



*Lamont-Doherty
Earth Observatory
of Columbia University*

EW9903 DATA REDUCTION CRUISE SUMMARY

March 10, 1999 - April 12, 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
```

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	last
		shot	shot
LINE ABC1:	yy+ddd:hh:mm:ss.mmm	065479	.. 070819
MISSING:	66791, 67749, 67907		

Even though the following file is not being processed and/or merged with navigation, here is it's discription:

cb1. - shooting geometry and bird status file

yy+ddd:hh:mm:ss.mmm alijos 001302 N 23 05.3419 W 116 03.1789 N 23 05.3193 W 116 03.1961 N 00 00.000 E 000 00.0000 266.8 C04
 167.2

compass	yr	day	time	line name	shot	gps1 lat	gps1 long	gps2 lat	gps2 long	tailbuoy	tailbuoy	tailbuoy
					number					latitude	longitude	azimuth number and direction

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
069	0330	Data logging/processing begins
102	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
069	0330	Data logging/processing begins
102	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
069	0330	Data logging/processing begins
102	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
069	0330	Data logging/processing begins
078-079	2300 - 1100	Acquisition is off; instrument deployment
079-081	1100 - 0130	Data logging
081 - 082	0130 - 0530	Acquisition is off, instrument recovery
082 - 082	0530 - 1530	Data logging
082 - 082	1530 - 2000	Acquisition is off, instrument retrieval
082 - 084	2000 - 2000	Data logging
084 - 086	2000 - 0310	Acquisition stopped, instrument recovery
086 - 086	0310 - 1340	Data logging
086 - 086	1340 - 2010	Acquisition is off, instrument recovery
086 - 093	2010 - 2110	Data logging
093 - 093	2110 - 2150	Acquisition is stopped
093 - 098	2150 - 0150	Data logging
098 - 099	0150 - 0650	Acquisition stopped, instrument recovery
099 - 102	0650 - 1600	Data logging

SEA TEMPERATURE:

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

Day	Time	Comments
069	0330	Data logging/processing begins
102	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
069	0330	Data logging/processing begins
102	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
99031.xt7	07 58.53N 90 36.02W
99032.xt5	23 11.09N 115 48.88W

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	Shots
071	22:14	Line-1	1 .. 2
071	22:14	Line-2	3 93
071	23:34	Line-3	333 4890
072	23:49	Line-4	5000 5917
073	05:12	Line-5	5918 8101

073	15:31	Odpsite1	8050	12410
074	09:35	odphelp	1	4060
075	04:20	odphelps	4075	18682
083	02:48	site1obh	20000	21437
094	05:56	alijos	1	9768
096	02:37	alijos	100000	101037
096	12:48	alijos	1	1303

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
070-071	2100-1500	Acquisition on
072-078	0330-1640	Acquisition on
082-082	0740-1640	Acquisition on
086-086	0320-1320	Acquisition on
086-088	2020-1930	Acquisition on
093-093	0730-1600	Acquisition on
094-096	1520-0500	Acquisition on
099-100	0840-2140	Acquisition on

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

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

1980 theoretical gravity formula

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

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

EW-9903 San Diego, CA, USA OFFICIAL																																						
Pier/Ship	Latitude	Longitude	Reference	Latitude	Longitude																																	
	32 42.378	N 17 14.159	W	32 42.378	N 17 14.159	W																																
Shore ward of the 2nd 400KHz cement pow recepticles has red X painted on the pier 11 sea ward (away from recepicle) and 100 cm the edge of the pier.			same																																			
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<i>Gravity meter is 5.5 meters below CDeck</i>																																						
Difference in meters between Gravity Meter and Pier				7.50	meters																																	
Height Cor = Pier Height * FAA Constant				7.50	0.31	2.33 mGals/min																																
Difference in mGals between Pier and Gravity Meter																																						
Delta L&R = Pier (avg) - Reference * 1.06 L&R/mGal				3283.30	3283.20	1.06																																
						0.11 mGals																																
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Reference + Delta mGals [+ Potsdam]				979535.52	0.11	13.60																																
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Pier Gravity+Height Correction				979549.23	2.33	979551.56 mGals																																
Current Mistie =																																						
BGM Reading - Calculated Gravity				979550.70	979551.55	-0.85 mGals																																