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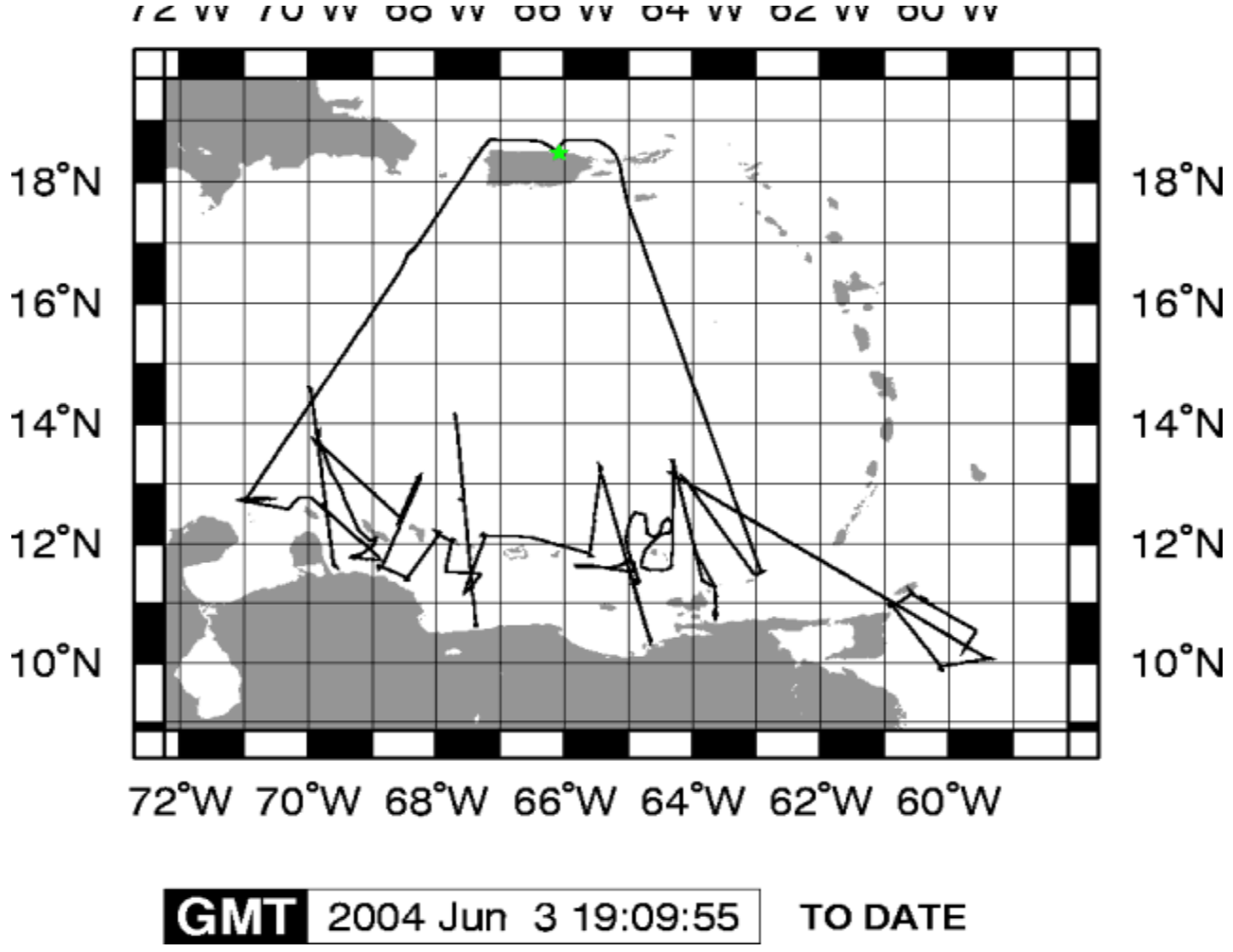
R/V Maurice Ewing Data Reduction Summary

EW–0404 San Juan, Puerto Rico – San Juan, Puerto Rico

Date	Julian Date	Time	Port
April 19, 2004	109	06:11:16	San Juan, Puerto Rico
June 3, 2004	155	12:37:20	San Juan, Puerto Rico



Project Summary

DESCRIPTION

Background and Scientific Objectives

Continental interiors are constructed of island arcs and micro−continent fragments. Theories of continental formation rely on island arc accretion to continental margins as a primary means of post−Archean continental growth. The Caribbean−South American plate boundary zone is the result of Caribbean−American plate interactions starting in the Mesozoic, that are now accreting the Leeward Antilles arc to the South American craton. The Leeward Antilles arc has been diachronously colliding obliquely along this boundary since the Eocene, starting in western Venezuela and migrating eastward with the Caribbean plate relative to South America. This plate boundary and the processes associated with it have been active in near present form for ~50Ma. The boundary now consists of trenches of opposite polarity at either end of a >1000 km long right lateral transpressional zone. This shear zone extends from the Gulf of Paria between Trinidad and Venezuela, to Colombia, connecting the NW−dipping Lesser Antilles subduction zone in the east to the SE−dipping Southern Caribbean Deformation Belt subduction zone in the west. Teleseismic tomography and seismicity show the Caribbean plate overriding the Atlantic seafloor of the South American plate east of the Gulf of Paria. In the west the Caribbean plate is subducting beneath continental South America. The subduction polarity reversal and right lateral shear zone connecting the trenches developed following initial collision of the Great Caribbean arc with South America in the mid to Late Cretaceous. The plate boundary now consists of a series of EW−trending allochthonous belts that include the Leeward Antilles arc, the metamorphic belts of the Caribbean Mountain system, the para−autochthonous Serranía del Interior foreland fold and thrust belt, and associated foreland and shear zone basins.

In addition to the eastward migrating Lesser Antilles trench and accreting Leeward Antilles island arc, a number of other time transgressive tectonic events are associated with this plate boundary, including the exhumation of the high pressure−low temperature (HP/LT) metamorphic belts of the Caribbean Mountain system, the formation of the Serranía fold and thrust belt and associated foreland basins, and the formation of basins within the strike−slip system. All of these tectonic processes appear to have begun in the Eocene in the west and have subsequently moved eastward along the margin. The HP/LT rocks (up to 75 km depth) are now at the surface in margin parallel belts in which initial data suggests that progressively shallower HP/LT metamorphic rocks have been exhumed from west to east. We conjecture that the ascent and exhumation of the metamorphic belts is the result of strike−slip, extension, and compression that operate in concert. Strike slip and arc−parallel extension tectonically unroof deeply buried rocks that are then obducted southward over the margin and eroded. The mantle involvement in this exhumation process is poorly understood. The orogenic belt has developed above a crustal scale basal decollement into which both the thrust faults and the strike−slip faults merge, making the entire crust of the plate boundary a zone of orogenic float rooting to the mantle. This geometry

provides a pathway for HP rocks subducted in the mantle to mechanically re−enter the crust.

We propose a multi−disciplinary investigation to test hypotheses related to arc−continent collision and accretion, HP/LT rock exhumation, and the development of folded belts and sedimentary basins. We will time the cessation of arc magmatism associated with arc accretion, and time and measure peak conditions of HP/LT metamorphism and exhumation along the plate boundary. The geometries of arc accretion, exhumation, the folded belt, and basins will be investigated throughout the margin with active and passive land and marine seismic experiments. The timing and uplift histories and the seismic geometries will constrain geodynamic models of margin development that make use of realistic crust and mantle rheologies in 2D and 3D. The research will provide an understanding of the time−transgressive history and crust−mantle mechanical processes by which island arcs accrete to continents, deeply buried HP/LT rocks are exhumed, and folded belts and different types of sedimentary basins form along oblique collision zones. We will examine the interplay of the crust and subcrustal lithosphere during arc accretion and metamorphic belt exhumation, and how subduction polarity reverses. We will determine the flow patterns of the sub−lithospheric mantle beneath the plate boundary and northern South America as a whole, around the two subducting plates, and beneath the right lateral shear zone between them.

Cruise Members

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Cruise Notes

All data in this report is logged using GMT time and Julian days in order to avoid confusion with local time changes.

Hydrosweep

Hydrosweep acquisition was solid during this cruise with less than 2 % average dropouts. No processing was done on the Hydrosweep bathymetry

On julian day 118 at 23:07, the 0404.hs sound velocity profile was entered in the DS2. The hydrosweep online workstation crashed on julian day 129 and upon reboot, tan old sound velocity profile (from 0403) was loaded. The correct svp was re−applied, but the exact time was not noted. Also, on julian day 143, the c−keel port hung and a value of (−214) was used for almost three hours. This was fixed @ 04:34.

Gravity

We received our calibrated gravitimeter in San Juan just prior to sailing. At 20:00 on julian day 110, we switched from a borrowed unit to our gravimeter. From 02:50 to 04:00, new software was being loaded into the new gravimeter. As a result acquisition was spotty.

Magnetics

Magnetic data acquistion was not good over the course of the entire cruise and the fish was lost on julian day 149.

Seismic Acquisition

There were many failures of the Syntron system this cruise. Several were related to tape drive problems while others may have been precipitated by a failing seisnet data acquistion system. Ultimately we abandoned Seisnet in favor of using 3490 tape for brute stacks, segy QC file generation and tape copying.

Streamer configuration files are included on the tape in Excel 97 format.

Data Logging

The R/V Maurice Ewing data logging system is run on a Sparc Ultra Enterprise Server. Attached are 48 serial ports via 3 16−port Digi International SCSI Terminal Servers. Generally, all data logged by the Ewing Data Acquisition System (DAS) is time stamped with the CPU time of the server, and broadcast to the Ewing network using UDP packet broadcasts. The CPU time of the server is synchronized once every half hour to a Datum UTC gps time clock.

GPS times are also time−tagged with cpu time, although the time of the GPS position is from the GPS fix itself.

The following tables describe the data instruments which performed logging during this cruise. The tables associated with the instruments describe logging periods and data losses for that instrument.

Time Reference

JOETIME

logging interval: 10 seconds
file id: tr3

Used as the CPU synchronization clock. This clock is polled once every ten seconds to synchronize the CPU clock of the data logger to UTC time. The logger (octopus) is responsible for updating the times of the other CPUs.

This clock was running and synchronizing the system the entire cruise.

Interruption s greater than 30 minutes are displayed in the following table

Log Date	LogDate	Comment
2004+109:06:05:39.779		Logging officially started
2004+148:10:44:29.080	2004+148:20:34:56.782	Data Interruption
2004+154:23:59:50.719		Logging officially ends

GPS Receivers

GPS data is usually logged at 1−2 second intervals. The NMEA strings GPGGA and GPVTG are logged for position, speed, and heading fixes. This data was logged constantly throughout the cruise.

The POS/MV with auxillary input from the C−Nav Global DPGS was the primary GPS for this cruise.

Trimble Tasmon P/Y Code Receiver

logging interval: 10 seconds
file id: gp1

The Tasmon GPS receiver's accuracy is around 15 meters.

Interruptions greater than 10 minutes are displayed in the following table

Log Date	LogDate	Comment
2004+109:06:01:00.766		Logging officially started
2004+144:00:18:58.500	2004+144:02:36:03.654	Data Interruption
2004+154:23:59:58.963		Logging officially ends

Trimble NT300D

logging interval: 2 seconds
file id: gp2

The Trimble is the secondary receiver for GPS data. Data is logged at 2 second intervals and is also used as an input to Spectra, although it is weighed at a lower value than the Tasmon receiver.

Interruptions greater than 10 minutes are displayed in the following table

Log Date	LogDate	Comment
2004+109:06:05:57.403		Logging officially started
2004+130:14:32:17.949	2004+130:14:43:04.427	Data Interruption
2004+152:07:56:31.542	2004+152:08:25:23.341	Data Interruption
		Logging Ends

C−Nav

logging interval: 2 seconds
file id: gp3

The C−Nav is a global satellite−based differential receiver. This is the best individual receiver currently on the ship.

Interruptions greater than 10 minutes are displayed in the following table

Log Date	LogDate	Comment
2004+109:06:06:11.536		Logging officially started
2004+155:12:37:18.722		Logging Ends

POS/MV

logging interval: 1 second
file id: gp4

The POS/MV is a receiver which uses C−Nav input, its own antennae, an inertial sensor, and optional RTCM corrections (when available) and a kalman filter to produce a smooth nav output and very accurate heading. As of June 2003 it is used as the primary GPS for Hydrosweep, as an input to Spectra, and can be used as the gps for reduction processing. With the C−Nav auxiliary input, this is the most accurate receiver on the ship.

Interruptions greater than 10 minutes are displayed in the following table

Log Date	LogDate	Comment
2004+109:06:11:16.141		Logging officially started
2004+155:12:37:20.819		Logging Ends

Tailbuoy Garmin GP8

logging interval: 10 seconds
file id: tb1

Also note that often, the tailbuoy was being logged while it was on deck for testing purposes.

Interruptions greater than 30 minutes are displayed in the following table

Log Date	Log Date	Comment
2004+109:20:55:00.520		Tailbuoy logging starts
2004+110:13:23:56.523	2004+111:14:06:58.605	Data Interruption
2004+111:14:12:22.510	2004+111:14:43:50.474	Data Interruption
2004+111:19:21:37.462	2004+111:20:15:51.826	Data Interruption
2004+113:15:44:09.634	2004+113:19:38:52.574	Data Interruption
2004+113:20:46:58.528	2004+113:21:59:38.712	Data Interruption
2004+113:22:09:53.494	2004+118:20:21:32.059	Data Interruption
2004+118:20:26:21.476	2004+118:23:18:33.618	Data Interruption
2004+118:23:20:13.684	2004+119:00:27:21.465	Data Interruption
2004+119:00:27:41.531	2004+119:08:02:13.384	Data Interruption
2004+127:00:58:21.466	2004+127:05:01:20.456	Data Interruption
2004+127:05:26:44.453	2004+127:10:15:19.143	Data Interruption
2004+135:20:02:41.484	2004+136:00:11:26.306	Data Interruption
2004+137:18:20:56.585	2004+138:23:18:18.644	Data Interruption
2004+140:05:39:57.461	2004+140:09:16:32.919	Data Interruption
2004+153:04:42:32.463	2004+153:09:29:18.774	Data Interruption
2004+153:09:31:32.475		Tailbuoy logging officially ends

Speed and Heading

Furuno CI−30 Dual Axis Speed Log
Sperry MK−27 Gyro

logging interval: 3 seconds
file id: fu

The Furuno and Gyro are combined to output speed, heading and course information to a raw Furuno file, as well as an NMEA VDVHW signal used as an input to various systems including steering and Spectra.

Interruptions greater than 30 minutes are displayed in the following table

Log Date	Log Date	Comment
2004+109:06:06:51.681		Official start date
2004+114:14:09:03.485	2004+118:18:18:17.640	Data Interruption
2004+155:12:37:20.410		Official end date

Gravity

Bell Aerospace BGM−3 Marine Gravity Meter System

logging interval: 1 second
file id: vc. (raw), vt. (processed)
drift per day: 0.081

The BGM consists of a forced feedback accelerometer mounted on a gyro stabilized platform. The gravity meter outputs raw counts approximately once per second which are logged and processed to provide real−time gravity displays during the course of the cruise as well as adjusted gravity data at the end of the cruise.

Interruptions greater than 10 minutes are displayed in the following table

Log Date	Log Date	Comment
2004+109:06:07:17.337		Official start date
2004+128:02:50:33.578	2004+128:03:04:29.324	Data Interruption
2004+128:03:04:41.323	2004+128:03:51:45.565	Data Interruption
		Official end time

Bathymetry

Krupp Atlas Hydrosweep−DS2

logging interval: variable based on water depth
file id: hb (centerbeam), hs (swath)

The hydrosweep full swath data is continuously logged for every cruise, and centerbeam data is extracted and processed separately. The centerbeam operates at a logging frequency dependent on the water depth.

The full swath data is not routinely processed, but can be processed with the MB−System software which can be downloaded for free. For instructions, use the website: http://www.ldeo.columbia.edu/MB−System.

MBSystem, version 5.0beta3 is necessary to process data after June 1, 2001.

Interruptions greater than 10 minutes are displayed in the following table

Log Date	LogDate	Comment
2004+109:13:29:33		Official start logging
2004+114:13:17:50	2004+118:18:54:01	Data Interruption
2004+141:23:57:54	2004+142:01:19:23	Data Interruption
2004+142:07:57:41	2004+142:10:27:35	Data Interruption
2004+148:10:42:01	2004+148:11:03:43	Data Interruption
2004+148:17:40:56	2004+148:18:17:07	Data Interruption
2004+155:12:30:35		Official end logging

Weather Station

RM Young Precision Meteorological Instruments, 26700 series

logging interval: 1 minute
file id: wx

The weather station is used to log wind speed, direction, air temperature, and barometric pressure. We log this information at 1−minute intervals.

Log Date	LogDate	Comment
2004+109:06:08:31.480		Official start logging
2004+117:13:31:00.520	2004+118:18:19:12.079	Data Interruption
2004+118:18:19:12.079	2004+118:19:05:50.159	Data Interruption
2004+155:12:37:00.300		Official end logging

Magnetics

Varian Magnetometer

logging interval: 16 seconds
file id: mg

The following table shows the times the magnetometer was logging

Log Date	LogDate	Comment
2004+113:00:14:45.651	2004+113:18:17:12.411	Logging officially started
2004+119:02:19:22.688	2004+119:08:46:08.300	
2004+119:16:13:28.767	2004+120:19:06:38.286	
2004+123:16:10:41.675	2004+123:17:14:44.359	
2004+123:17:49:36.542	2004+123:17:54:40.538	
2004+124:00:21:05.663	2004+124:00:35:31.561	
2004+124:01:17:39.594	2004+137:00:08:11.469	
2004+139:01:49:31.673	2004+141:11:38:05.212	
2004+142:10:59:33.258	2004+142:16:17:32.850	
2004+142:17:24:29.989	2004+142:17:42:25.609	
2004+142:19:01:07.390	2004+145:13:46:20.090	
2004+145:22:36:51.069	2004+147:21:02:44.219	
2004+148:00:03:21.983	2004+148:10:44:17.311	Logging officially ends

LOCATION 1

EW0403 San Juan, Puerto Rico

Pier/Ship	Latitude	Longitude
	60 23.322N	005 18.572E

Pier #13

Reference	Latitude	Longitude

Gravimeter calibrated at Lockheed Martin; zeroed drift.

	Id	Julian	Date	Mistie	Drift/Day	Prev Mistie
Pre Cruise					0.00	28.73
Post Cruise	EW0403	106			Err:503	0.00
Total Days			0.00	0.00		

Time	Entry	Value	
05:30:00	CDeck Level BELOW Pier	0.00	
22:00:00	Pier 1 L&R Value		L&R
13:15:00	Reference L&R Value		L&R
05:30:00	Pier 2 L&R Value		L&R
	Reference Gravity		mGals
	Gravity Meter Value (BGM Reading)		mGals
	Needs Potsdam Correction	0	1 if Potsdam referenced

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

Difference in meters between Gravity Meter and Pier: 0.00 meters

Height Cor = Pier Height* FAA Constant

Pier Height*	FAA Constant			
0.00	0.31			0.00 mGals/min

Difference in mGals between Pier and Gravity Meter

Pier (avg) −	Reference *	1.06 L&R/mGal		Delta L&R
0.00	0.00	1.06		0.00 mGals

Gravity in mGals at Pierside

Reference + Delta mGals [+ Potsdam]				IGSN−71 Referenced Pier (
0.00	0.00	0.00		0.00 mgals

Gravity in mGals at Meter

Pier Gravity+	Height Correction			Gravity@meter
0.00	0.00			0.00 mGals

Current Mistie

BGM Reading	Calculated Gravity			Current Mistie
0.00	0.00			0.00 mGals

Location 2

EW0404 San Juan, Puerto Rico

Pier/Ship	Latitude	Longitude
	18 27.65002N	066 05.54170W

Pierside reading was taken exactly at the reference point on map

Reference	Latitude	Longitude

Reference station at bollard base next to Water Pipe housing.

	Id	Julian	Date	Mistie	Drift/Day	Prev Mistie
Pre Cruise	EW0403	105	14. Apr 03	0.00	0.00	28.73
Post Cruise	EW0404	155	15. Jun 03	5.00	0.081	0.00
Total Days			62.00	5.00		

Time	Entry	Value	
10:30:00	CDeck Level BELOW Pier	0.00	
10:50:00	Pier 1 L&R Value	2328.72	L&R
10:50:00	Reference L&R Value	2328.72	L&R
11:00:00	Pier 2 L&R Value	2328.70	L&R
	Reference Gravity	978666.71	mGals
	Gravity Meter Value (BGM Reading)	978671.70	mGals
	Needs Potsdam Correction	0	1 if Potsdam referenced

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

Difference in meters between Gravity Meter and Pier _____ meters

Height Cor = Pier Height* FAA Constant

0.00	0.31			0.00 mGals/min

Difference in mGals between Pier and Gravity Meter

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

2328.71	2328.72	1.06		−0.01 mGals

Gravity in mGals at Pierside

Reference + Delta mGals [+ Potsdam] **IGSN−71 Referenced Pier**

978666.71	−0.01	0.00		978666.70 mgals

Gravity in mGals at Meter

Pier Gravity+ Height Correction **Gravity@meter**

978666.70	0.00			978666.70 mGals

Current Mistie

BGM Reading Calculated Gravity **Current Mistie**

978671.70	978666.70			5.00 mGals

For all formats, a – in the time field means an invalid value for some reason.

Streamer Compass/Bird Data cb.r

This data is not processed, but can still be found in the "processed" data directory.

```
Shot Time               Line     Shot     Latitude      Longitude

2000+079:00:08:40.085  strike1 000296  N 15 49.6217 W 060 19.8019

2nd GPS Position                      Tailbuoy Position
Latitude     Longitude                Latitude     Longitude

N 15 49.6189 W 060 19.8101    N 15 47.1234 W 060 20.1901

Furuno  Streamer
Gyro    Compasses & Heading

344.1       C01 2.3 C02 1.7  ...
```

Gun Depths dg

Gun depths in tenths of meters. There will always be 20 gundepths even if only one gun was configured and shooting.

```
                        Gun Depths
Shot Time               1   2   3  4    5   6   7   8   9  ...  20

2001+089:06:47:05.909 189 068 005 005 096 005 060 054 005 ... 6
```

Raw Furuno Log fu.s

This data has been smoothed and output 1 fix per minute.

```
CPU Time Stamp         Track Speed Hdg   Gyro

2000+166:00:01:53.091 –     4.4   140.5 148.3
```

Hydrosweep Centerbeam hb.n

Hydrosweep data merged with navigation

```
                              Centerbeam
CPU Time Stamp       Latitude Longitude          Depth

2000+074:09:55:00.000  N 13 6.6206    W 59 39.3908   134.9
```

Merged Data m

```
                                                        GPS
CPU Time Stamp         Latitude     Longitude          Used  Set  Drift Depth

2000+200:12:25:00.000  N 45 54.1583 W 42 47.1770       gp1   0.0  0.0

Magnetic                        Gravity
Total Intensity   Anomaly     FAA  GRV       EOTVOS   Drift   Shift

49464.7           55.5        22.2 980735.0   –8.4     –0.1     2.8

Temperature Salinity Conductivity

0.0         0.0      0.0
```

The gravity drift and shift are values that have been added to the raw gravity to make up for drift in the meter that has been lost in accordance with a gravity check at each port stop.

Temperature,Salinity and Conductivity will only be valid while logging a Thermosalinograph, which is not usually the case.

Magnetics Data mg.n

- A minus sign in the time stamp is flagged as a spike point, probably noise...
- Anomaly is based on the International Geomagnetic Reference Field revision 2000

```
CPU Time Stamp        Latitude     Longitude      Raw Value Anomaly
200+077:00:23:00.000 N 16 11.2918 W  59 47.8258 36752.2   -166.8
```

Navigation File n

```
CPU Time Stamp         Latitude     Longitude       Used  Set  Drift
2000+074:00:03:00.000 N 13 6.2214  W  59 37.9399   gp1   0.0   0.0
```

Navigation Block nb0

Navigation is a compendium of Ewing logged data at shot time. The shot position here is the shot position from the Spectra system.

```
Shot Time               Shot # CPU Time               Shot Position
2001+088:00:00:00.606 016967 2001+088:00:00:03.031 N 30 11.8324 W 042 10.8162

Water  Sea    Wind   -------------Tailbuoy------------------ Line
Depth  Temp Spd  Dir Latitude     Longitude     Range Bearg Name   Speed Heading
2565.1 20.7 16.4 164 N 30 12.0427 W 042 14.7319 6296.3 93.5 MEG-10 4.2   101.1
```

Tailbuoy Navigation tb1.c

Raw tailbuoy fixes

```
CPU Time Stamp         Latitude     Longitude       GPS Precision
2001+088:00:00:02.000 N 30 12.0424 W 042 14.7309   SA
```

GPS Precision is either SA, DIFF or PCODE

Ewing Processed Shot Times ts.n

Shot times and positions based on the Ewing navigation data processing

```
CPU Time Stamp         Shot # Latitude     Longitude     Line Name
2000+079:00:08:01.507 000295 N 15 49.5703 W 060 19.7843 strike1
```

Shot Data Status ts.n.status

The ts.nxxx.status file describes the line information for that day, giving some basic statistics about the line: start, end times; missing shots; start and end shots.

```
LINE   strike1: 98+079:00:00:15.568 : 000283 .. 002286
        MISSING: 347, 410, 1727
LINE   dip2: 98+079:23:05:22.899 : 000002 .. 000151
```

This example says that on Julian Day 079 of 1998, two lines (strike1 and dip2) were run: the end of strike 1 (shots 000283 to 002286) and the start of dip2 (shots 000002 to 000151).

Line strike1 had some missing shots in the data file (probably missing on the SEG-d header as well).

Spectra Shot Times — nb2.r

The shot times and positions based on the Spectra positioning; with raw tailbuoy range and bearing.

```
CPU Time Stamp          Shot # Latitude      Longitude      Line Name
2001+084:00:00:05.924 009245 N 23 31.2410 W 045 25.0894

                                Tailbuoy
Latitude      Longitude      Range  Bearing  Line Name
N 23 30.4540 W 045 21.4338 6389.8 283.2    KANE-4
```

Raw Gravity Counts — vc.r

sample BGM-3 gravity count record (without time tag):

```
pp:dddddd ss
|    |    |___________ status: 00 = No DNV error; 01 = Platform DNV
|    |                         02 = Sensor DNV;   03 = Both DNV's
|    |________________ count typically 025000 or 250000
|_____________________ counting interval, 01 or 10
                       The input of data can be at 1 or 10 seconds.
```

Gravity Data — vt.n

* A minus sign in the time stamp is flagged as a spike point
* m_grv3 calculates the Eotvos correction as:
  eotvos_corr = 7.5038 * vel_east * cos(lat) + .004154 * vel*vel
* The theoretical gravity value is based upon different models for the earth's shape.
  - 1930 = 1930 International Gravity Formula
  - 1967 = 1967 Geodetic Reference System Formula
  - 1980 = 1980 Gravity Formula
* The FAA is computed as:
  faa = corrected_grv – theoretical_grv
* Velocity smoothing is performed w/ a 5 point window

```
CPU Time Stamp          Latitude      Longitude      Model FAA      RAW
2000+148:00:10:00.000 N 09 34.7255 W 085 38.5826 1980  9.48    978264.16

Eotvos  Drift DC      Raw  Velocity     Smooth Velocity
Smooth  Total Shift   North     East     North    East
-74.78  0.06  4.16    1.875 -10.373     1.927 \10.166
```

Datum Time — ts2.r

```
CPU Time                Datum Time        Time Reference
2001+069:00:15:29.727 069 00 15 29.378 datum
```

Raw GPS — gp(12).d, tb1.d

Raw GPS is in NMEA Format.

Meteorological Data wx

```
                          True
CPU Time Stamp          Spd Dir

2001+045:00:00:00.967   7.8  22

Bird1:                                                Bird 2
Speed                     Direction                   Speed                     Direction
Inst  60sA   60mA  60sM  Inst 60sA 60mA              Inst  60sA  60mA  60sM    Inst 60sA 60mA

7.8   6.6    8.5   16.8  277  291  5                 0.0   0.0   0.0   0.0     0    0    0

Temperature                    Humidity
Inst  60mA  60mm  60mM         Inst 60mm 60mM          Barometer

15.0  14.2  14.3  15.1         92   90   93            1027.5

Inst:       Current
60sA:       60 second average
60mA:       60 minute average
60sM:       60 second maximum
60mm:       60 minute minimum
60mM:       60 minute maximum
```

Merged Meteorological Data mmet

```
TSG, WX, CT merged with Nav at 1 minute fixes
date        time        lat       lon       gpu head spd
2001+244:00:00:00.000 12.14071 44.98469 gp1 10.2 83.0

tws  twd   temp hum  press  cti  cte  con sal  ct
26.5 228.0 30.6 87.0 1000.8 28.8 28.8 5.9 36.3 28.8

gpu  = gps unit in use
head = ship's heading
spd  = ship's speed in knots
tws  = true wind speed
twd  = true wind direction
temp = air temp (celcius)
hum  = relative humidity (%)
press= pressure in mb
cti  = sea temp from the internal TSG sensor
cte  = sea temp from the external TSG sensor
con  = conductivity, Siemens/meter
sal  = salinity, practical salinity units
ct   = sea temp from the C-keel sensor (to tenths of a degree)
```

Shot Times from Spectra P1 Files shots.p1

```
These files were created with the script: extract_shots_from_p1 -a 1
Epoch Time    Shot#  Source Lat/Lon         TB Lat      TB Lon
985788741.000 015570 30.283881 -41.854536  30.320144  -41.886642
Vessel Ref Lat/Lon   Antenna GPS Lat/Lon     Water Depth
```

30.283478 −41.854117 30.283531 −41.854078 2894.2

- Source is the Center of the Guns
- TB is the Tailbuoy, according to Spectra
- Vessel Ref is the location of the center of the Mast
- Antenna GPS is the location of Antenna 1 (−a 1 flag); in this case is the Tasmon GPS
- Water Depth is the HS Centerbeam depth

Shot Times from Spectra P2 Files shots.p2

These files were created with the script: *extract_shots_from_p2 −o "V1 G1"*

Epoch Time Shot# Vessel Ref Lat/Lon Source Lat/Lon

985716772.4 00015572 30.282803 −41.866136 30.283207 \41.866540

- Vessel Ref is the location of the center of the Mast
- Source is the Center of the Guns

Scripts

Included are some scripts for extracting information out of the P1 and P2 formatted files. In order to use these scripts you will also need to install the Ewing Perl libraries included in the scripts directory, or at least include that directory in your PERL5LIB environment. The use of perl is beyond the scope of this document.

extract_shots_from_p1 [−a antenna] [−h] filename

Given an input P1 File, create a shotpoint file with the times, and the positions of the given antenna [1 = tasmon, 2 = Trimble] and optionally the header records at the beginning of the file.

The output will be:

```
epochtime shotnumber sourcePos tbPos vesselPos antennaPos depth
```

- **epochtime** is the # of seconds since Jan 1, 1970
- **shotnumber** is the shot number
- **sourcePos** is the center position of the sound source [lat lon]
- **tbPos** is the position of the tailbuoy [lat lon]
- **vesselPos** is the position of the vessel reference (center of mast) [lat lon]
- **antennaPos** is the position of the specified antenna [lat lon]
  1 = tasmon, 2 = trimble
- **depth** is the water depth in meters

extract_shots_from_p2 [−s shotnumber] [−o "output values"]

−s define if you only want the statistics for a single shot

−o "*outputs*" defines the outputs you want from the P2 file.

This routine will output by default the shotpoint, the line name and the shot time. Optionally, you can output position (Lat Lon) info for a number of items:

Outputs can be one or more of the following:

- V1 Vessel 1 Reference
- V1G1 Tasmon GPS Receiver
- V1G2 Trimble GPS Receiver
- V1E1 Hydrosweep Transducer
- TB1 Tailbuoy 1
- S1 Streamer 1
- V1SC Streamer Compasses
- G1 Gun Array 1

All the formats output a Lat Lon pair in decimal degrees. (*West and South being negative*)

Output will be: `epochtime shotnumber [output lat/lon pairs]`

Tape Contents

EW0404/

EW0404.pdf	this document
ew0404.cdf	NetCDF database file of this cruise
ew0404.cdf_nav	NetCDF database file of this cruise' navigation
docs/	File Formats, Spectra manuals
mbsystem/	Latest on−board mbsystem source
MMO/	Marine mammal observer files
processed/	Processed datafiles merged with navigation
shotlogs/	processed Shot Files
trackplots/	daily cruise track plots (*postscript*)
raw/	Raw data directly from logger
reduction/	Reduced data files
clean/	daily processing directory, includes daily postscript plots of the data.
fixes/	fixes for the RTNu HS loss of d088
scripts/	Perl scripts and their friends
segy_patches/	Segy patches constituted from 3490 tape
seismic_metadata/	Lamont seismic archive DLT logs
sioseis_scripts/	Sioseis csh scripts for SIOui
spectra/	P1/90, P2/94, and config files from MCS lines
streamer/	Excel spreadsheets of streamer configuration
XBTs/	XBT data and sound velocity profiles