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Prepared On: May 20, 2005



R/V Maurice Ewing Data Reduction Summary

EW-0411 San Diego, CA – Putarenas, Costa Rica

| Date | Julian Date | Time | Port |
|-------------------|-------------|----------|------------------------|
| November 9, 2004 | 314 | 00:00:01 | San Diego, CA |
| November 19, 2004 | 324 | 21:03:05 | Puntarenas, Costa Rica |

Project Summary

DESCRIPTION

Background and Scientific Objectives

This leg was a transit. Standard transit data collection policy applied.
No hydrosweep data was collected.

Cruise Members

Science Party

No science party on board

Ship's Science

| | | |
|------------------|-----------------|--|
| Karl Hagel | Science Officer | sci@ewing.ldeo.columbia.edu |
| John Dibernardo | PSSO | honey@ldeo.columbia.edu |
| Carlos Gutierrez | Gunner | carlosgu@ldeo.columbia.edu |
| Dietmar Kathmann | ET | kathmann@ldeo.columbia.edu |
| Justin Walsh | Gunner | cabinboy@ldeo.columbia.edu |

Ship Crew

| | | |
|---------------------|----------------------------|--|
| Mark Landow | Captain | captain@ewing.ldeo.columbia.edu |
| Steven Pica | Chief Engineer | engine@ewing.ldeo.columbia.edu |
| Dave Wolf | 1 st Mate | wolf@ewing.ldeo.columbia.edu |
| RJ Lyons | 2 nd Mate | rilyonsj@ewing.ldeo.columbia.edu |
| Elliot Gabbert | 3 rd Mate | elliott@ewing.ldeo.columbia.edu |
| Matt Tucke | 1 st A/Engineer | tuk@ewing.ldeo.columbia.edu |
| Bradford McDermott | 2 nd A/Engineer | brad@ewing.ldeo.columbia.edu |
| Hieu Nguyen | 3 rd A/Engineer | hieu@ewing.ldeo.columbia.edu |
| Gary Braddock | Steward | steward@ewing.ldeo.columbia.edu |
| David Philbrick | Bosun | davidp@ewing.ldeo.columbia.edu |
| Rios, Ricardo | Cook | ricardo@ewing.ldeo.columbia.edu |
| Beckett, Jeremy | A/B | jeremyb@ewing.ldeo.columbia.edu |
| Montgomer, Victoria | Utility | victoria@ewing.ldeo.columbia.edu |
| Florendo, Rudy | Oiler | florendo@ewing.ldeo.columbia.edu |
| Guinn, David | A/B | guinn@ewing.ldeo.columbia.edu |
| McBride, Brandon | O/S | mcbride@ewing.ldeo.columbia.edu |
| Otto, Eugene | A/B | eugene@ewing.ldeo.columbia.edu |
| Mardones, George | Oiler | george@ewing.ldeo.columbia.edu |
| Schallenkamp, Dean | Oiler | dean@ewing.ldeo.columbia.edu |

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

No Hydrosweep data was collected during this cruise.

Gravity

The gravimeter performed normally.

Navigation

Navigation operated normally.

Timing

Timing operated normally.

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 to a 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

DATUM

logging interval: 30 min
file id: tr2

Used as the CPU synchronization clock. This clock is polled once every thirty minutes 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.

Interruptions greater than 30 minutes are displayed in the following table

| Log Date | LogDate | Comment |
|-----------------------|---------|----------------------------|
| 2004+314:00:00:00.000 | | Logging officially started |
| 2004+324:21:00:00.000 | | 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 the CNAV GcGPS as an auxiliary input was the primary gps for this cruise.

Trimble Tasmon P/Y Code Receiver

logging interval: 2 seconds
file id: gp1

The Tasmon is the primary GPS receiver for the Ewing Logging system and the primary GPS for Spectra fixes. The accuracy is around 15 meters. There were no interruptions during this cruise.

Interruptions greater than 10 minutes are displayed in the following table

| Log Date | LogDate | Comment |
|-----------------------|---------|----------------------------|
| 2004+314:00:00:00.000 | | Logging officially started |
| 2004+324:21:00:00.000 | | Logging officially ends |

Trimble NT200D

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+314:00:00:00.000 | | Logging officially started |
| 2004+324:21:00:00.000 | | 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+314:00:00:00.000 | | Logging officially started |
| 2004+314:21:52:44.809 | 2004+314:23:04:57.121 | Data Interruption |
| 2004+324:21:00:00.000 | | 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 RTG, WTC, or WAAS 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+314:00:00:00.000 | | Logging officially started |
| 2004+316:00:30:24.010 | 2004+319:15:15:18.661 | Data Interruption |
| 2004+324:21:00:00.000 | | Logging Ends |

Tailbuoy Garmin GP8

logging interval: 10 seconds
file id: tb1

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 |
|----------|----------|----------------------------------|
| N/A | | Tailbuoy logging starts |
| N/A | | 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+314:00:00:00.000 | | Official start date |
| 2004+324:21:00:00.000 | | 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: 0.018

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+314:00:00:00.000 | | Official start date |
| 2004+324:21:00:00.000 | | 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.ideo.columbia.edu/MB-System>.

MBSsystem, 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 |
|----------|---------|------------------------|
| N/A | | Official start logging |
| N/A | | 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+314:00:00:00.000 | | Official start logging |
| 2004+324:21:00:00.000 | | Official end logging |

Magnetics

Geometrix G-882 Magnetometer

logging interval: 12 seconds
file id: mg

The magnetometer employs a Cesium atomic magnetic resonance system operating as the frequency controlling element of an oscillator. The frequency of the oscillation varies directly with the external magnetic field at the sensor.

The following table shows the times the magnetometer was logging

| Start Log Date | End LogDate | Comment |
|----------------|-------------|------------------------|
| N/A | | Official start logging |
| N/A | | Official end logging |

Gravity Ties

LOCATION 1

EW0410 San Diego, CA

| Pier/Ship | Latitude | Longitude |
|----------------------------------|------------|-------------|
| | 32 42.393N | 117 14.170W |
| Scripps Pier on Rosecrans Street | | |
| Reference | Latitude | Longitude |
| | 32 42.399N | 117 14.187 |
| EW0406 gravity tie reference. | | |

| | Id | Julian | Date | Mistie | Drift/Day | Prev Mistie |
|-------------|--------|--------|------------|--------|-----------|-------------|
| Pre Cruise | EW0409 | 288 | 14. Oct 04 | -5.92 | 0.15 | -8.97 |
| Post Cruise | EW0410 | 309 | 04. Nov 04 | -5.53 | 0.018 | -5.92 |
| Total Days | | | 21.00 | 0.39 | | |

| Time | Entry | Value | |
|----------|-----------------------------------|-----------|----------------|
| 0 | CDeck Level BELOW Pier | 0.00 | |
| 16:00:00 | Pier 1 L&R Value | 3148.65 | L&R |
| 15:55:00 | Reference L&R Value | 3149.01 | L&R |
| 16:05:00 | Pier 2 L&R Value | 3148.63 | L&R |
| | Reference Gravity | 979535.52 | mGals |
| | Gravity Meter Value (BGM Reading) | 979544.90 | mGals |
| | Potsdam Corrected | 1 | 1 if corrected |

Gravity meter is 5.5 meters below CDeck

| | | |
|---|------|----------------|
| Difference in meters between Gravity Meter and Pier | 5.50 | meters |
| Height Cor = Pier Height* FAA Constant | 5.50 | 0.31 |
| | | 1.71 mGals/min |

Difference in mGals between Pier and Gravity Meter

| | |
|---------------------------------------|-------------|
| Pier (avg) - Reference *1.06 L&R/mGal | Delta L&R |
| 3148.64 3149.01 1.06 | -0.39 mGals |

Gravity in mGals at Pierside

| | |
|-------------------------------------|-----------------|
| Reference + Delta mGals [+ Potsdam] | Pier Gravity |
| 979535.52 -0.39 13.60 | 979548.73 mgals |

Gravity in mGals at Meter

| | |
|---------------------------------|-----------------|
| Pier Gravity+ Height Correction | Gravity@meter |
| 979548.73 1.71 | 979550.43 mGals |

Current Mistie

| | | |
|-------------|--------------------|----------------|
| BGM Reading | Calculated Gravity | Current Mistie |
| 979544.90 | 979550.43 | -5.53 mGals |

Gravity Ties

Location 2

EW0412 Balboa, Panama

| Pier/Ship | Latitude | Longitude |
|----------------------|-----------|-----------|
| | 18 27.84N | 66 06.36W |
| Pier 2 | | |
| Reference | Latitude | Longitude |
| | 18 27.8N | 66 05.5W |
| Cruise Ship terminal | | |

| | Id | Julian | Date | Mistie | Drift/Day | Prev Mistie |
|-------------|--------|--------|------------|--------|-----------|-------------|
| Pre Cruise | EW0410 | 326 | 04. Nov 04 | -5.53 | 0.15 | 8.99 |
| Post Cruise | EW0412 | 357 | 22. Dec 04 | -0.88 | 0.097 | -5.53 |
| Total Days | | | 48.00 | 4.65 | | |

| Time | Entry | Value | |
|------|-----------------------------------|-----------|----------------|
| 1446 | CDeck Level BELOW Pier | 2.00 | |
| 1446 | Pier 1 L&R Value | 2332.11 | L&R |
| 1446 | Reference L&R Value | 2334.21 | L&R |
| | Pier 2 L&R Value | 2332.11 | L&R |
| | Reference Gravity | 978680.69 | mGals |
| | Gravity Meter Value (BGM Reading) | 978691.80 | mGals |
| | Potsdam Corrected | 1 | 1 if corrected |

Gravity meter is 0.0 meters below CDeck

| | | |
|---|-----------|----------------|
| Difference in meters between Gravity Meter and Pier | 2.00 | meters |
| Height Cor = Pier Height* FAA Constant | 2.00 0.31 | 0.62 mGals/min |

Difference in mGals between Pier and Gravity Meter

| | |
|--|-------------|
| Pier (avg) - Reference * 1.06 L&R/mGal | Delta L&R |
| 2332.11 2334.21 1.06 | -2.23 mGals |

Gravity in mGals at Pierside

| | |
|-------------------------------------|-----------------|
| Reference + Delta mGals [+ Potsdam] | Pier Gravity |
| 978680.69 -2.23 13.60 | 978692.06 mgals |

Gravity in mGals at Meter

| | |
|---------------------------------|-----------------|
| Pier Gravity+ Height Correction | Gravity@meter |
| 978692.06 0.62 | 978692.68 mGals |

Current Mistie

| | |
|---------------------------------|----------------|
| BGM Reading- Calculated Gravity | Current Mistie |
| 978691.80 978692.68 | -0.88 mGals |

File Formats

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.

| <u>Shot Time</u> | <u>Line</u> | <u>Shot</u> | <u>Latitude</u> | <u>Longitude</u> |
|---|------------------|--------------------------|------------------|------------------|
| 2000+079:00:08:40.085 | strike1 | 000296 | N 15 49.6217 | W 060 19.8019 |
| <u>2nd GPS Position</u> | | <u>Tailbuoy Position</u> | | |
| <u>Latitude</u> | <u>Longitude</u> | <u>Latitude</u> | <u>Longitude</u> | |
| N 15 49.6189 | W 060 19.8101 | N 15 47.1234 | W 060 20.1901 | |
| <u>Furuno Streamer Gyro Compasses & Heading</u> | | | | |
| 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.

| <u>Shot Time</u> | <u>Gun Depths</u> | | | | | | | | | | | | | | | | | | |
|-----------------------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|--|--|--|--|--|--|--|--|
| | 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.

| <u>CPU Time Stamp</u> | <u>Track</u> | <u>Speed</u> | <u>Hdg</u> | <u>Gyro</u> |
|-----------------------|--------------|--------------|------------|-------------|
| 2000+166:00:01:53.091 | - | 4.4 | 140.5 | 148.3 |

Hydrosweep Centerbeam

hb.n

Hydrosweep data merged with navigation

| <u>CPU Time Stamp</u> | <u>Centerbeam</u> | | <u>Depth</u> |
|-----------------------|-------------------|------------------|--------------|
| | <u>Latitude</u> | <u>Longitude</u> | |
| 2000+074:09:55:00.000 | N 13 6.6206 | W 59 39.3908 | 134.9 |

Merged Data

m

| <u>CPU Time Stamp</u> | <u>Latitude</u> | <u>Longitude</u> | <u>GPS</u> | | | <u>Drift</u> | <u>Depth</u> |
|--|-----------------|------------------|-------------|---------------|------|--------------|--------------|
| | | | <u>Used</u> | <u>Set</u> | | | |
| 2000+200:12:25:00.000 | N 45 54.1583 | W 42 47.1770 | gp1 | 0.0 | 0.0 | | |
| <u>Magnetic</u> | | <u>Gravity</u> | | <u>EOTVOS</u> | | <u>Drift</u> | <u>Shift</u> |
| <u>Total Intensity</u> | <u>Anomaly</u> | <u>FAA</u> | <u>GRV</u> | | | | |
| 49464.7 | 55.5 | 22.2 | 980735.0 | -8.4 | -0.1 | 2.8 | |
| <u>Temperature Salinity Conductivity</u> | | | | | | | |
| 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 | gpl | 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

tbl.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 | Centerbeam | Depth |
|-----------------------|--------|--------------|---------------|-----------|------------|--------|
| 2000+079:00:08:01.507 | 000295 | N 15 49.5703 | W 060 19.7843 | strikel | | 2345.6 |

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 strikel: 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 (strikel and dip2) were run: the end of strike 1 (shots 000283 to 002286) and the start of dip2 (shots 000002 to 000151).

Line strikel 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 | |
|-----------------------|--------|--------------|---------------|--|

| Latitude | Longitude | Tailbuoy 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:
$$\text{eotvos_corr} = 7.5038 * \text{vel_east} * \cos(\text{lat}) + .004154 * \text{vel} * \text{vel}$$
- * 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:
$$\text{faa} = \text{corrected_grv} - \text{theoretical_grv}$$
- * 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:
Speed                                Bird 2
                                Speed
Inst  60sA  60mA  60sM  Inst 60sA 60mA  Inst  60sA 60mA 60sM  Inst 60sA 60mA
Direction                                Direction
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

Tape Contents

EW0411

| | |
|----------------|---|
| EW0411.pdf | this document |
| ew0411.cdf | NetCDF database file of this cruise |
| ew0411.cdf_nav | NetCDF database file of this cruise' navigation |
| configs/ | Ewing Data System configuration files |
| docs/ | File Formats, Spectra manuals |
| processed/ | Processed datafiles merged with navigation |
| trackplots/ | daily cruise track plots (<i>postscript</i>) |
| mbsystem/ | Latest MBSsystem source code |
| raw/ | Raw data directly from logger |
| reduction/ | Reduced data files |
| clean/ | daily processing directory, includes daily postscript plots of the data. |