

Lamont– Doherty Earth Observatory
Office of Marine Affairs
61 Route 9W
Palisades, NY 10969

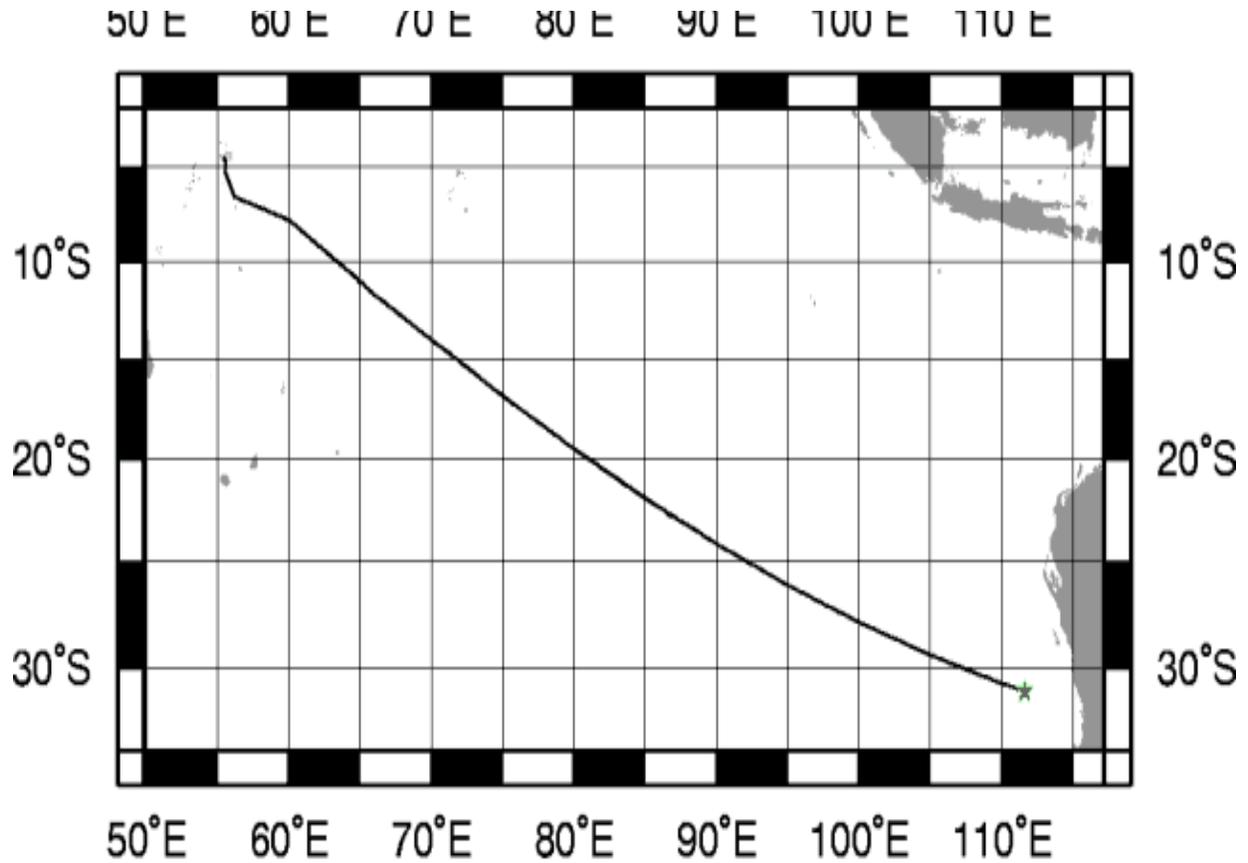


Prepared By: Ethan Gold
etgold@ldeo.columbia.edu
845 365-8677

R/V Maurice Ewing Data Reduction Summary

EW-0112 Seychelles – Fremantle, Australia

Date	Julian Date	Time	Port
October 6, 2001		279	1018 Victoria, Seychelles
October 23, 2001		296	820 Fremantle, Australia



GMT 2001 Oct 22 01:06:30 TO DATE

Project Summary

DESCRIPTION

Background and Scientific Objectives

The purpose of our work is to produce acoustic signals at various locations in the Indian Ocean basin so that the nature of sound propagation, and losses, can be documented. One goal is to determine what types of topography are conducive to using large, shallow sources that require that energy be scattered off the seafloor into the SoFar channel, for basin scale propagation. Another goal is to determine the range at which small, deep imploding sources can be detected at distant receivers. The acoustic sources consist of a large array of airguns, imploding glass spheres, and a triggered imploding cylinder. The receivers are permanently installed hydrophones that are part of the International Monitoring System that is overseen by the Comprehensive Test-Ban Treaty Office of the United Nations. Each hydrophone station consists of 3 instruments. Two stations are deployed in the vicinity of Diego Garcia, on the east and west slopes of Chagos platform. One station is installed off Cape Leeuwin, SW Australia.

Cruise Members

Science Party

Donna Blackman	Chief Scientist	
Allan Sauter	Specialist	
Erica Key	Scientist	ekey@rsmas.miami.edu

Ship's Science

Chris Leidhold	Science Officer	sci@ewing.ldeo.columbia.edu
Ted Koczyński	ET	Tedski@ldeo.columbia.edu
Ethan Gold	Systems Manager	etgold@ldeo.columbia.edu
Johnny DiBernardo	Gunner	honey@ewing.ldeo.columbia.edu
John Byrne	Gunner	johnby@ewing.ldeo.columbia.edu
Justin Walsh	Gunner	cabinboy@ewing.ldeo.columbia.edu
Hamish Gordon	Gunner	gordon@ewing.ldeo.columbia.edu

Ship Crew

James O'Loughlin	Captain	captain@ewing.ldeo.columbia.edu
Steven Pica	Chief Engineer	engine@ewing.ldeo.columbia.edu
Bert Thurston	Chief Mate	oscanner@ewing.ldeo.columbia.edu
Bob Beauregard	2 nd Mate	beaurega@ewing.ldeo.columbia.edu
Meredith Mecketsy	3 rd Mate	mecketsy@ewing.ldeo.columbia.edu
Paul Morris	1 st A/Engineer	morris@ewing.ldeo.columbia.edu
Ryan Weber	2 nd A/Engineer	weber@ewing.ldeo.columbia.edu
Christopher Rooney	3 rd A/Engineer	rooney@ewing.ldeo.columbia.edu
Ryan Dennis	Steward	ryan@ewing.ldeo.columbia.edu
David Philbrick	Bosun	davidp@ewing.ldeo.columbia.edu
Wakefield Walker	A/B	walker@ewing.ldeo.columbia.edu
Bryan Ruegg	A/B	ruegg@ewing.ldeo.columbia.edu
Robert Ewing	A/B	robert@ewing.ldeo.columbia.edu
Elizabeth Scanland	A/B	escan@ewing.ldeo.columbia.edu
Frederick McNeal	O/S	tbear@ewing.ldeo.columbia.edu
Dan Lee	Oiler	lee@ewing.ldeo.columbia.edu
Luke Moqo	Utility	luke@ewing.ldeo.columbia.edu
Fernando Uribe	Oiler	gato@ewing.ldeo.columbia.edu
Jack Schwartz	Electrician	jack@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.

Octopus inexplicably fell down on j293 at 1936UTC. All logging was down for about 20 minutes.

Hydrosweep

The Hydrosweep is still waiting for a working "stair-step" patch from Atlas. Otherwise working fine.

Thermosalinograph

The TSG was off for the first couple days of the cruise. Octopus's hiccup resulted in bad flakey TSG data on days j293 and j294.

Gravity

No notes.

Magnetometer

The maggie died on j290. Several repairs were attempted over the course of several days. The maggie was finally back up and working on j294.

GPS

The P-code GPS receiver lost its crypto keys on j291 for good. All fixes reduced to Selective Availability accuracy for the remainder of the cruise.

Weather

The weather station ran with an estimated 10-degree offset for air temperature throughout the entire cruise. The reason for this has not yet been determined.

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

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
2001+279:00:05:29.724		Logging officially started
2001+295:18:21:29.732		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 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
2001+279:05:16:52.228		Logging officially started
2001+291:03:57:49.839	2001+291:07:41:19.895	
2001+293:19:36:27.050	2001+293:19:54:54.99	
2001+295:18:34:59.547		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
2001+279:05:17:37.767		Logging officially started
2001+281:05:26:46.036	2001+281:05:48:43.756	
2001+288:09:12:07.887	2001+288:14:14:53.742	
2001+288:18:37:05.828	2001+288:19:14:05.774	
2001+289:15:01:36.215	2001+289:16:33:30.041	
2001+289:20:50:50.063	2001+289:21:32:59.930	
2001+290:04:49:56.058	2001+290:05:25:53.833	
2001+290:05:47:57.554	2001+290:05:59:29.811	
2001+290:14:00:30.113	2001+290:14:12:35.704	
2001+290:15:52:00.004	2001+290:16:05:26.026	
2001+291:03:17:29.855	2001+291:03:47:35.864	
2001+291:16:22:47.608	2001+291:17:17:35.726	
2001+291:19:41:19.755	2001+292:02:15:05.819	
2001+292:03:34:25.877	2001+292:06:41:07.736	
2001+292:12:54:23.771	2001+292:15:02:42.021	
2001+292:16:00:53.703	2001+292:18:07:05.878	
2001+293:19:36:25.707	2001+293:20:08:45.885	
2001+295:18:34:53.785		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

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.

Interruptions greater than 30 minutes are displayed in the following table

Log Date	Log Date	Comment
2001+279:05:17:57.201		Official start date
2001+288:09:12:07.887	2001+288:14:14:53.742	
2001+288:18:37:05.828	2001+288:19:14:05.774	
2001+289:15:01:36.215	2001+289:16:33:30.041	
2001+289:20:50:50.063	2001+289:21:32:59.930	
2001+290:04:49:56.058	2001+290:05:25:53.833	
2001+291:03:17:29.855	2001+291:03:47:35.864	
2001+291:16:22:47.608	2001+291:17:17:35.726	
2001+291:19:41:19.755	2001+292:02:15:05.819	
2001+292:03:34:25.877	2001+292:06:41:07.736	
2001+292:12:54:23.771	2001+292:15:02:42.021	
2001+292:16:00:53.703	2001+292:18:07:05.878	
2001+293:19:36:25.707	2001+293:20:08:45.885	
2001+295:18:34:53.785		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
2001+279:05:18:13.870		Official start date
2001+295:18:35:00.566		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
2001+279:05:21:25.000		Official start logging
2001+293:19:35:30.000	2001+293:20:05:50.000	
2001+295:18:34:50.000		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
2001+279:05:52:00.138		Official start logging
2001+293:19:36:00.542	2001+293:19:56:31.607	
2001+295:18:35:00.479		Official end logging

Magnetics

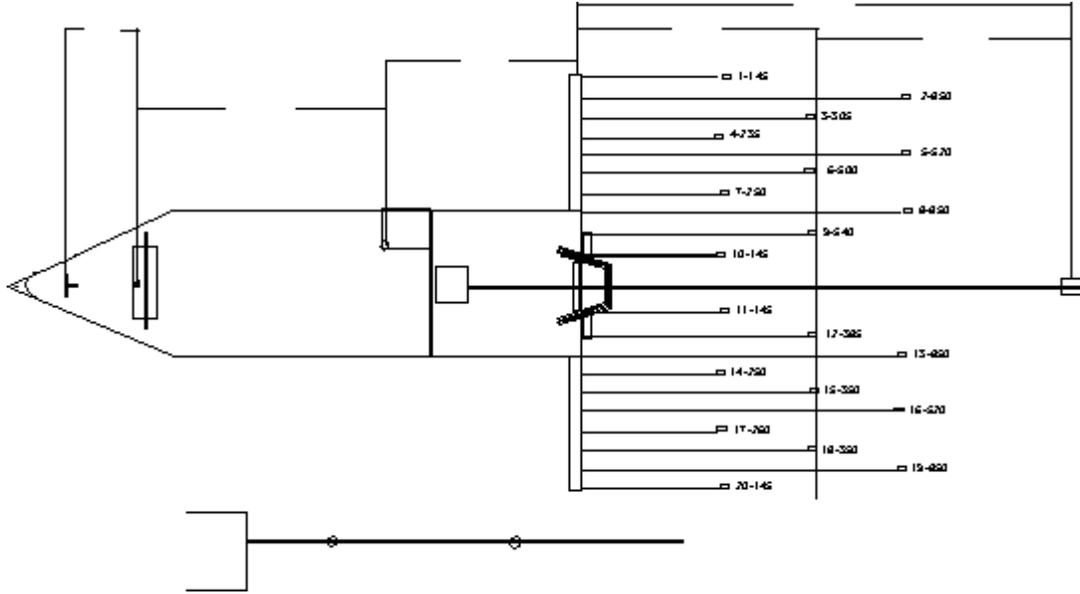
Varian Magnetometer

logging interval: 12 seconds
file id: mg

The following table shows the times the magnetometer was logging

Start Log Date	End LogDate	Comment
2001+284:19:23:42.219	2001+286:03:27:14.578	
2001+286:05:47:08.633	2001+288:23:19:12.832	
2001+289:14:03:29.948	2001+290:08:34:51.597	
2001+290:10:18:48.820	2001+290:14:15:20.371	
2001+290:17:33:12.160	2001+292:09:21:43.241	
2001+294:12:05:41.346	2001+294:14:54:29.037	
2001+295:00:59:05.671	2001+295:04:39:40.951	

Offset Diagram



Gravity Ties

Location 1

EW0111 Victoria, Seychelles

Pier/Ship Latitude Longitude

04 37.503S 55 27.732E

At the north corner of the pier near the bow of the Ewing

Reference Latitude Longitude

4 37.5360S 27.2520E

Seychelles National Archives, left corner of the top step at the main entrance

	Id	Julian	Date	Mistie	Drift/Day	Prev Mistie
Pre Cruise	EW0108	213	08/01/2001	22.69	0.13	8.25
Post Cruise	EW0111	264	09/21/2001	27.73	0.099	22.69
Total Days			51.00	5.04		

Time	Entry	Value	
09:25	CDeck Level BELOW Pier	0.00	
09:30	Pier 1 L&R Value	18160.00	L&R
11:10	Reference L&R Value	18156.50	L&R
11:28	Pier 2 L&R Value	18148.00	L&R
	Reference Gravity	978116.41	mGals
	Gravity Meter Value (BGM Reading)	978143.20	mGals
	Potsdam Corrected	0	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**
18154.00 **18156.50** **1.06** **-2.65** mGals

Gravity in mGals at Pierside

Reference + Delta mGals [+ Potsdam] **Pier Gravity**
978116.41 **-2.65** **0.00** **978113.76** mgals

Gravity in mGals at Meter

Pier Gravity+ Height Correction **Gravity@meter**
978113.76 **1.71** **978115.47** mGals

Current Mistie

BGM Reading Calculated Gravity **Current Mistie**
978143.20 **978115.47** **27.73** mGals

EW0112 Fremantle, Australia

Pier/Ship	Latitude	Longitude
	32 03.155S	115 44.250E

At the north corner of the pier near the bow of the Ewing in berth #1

Reference	Latitude	Longitude
	32 03.122S	115 44.58E

East steps of the Fremantle Port authority Admin Building on the east side of the inner harbour

	Id	Julian	Date	Mistie	Drift/Day	Prev Mistie
Pre Cruise	EW0111	264	09/21/2001	27.73	0.10	22.69
Post Cruise	EW0112	296	10/23/2001	34.68	0.217	27.73
Total Days			32.00	6.95		

Time	Entry	Value	
04:30	CDeck Level BELOW Pier	1.50	
04:33	Pier 1 L&R Value	30283.00	L&R
08:12	Reference L&R Value	30290.00	L&R
09:05	Pier 2 L&R Value	30282.00	L&R
	Reference Gravity	979401.00	mGals
	Gravity Meter Value (BGM Reading)	979429.90	mGals
	Potsdam Corrected	0	1 if corrected

Gravity meter is 5.5 meters below CDeck

Difference in meters between Gravity Meter and Pier	7.00	meters
Height Cor = Pier Height* FAA Constant	7.00	0.31
		2.17 mGals/min

Difference in mGals between Pier and Gravity Meter

Pier (avg) - Reference * 1.06 L&R/mGal	Delta L&R
30282.50	30290.00
1.06	-7.95
	mGals

Gravity in mGals at Pierside

Reference + Delta mGals [+ Potsdam]	Pier Gravity
979401.00	-7.95
0.00	979393.05
	mGals

Gravity in mGals at Meter

Pier Gravity+ Height Correction	Gravity@meter
979393.05	2.17
	979395.22
	mGals

Current Mistie

BGM Reading	Calculated Gravity	Current Mistie
979429.90	979395.22	34.68
		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 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.

```
Shot Time      Gun Depths
                   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

```
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

```
CPU Time Stamp   Latitude   Longitude   GPS
                   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	gpl	0.0	0.0

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
-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 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          Bird 2
Inst 60sA 60mA 60sM Inst 60sA 60mA Inst 60sA 60mA 60sM 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)

```

Tape Contents

EW0112/	
CruiseReport_EW0112.pdf	this document
ew0112cdf	NetCDF database file of this cruise
ew0112cdf_nav	NetCDF database file of this cruise' navigation
docs/	File Formats, etc.
configs/	reduction and Spectra config files
processed/	Processed datafiles merged with navigation
trackplots/	daily cruise track plots (<i>postscript</i>)
raw/	Raw data directly from logger
0112ds2.d*	Hydrosweep Bathymetry in mb183 format
reduction/	Reduced data files
clean/	daily processing directory, includes daily postscript plots of the data.
mbsystem-5.0beta7/	Mbsystem 5.0b7SPARC + source