



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

EW9904 DATA REDUCTION CRUISE SUMMARY

April 17, 1999 - May 3, 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 Trimble 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
```

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
```

ts.n - Shot time/Nav Block data remerged with final nav.

yy+ddd:hh:mm:ss.mmm 000913 N 53 17.4459 W 166 59.4171 MCS_LINE1
yr day shot time shot # latitude longitude line name

ts.n.status - Shot status. Statistics of the shot file (*first, last, missing, errors*)

linename	Time of First Shot	first shot	last shot
LINE ABC1:	yy+ddd:hh:mm:ss.mmm	065479	070819
MISSING: 66791, 67749, 67907			

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
107	1730	Data logging/processing begins
123	1600	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
107	1730	Data logging/processing begins
123	1600	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
107	1730	Data logging/processing begins
123	1600	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
107	1730	Data logging/processing begins
110	0950 – 1710	Acquisition is off, operator's error
110 – 118	1710 – 1750	Acquisition is on
118 – 119	1750 - 0510	Acquisition is off, instrument recovery
119	0510 – 1330	Acquisition is on Survey - 2
119 – 120	1330 – 0545	Acquisition is off, instrument recovery
120	0545 – 1345	Acquisition is on Survey – 3
120 – 121	1345 - 0510	Acquisition is off, instrument recovery
121 – 123	0510 – 1600	Acquisition is on

SEA TEMPERATURE:

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

Day	Time	Comments
110	1754	Data logging/processing begins
123	1600	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
107	1730	Data logging/processing begins
123	1600	Acquisition off

Sound Velocities

Instrument Sparton Expandable BathyThermograph (5 & 7) *XBT*
Processing Data is processed using the MB-System 4.3 to convert the depth/temperature readings to depth/sound velocity.
Science Data *XBT* and velocity profiles in *xbt* subdirectory

XBT	Location	
990401.xt 7	45 26N	130 16W
990402.xt 5	45 53.1N	129 56.9W

Guns

Logging Varying intervals
Processing Gun Shot data is created initially with a fifteen minute filter for the navigation data to reduce the effects of the selective availability. This data is then combined with the one-minute navigation and corrected for course and speed to produce the final formatted data.
Science Data *ts.n*

Day	Time	Line	Shooting Interval (sec/m)	Shot Number
111	17:45	sas - 1	120 sec	1 .. 4488
117	23:21	sas - 1	60 sec	4490 4618
118	01:29	sas - 1	120 sec	4620 5025

MAGNETICS:

Instrument Geometrics
Logging 12 sec intervals
Processing Magnetic data is collected and local anomaly is calculated with respect to IGRF 1995. This data is then combined with the one-minute navigation.
Science Data *mg.n* (observed total magnetic field and local anomaly values at 00 of each minute),
m.n (merged bathy, maggie, gravity with final nav.)

Day	Time	Comments
121-122	0500-2330	Acquisition on, poor quality due to equipment probles

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 gmssystem) 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

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

Day	Time	Comments
069	0330	Data logging/processing begins
102	1600	Acquisition is Off

EW-9904 Newport, OR, USA						
Pier/Ship	Latitude	Longitude	Reference	Latitude	Longitude	
	44 37.542N	124 02.695W		44 37.542N	124 02.695W	
Bollard in the middle of the Yaquina Bay "T" on the south shore of Yaquina bay.			Gravity field at the foot of the west "T" pier (not Oregon State University Marine Facility) on the s shore of Yaquina Bay.			

	Id	Date	Mistie	Drift/Day	DC Shift
Pre Cruise	EW9903	4/12/99	-0.85	-0.0193	-0.39
Post Cruise	EW9904	5/3/99	-0.39	-0.0184	-0.85
Total Days		21.00			

Time	Entry	Value
00:00	CDeck Level BELOW Pier	1.00 meters
22:50	Pier 1 L&R Value	4153.05 L&R
23:00	Reference L&R Value	4153.66 L&R
23:10	Pier 2 L&R Value	4153.80 L&R
22:25	Reference Gravity	980610.42 mGals
22:25	Gravity Meter Value (BGM Reading)	980611.80 mGals
	Potsdam Corrected	0 1 if corrected

Gravity meter is 5.5 meters below CDeck

Difference in meters between Gravity Meter and Pier	6.50 meters
Height Cor = Pier Height * FAA Constant	
	6.50 0.31 2.02 mGals/min

Difference in mGals between Pier and Gravity Meter

Delta L&R = Pier (avg) - Reference * 1.06 L&R/mGal	
	4153.43 4153.66 1.06 -0.23 mGals

Pier Gravity =

Reference + Delta mGals [+ Potsdam]	
	980610.42 -0.23 0.00 980610.17 mGals

Gravity @meter =

Pier Gravity+Height Correction	
	980610.17 2.02 980612.19 mGals

Current Mistie =

BGM Reading - Calculated Gravity	
	980611.80 980612.19 -0.39 mGals