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# R/V Maurice Ewing Data Reduction Summary

## EW-0405 San Juan, Puerto Rico - - Tampa, FL

| Date | Julian Date | Time | Port |
|------|-------------|------|------|
| 6/6/04 | 175 | 13:00 GMT | San Juan, PR |
| 6/11/04 | 191 | 17:45 GMT | Tampa, FL |

## Background and Scientific Objectives

This leg was a transit.

# Cruise Members

## Ship's Science

| | | |
|---|---|---|
| Anthony Johnson | Data Reduction | ajohnson@ldeo.columbia.edu |
| Justin Walsh | Gunner | cabinboy@ldeo.columbia.edu |
| Howie Goldstein | MMO | |
| Joseph Beland | MMO | |

## Ship Crew

| | | |
|---|---|---|
| James O'Loughlin | Captain | captain@ewing.ldeo.columbia.edu |
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| Lorne Bonney | A/B | |
| David Guinn | A/B | |
| Elmo Harvey | Oiler | |
| George Mardones | Oiler | |
| Victoria Montgomery | Utility | |
| Nolan Osorio | O/S | |
| Michael Quick | A/B | |
| Fernando Uribe | Oiler | |
| Stan Zygarlicki | A/B | |

# Cruise Notes

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

## Furuno

The furuno data was intermittent during the beginning of the cruis. The Furuno was set to ground track at the beginning of the cruise, and data readings were intermittent starting on day 176. The problem was identified, and the furuno set to water track at 2004+176:17:26. Furuno data collection operated normally after that.

## Sea Temperature

Sea temperature logging did not begin until 2004+177:19:34.

## Spectra

Spectra was not operated during this cruise.

## Hydrosweep

Hydrosweep acquisition was fairly good during this cruise. No processing was done on the Hydrosweep bathymetry.

## Gravity

BGM operation was normal during this cruise.

## Time

Time operated normally. Data collected on octopus was tagged with the Joetime clock.

## Magnetics

No magnetics data was collected during this cruise.

## Seismic Acquisition

No seismic data was collected during this cruise.

# 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 half hour 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 |
| --- | --- | --- |
| | | Logging officially started |
| | | Logging officially ends |

## GPS Receivers

GPS data is usually logged at 10 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 was the primary GPS for this cruise.

### Trimble Tasmon P/Y Code Receiver

**logging interval:**     10 seconds
**file id:**                gp1

The Tasmon is the primary GPS receiver for the Ewing Logging system and the

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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+174:17:43:46.290 | | Logging officially started |
| 2004+191:17:51:19.785 | | Logging officially ends |

### Trimble Tasmon P/Y Code Receiver

**logging interval**:     10 seconds
**file id:**     gp2

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+174:17:43:46.290 | | Logging officially started |
| 2004+191:17:51:19.785 | | Logging officially ends |

### C-NAV

**logging interval**:     10 seconds
**file id:**     gp3

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+174:17:44:07.563 | | Logging officially started |
| 2004+175:22:59:54.548 | 2004+176:00:00:00.263 | Data Interruption |
| 2004+191:17:51:20.591 | | Logging officially ends |

### POS-MV

**logging interval**:     10 seconds
**file id:**     gp4

The Trimble is the secondary receiver for GPS data. Data is logged at 10 second intervals and is also used as an input to Spectra, although it is weighed at a lower value than the Tasmon receiver.

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*Interruptions greater than 10 minutes are displayed in the following table*

| Log Date | LogDate | Comment |
| --- | --- | --- |
| 2004+174:17:43:46.27 8 | | Logging officially started |
| 2004+191:17:51:21.352 | | Logging officially ends |

## Speed and Heading

**Furuno CI‑30 Dual Axis Speed Log**
**Sperry MK‑27 Gyro**

**logging interval:** 6 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. Furuno data was lost periodically during the first few days of the cruise.

*Interruptions greater than 90 seconds are displayed in the following table*

| Log Date | Log Date | Comment |
| --- | --- | --- |
| 2004+174:17:44:21 | | Official start date |
| 2004+191:17:51:14.284 | | 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:** 0.035

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+174:17:44:38.52 1 | | Official start date |
| 2004+191:17:51:08.04 4 | | 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+175:19:06:37.000 | | Official start logging |
| 2004+191:17:51:23.000 | | 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+174:17:44:49.511 | | Official start logging |
| 2004+191:17:50:00.199 | | Official end logging |

# Gravity  Ties

## EW0404 San Juan, Puerto Rico

**Pier/Ship**   **Latitude**   **Longitude**

| 18 27.65002N | 066 05.54170 W |
|---|---|

Pierside reading was taken exactly at the reference point on map

**Reference**   **Latitude**   **Longitude**

| 18 27.78 N | 66 05.43 W |
|---|---|

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 G**

| 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 |
|---|---|---|---|---|---|

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*Location 2*

## EW0406 San Diego, CA

| Pier/Ship | Latitude | Longitude |
|-----------|----------|-----------|
| | 32 42.394 N | 117 14.17 W |

Nimitz Marine Facility -- Rosecrans St

| Reference | Latitude | Longitude |
|-----------|----------|-----------|
| | 32 42.400 N | 117 14.187 W |

Nimitz Marine Facility -- Rosecrans St

| | Id | Julian | Date | Mistie | Drift/Day | Prev Mistie |
|-----------|--------|--------|-------------|--------|-----------|-------------|
| Pre Cruise | EW0404 | 155 | 03. Jun 04 | 5.00 | 0.10 | 0.00 |
| Post Cruise | EW0105 | 193 | 11. Jul 04 | 7.36 | 0.062 | 5.00 |
| Total Days | | | 38.00 | 2.36 | | |

| Time | Entry | Value | |
|------|-------|-------|---|
| 1400 | CDeck Level BELOW Pier | 0.00 | |
| 1405 | Pier 1 L&R Value | 3148.25 | L&R |
| 1410 | Reference L&R Value | 3148.50 | L&R |
| 1415 | Pier 2 L&R Value | 3148.23 | L&R |
| | Reference Gravity | 979535.52 | mGals |
| | Gravity Meter Value (BGM Reading) | 979542.60 | mGals |
| | Potsdam Corrected | 0 | 1 if corrected |

*Gravity meter is **0.0** meters below CDeck*

| | Difference in meters between Gravity Meter and Pier | | | | 0.00 | 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 | |
|---|---|---|---|---|---|
| 3148.24 | 3148.50 | 1.06 | | -0.28 | mGals |

**Gravity in mGals at Pierside**

| Reference + Delta mGals [+ Potsdam] | | | | Pier Gravity | |
|---|---|---|---|---|---|
| 979535.52 | -0.28 | 0.00 | | 979535.24 | mgals |

**Gravity in mGals at Meter**

| Pier Gravity+ | Height Correction | | | Gravity@meter | |
|---|---|---|---|---|---|
| 979535.24 | 0.00 | | | 979535.24 | mGals |

**Current Mistie**

| BGM Reading | Calculated Gravity | | | Current Mistie | |
|---|---|---|---|---|---|
| 979542.60 | 979535.24 | | | 7.36 | 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.

| 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 Gyro | Streamer 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 Depth | Sea Temp | Wind 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).

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

## Spectra Shot Times                                          nb2.r
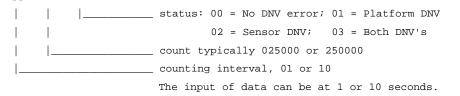
The shot times and positions based on the Spectra positioning; with raw tailbuoy range and bearing.

```
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]`

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# Tape Contents

EW0405/

    EW0405.pdf                this document

    ew0405.cdf                NetCDF database file of this cruise

    ew0405.cdf_nav      NetCDF database file of this cruise'
navigation

    docs      /          File Formats, Spectra manuals

    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.

    scripts/          Perl scripts and their friends