals between Pier and Gravity Meter

Delta L&R = Pier (avg) - Reference * 1.06 L&R/mGal

1969.52 − 1970.73 × 1.06 = -1.29 mGals

Pier Gravity = Reference + Delta mGals [+ Potsdam]

978294.44 + -1.29 + 0.00 = 978293.15 mGals

Gravity @meter = Pier Gravity+Height Correction

978293.15 + 1.94 = 978295.09 mGals

Current Mistie = BGM Reading - Calculated Gravity

978294.70 − 978295.09 = -0.39 mGals