



**Lamont-Doherty
Earth Observatory
of Columbia University**

EW9902 DATA REDUCTION CRUISE SUMMARY

February 28, 1999 - March 5, 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
```

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	Kinematic/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
059	1300	Data logging/processing begins
064	1400	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
059	1300	Data logging/processing begins
064	1400	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
059	1300	Data logging/processing begins
064	1400	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
059	1300	Data logging/processing begins
064	1400	Data logging

SEA TEMPERATURE:

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

Day	Time	Comments
059	1300	Data logging/processing begins
064	1400	Acquisition is Off

WEATHER STATION:

Instrument R.M./I. 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
059	1300	Data logging/processing begins
064	1400	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

$$\text{eotvos_corr} = 7.5038 * \text{vel_east} * \cos(\text{lat}) + .004154 * \text{vel} * \text{vel}$$

$$\text{corrected_grv} = \text{raw_grv} + \text{eotvos_corr} - \text{drift} - \text{dc_shift}$$

$$\text{faa} = \text{corrected_grv} - \text{theoretical_grv}$$

1980 theoretical gravity formula

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

Day	Time	Comments
059	1300	Data logging/processing begins
064	1400	Acquisition is Off

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