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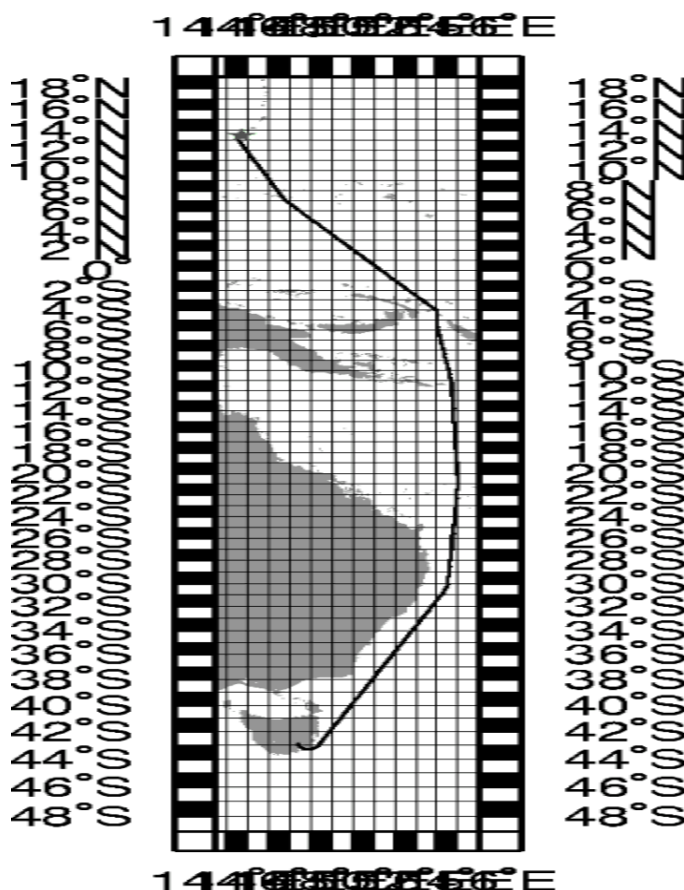
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## R/V Maurice Ewing Data Reduction Summary

EW-0201 Hobart, Tasmania – Guam

Date	Julian Date	Time	Port
January 31, 2002	31	2002+045:05:49:23.989	Hobart, Tasmania
February 14, 2002	45	2002+031:03:10:22.328	Apra, Guam



**GMT** 2002 Feb 23 07:27:06

TO DATE

# Project Summary

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## *DESCRIPTION*

### **Background and Scientific Objectives**

The goals of this cruise (in addition to launching a few ARGO profilers and getting the MCS system ready for the next leg) were to:

- debug and improve the Hydrosweep DS2 multibeam
- resurrect the failed Hydrosweep Sidescan Workstation
- evaluate network loading and performance
- replace the PCU of the POS/MV-320
- improve the integration of the Hydrosweep with the Ewing's real-time data system
- prepare for the installation of the new F77 INMARSAT
- integrate the navigation output from the POS/MV into the Ewing's network

Significant progress was made on all of these goals. In addition, substantial progress was made on a replacement email system and developing better documentation about the Ewing's science data systems.

Except for the launching of one of the six ARGO floats, one roll bias test, and various tests of equipment and safety gear, there were no deviations from the transit.

# Cruise Members

## Science Party

Dale Chayes	Hydrosweep Engineer	<a href="mailto:dale@ldeo.columbia.edu">dale@ldeo.columbia.edu</a>
Val Schmidt	Technician	<a href="mailto:vschmidt@ldeo.columbia.edu">vschmidt@ldeo.columbia.edu</a>
Justine Afghan	Scientist	

## Ship's Science

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## Ship Crew

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# Cruise Notes

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

## Spectra

Spectra logs data to files in UKOOA<sup>1</sup> P1/90 format and P2/94 Format. The file formats are included in separate PDF documents on the tape. The contents of these files contain all the parameters used during shooting each of the lines, as well as the positions of all the sensors. I have included perl scripts for extracting shot times and positions from the P1 and P2 files on the tape.

CRUISE NOTES:

## Hydrosweep

The hydrosweep's IPS processor OS was updated by Dale with two fixes from Atlas, neither of which fixed both problems at the same time. The update that may have fixed the cross-track stepping error produced a long gouge down the middle beams instead. Operation was reverted back to the original OS card. The hydrosweep was restarted many times during the cruise for maintenance purposes. A fix for the wandering heading across 0-degrees on the workstation display was also installed. This problem did not produce any data corruption. A problem with the nmea logger was fixed so that the hydrosweep now properly receives 1-second gyro updates instead of only getting them every 10 seconds.

## Gravity

Chris replaced a bad gyro in the gravimeter.

## Seismic Acquisition

Chris debugged several problems with the syntrek system following its battering during the last cruise. No data was taken with the seismic gear.

## GPS

The Tasmon GPS receiver lost its PCODE reception on day 034. The Palmer, operating in the Southern Ocean also reported losing its PCODE. Fixes were made to the rt\_nav+geo logger to allow proper switching between GPS sources.

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<sup>1</sup> United Kingdom Offshore Operators Association

# Data Logging

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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.

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## Time Reference

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### Datum StarTime 9390-1000

**logging interval:** 30 minutes  
**file id:** tr2

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.

*Interruptions greater than 30 minutes are displayed in the following table*

Log Date	LogDate	Comment
2002+031:00:11:29.727		Logging officially started
2002+031:01:04:30.241	2002+031:02:04:30.097	
		Logging officially ends

### Spectra

Spectra uses its own Trimble gps receiver for synchronizing its hardware to UTC time. This is the time the shot points are referenced to; not the CPU time.

Work has begun on getting the POS/MV's navigation data into spectra.

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## GPS Receivers

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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 Tasmon GPS 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 primary GPS for Spectra fixes. The accuracy is around 15 meters.

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

Log Date	LogDate	Comment
2002+031:03:10:22		Logging officially started
2002+031:23:59:57		Logging officially ends

#### Trimble NT200D

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

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.

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

Log Date	LogDate	Comment
2002+031:04:06:17		Logging officially started
2002+034:16:09:49.829	2002+034:21:30:31.884	
2002+036:04:53:26.055	2002+036:05:06:17.598	
2002+045:05:49:25		Logging Ends

#### Tailbuoy Garmin GP8

**logging interval:** 10 seconds  
**file id:** tb1

The tailbuoy was not used.

*Interruptions greater than 30 minutes are displayed in the following table*

Log Date	Log Date	Comment
		Tailbuoy logging starts
		Tailbuoy logging officially ends

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## Speed and Heading

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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.

*Interruptions greater than 30 minutes are displayed in the following table*

Log Date	Log Date	Comment
2002+031:03:11:34.723		Official start date
2002+045:05:49:24.449		Official end date

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## Gravity

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### 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
2002+031:03:12:10.510		Official start date
2002+031:22:10:39.035	2002+031:22:30:45.265	
2002+031:22:36:55.728	2002+031:22:47:46.853	
2002+031:22:54:47.707	2002+031:23:06:34.736	
2002+031:23:57:37.478	2002+032:00:11:19.540	
2002+045:05:49:26.169		Official end time

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## Bathymetry

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### 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>.

MBSysstem, 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
2002+031:03:15:34		Official start logging
2002+031:10:41:43.000	2002+031:10:53:38.000	
2002+045:05:49:21		Official end logging

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## Weather Station

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### 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.

The air temperature sensor is still broken.

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Log Date	LogDate	Comment
2002+031:03:14:17.287		Official start logging
2002+045:05:49:00.095		Official end logging

---

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## Magnetics

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### Varian Magnetometer

logging interval: 12 seconds  
file id: mg

*The following table shows the times the magnetometer was logging*

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Start Log Date	End LogDate	Comment
2002+038:04:57:47.591	2002+038:06:49:52.583	
2002+038:07:26:08.025	2002+038:13:21:36.369	

---



# Seismic Line

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The following items were of concern during this cruise:

- The P2 and P1 formats do not store the shot time in millisecond range
- SIOSEIS cannot handle the Spectra output header for SEG-D

Due to these facts, Jeff created a system where we would use data from the Spectra header, data from the Digicourse cable output, data from the gun depths, and real-time data from the Ewing logging system to compose a Ewing standard SEG-D header readable by SIOSEIS to place on the 3490 tape for each shot.

There are several files for each line reflecting the line status:

File	Description
ts.n	Shot time is merged with Ewing navigation to determine shot location
nb2.r	Navigation is from Spectra, and includes tailbuoy, tailbuoy range and bearing
shotlog.p1	Shots are from the p1 file. (should be identical to nb2.r), includes source position
shotlog.p2	Shots are from the p2 file (should be identical to tss.n), includes source position

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## Shot Files Table

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Line Name	Times ()	Ewing(ts.n, nb2.r)		Spectra (shots.p1, shotlog.p2)		
		Shots	Missing	P1 Shots	P2 Shots	Missing

# Gravity Ties

## LOCATION 1

### EW0114 Hobart, Tasmania

Pier/Ship Latitude Longitude

47 53.140S 147 20.042E

The pier tie was taken at an unnumbered bollard five (5) set on drain opening seven (7) marking on warehouse. (Shed #2)

Reference Latitude Longitude

32 03.156S 115 48.800E

The reference tie was made inside the main terminal at the extreme right of the Quay

	Id	Julian	Date	Mistie	Drift/Day	Prev Mistie
Pre Cruise	EW0113	338	12/03/2001	9.22	0.01	8.94
Post Cruise	EW0114	25	01/25/2002	9.44	0.004	9.22
Total Days			53.00	0.22		

Time	Entry	Value	
15:00	CDeck Level BELOW Pier	1.00	
15:00	Pier 1 L&R Value	4004.32	L&R
15:39	Reference L&R Value	4001.16	L&R
16:30	Pier 2 L&R Value	4004.32	L&R
	Reference Gravity	980449.40	mGals
	Gravity Meter Value (BGM Reading)	980464.20	mGals
	Potsdam Corrected	0	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

Pier (avg) - Reference *1.06 L&R/mGal	Delta L&R
4004.32	4001.16
1.06	3.35 mGals

Gravity in mGals at Pierside

Reference + Delta mGals [+ Potsdam]	Pier Gravity
980449.40	3.35
0.00	980452.75 mGals

Gravity in mGals at Meter

Pier Gravity+ Height Correction	Gravity@meter
980452.75	2.02
	980454.76 mGals

Current Mistie

BGM Reading	Calculated Gravity	Current Mistie
980464.20	980454.76	9.44 mGals

# Gravity Ties

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## *Location 2*

Gravity tie not available in Guam. Another attempt will be made at the next Guam port stop in 30 days after an attempt has been made at getting military base access. We managed to get within 50 meters of the expected base station location.

# 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 &amp; 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>Total Intensity</u>	<u>Anomaly</u>	<u>FAA</u>	<u>GRV</u>	<u>EOTVOS</u>	<u>Drift</u>	<u>Shift</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
2000+079:00:08:01.507	000295	N 15 49.5703	W 060 19.7843	strikel

## 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              Direction
Inst 60sA 60mA 60sM Inst 60sA 60mA
7.8  6.6  8.5  16.8 277 291 5

Bird 2
Speed              Direction
Inst 60sA 60mA 60sM Inst 60sA 60mA
0.0  0.0  0.0  0.0  0  0  0

Temperature
Inst 60mA 60mm 60mM
15.0 14.2 14.3 15.1
Humidity
Inst 60mm 60mM
92  90  93
Barometer
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



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

---

## EW0201/

CruiseReport_EW0201.pdf	this document
ew0201.cdf	NetCDF database file of this cruise
ew0201.cdf_nav	NetCDF database file of this cruise's navigation
docs/	File Formats, Spectra manuals
processed/	Processed datafiles merged with navigation
trackplots/	daily cruise track plots ( <i>postscript</i> )
raw/	Raw data directly from logger
reduction/	Reduced data files
clean/	daily processing directory, includes daily postscript plots of the data.