

Lamont– Doherty Earth Observatory  
Office of Marine Affairs  
61 Route 9W  
Palsades, NY 10964

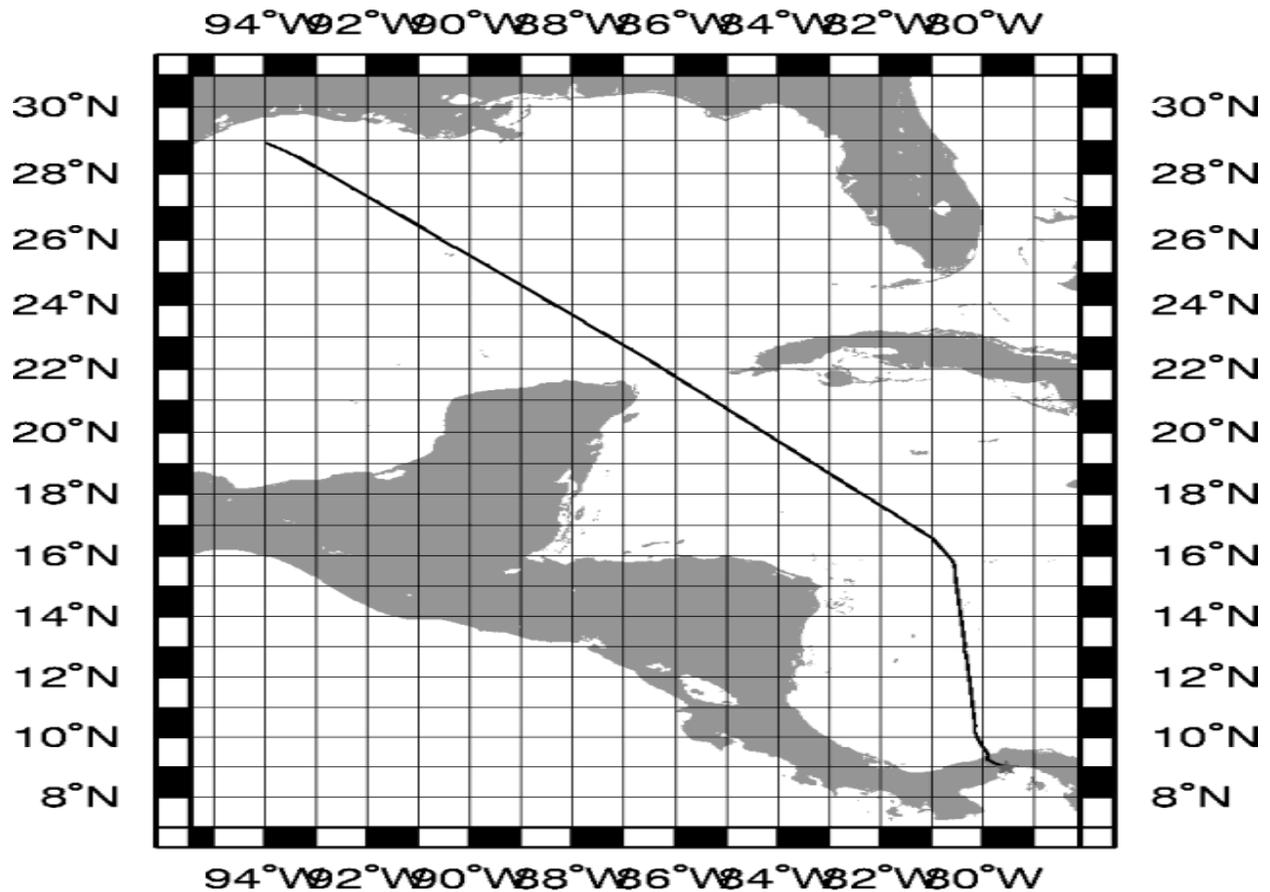


Prepared By: Ethan Gold  
etgold@ldeo.columbia.edu  
845-365-8677

## R/V Maurice Ewing Data Reduction Summary

EW-0304 Galveston, Texas – Panama City, Panama

Date	Julian Date	Time	Port
June 27, 2003	178	UTC 20:24	Galveston, Texas
July 3, 2003	185	UTC 07:00	Panama City, Panama



# Project Summary

---

## *DESCRIPTION*

### **Background and Scientific Objectives**

Transit.

Upgrades to the navigation system, including the addition of the C-Nav, vessel reference reporting, gun depth transducer installation, etc.

# Cruise Members

---

## Science Party

---

### Ship's Science

---

Joe Stennett	Science Officer	<a href="mailto:sci@ewing.ldeo.columbia.edu">sci@ewing.ldeo.columbia.edu</a>
Ted Koczynski	ET	<a href="mailto:tedski@ldeo.columbia.edu">tedski@ldeo.columbia.edu</a>
Justin Walsh	Gunner	<a href="mailto:cabinboy@ewing.ldeo.columbia.edu">cabinboy@ewing.ldeo.columbia.edu</a>
Ethan Gold	Computing	<a href="mailto:etgold@ldeo.columbia.edu">etgold@ldeo.columbia.edu</a>

---

### Ship Crew

---

James O'Laughlin	Captain	<a href="mailto:captain@ewing.ldeo.columbia.edu">captain@ewing.ldeo.columbia.edu</a>
Al Karlyn	Chief Engineer	<a href="mailto:engine@ewing.ldeo.columbia.edu">engine@ewing.ldeo.columbia.edu</a>
Stan Zeigler	1 <sup>st</sup> Mate	<a href="mailto:chmate@ewing.ldeo.columbia.edu">chmate@ewing.ldeo.columbia.edu</a>
Richard Thomas	2 <sup>nd</sup> Mate	<a href="mailto:rickt@ewing.ldeo.columbia.edu">rickt@ewing.ldeo.columbia.edu</a>
Meredith Mecketsy	3 <sup>rd</sup> Mate	<a href="mailto:mecketsy@ewing.ldeo.columbia.edu">mecketsy@ewing.ldeo.columbia.edu</a>
Matthew Tucke	1 <sup>st</sup> A/Engineer	<a href="mailto:tuk@ewing.ldeo.columbia.edu">tuk@ewing.ldeo.columbia.edu</a>
Alejandro Santiago	2 <sup>nd</sup> A/Engineer	<a href="mailto:santiago@ewing.ldeo.columbia.edu">santiago@ewing.ldeo.columbia.edu</a>
Dexter James	3 <sup>rd</sup> A/Engineer	<a href="mailto:dexter@ewing.ldeo.columbia.edu">dexter@ewing.ldeo.columbia.edu</a>
Ryan Dennis	Steward	<a href="mailto:ryan@ewing.ldeo.columbia.edu">ryan@ewing.ldeo.columbia.edu</a>
Kelly Tomas	Boatswain	<a href="mailto:tomask@ewing.ldeo.columbia.edu">tomask@ewing.ldeo.columbia.edu</a>
Florendo, Rodolfo	Oiler	<a href="mailto:rudy@ewing.ldeo.columbia.edu">rudy@ewing.ldeo.columbia.edu</a>
Uribe, Fernando	Oiler	<a href="mailto:gato@ewing.ldeo.columbia.edu">gato@ewing.ldeo.columbia.edu</a>
Richard LaJoie	Oiler	<a href="mailto:lajoie@ewing.ldeo.columbia.edu">lajoie@ewing.ldeo.columbia.edu</a>
Nolan Osorio	O/S	<a href="mailto:nolan@ewing.ldeo.columbia.edu">nolan@ewing.ldeo.columbia.edu</a>
	Electrician	
Shawn Lindenmuth	Cook	<a href="mailto:shawn@ewing.ldeo.columbia.edu">shawn@ewing.ldeo.columbia.edu</a>
Luke Moqo	Utility	<a href="mailto:luke@ewing.ldeo.columbia.edu">luke@ewing.ldeo.columbia.edu</a>
Sypongco, Arnold	A/B	<a href="mailto:arnold@ewing.ldeo.columbia.edu">arnold@ewing.ldeo.columbia.edu</a>
Syferd, Jim	O/S	<a href="mailto:jims@ewing.ldeo.columbia.edu">jims@ewing.ldeo.columbia.edu</a>
Jorge Norales	O/S	<a href="mailto:jorge@ewing.ldeo.columbia.edu">jorge@ewing.ldeo.columbia.edu</a>
Wakefield, Walker	A/B	<a href="mailto:walker@ewing.ldeo.columbia.edu">walker@ewing.ldeo.columbia.edu</a>

---

# Cruise Notes

---

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

## Gravity

No gravity notes

## Hydrosweep

Hydrosweep was logged the entire way using the new vessel-referenced nav and POS/MV heading.

## Magnetics

no data taken

## Navigation

rt\_nav was operated with gp04 as the primary GPS. There were some significant drop-outs as the POS and C-Nav systems were fiddled with during the C-Nav installation.

Final Nav files are vessel referenced. This is the first vessel-referenced cruise. Validity of these final nav files is unknown. This transit is a first test.

## Time

no notes

# 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.

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

<b>Log Date</b>	<b>LogDate</b>	<b>Comment</b>
2003+178:00:00:00.699		Logging officially started
2003+185:18:38:40.021		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:** 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.

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

<b>Log Date</b>	<b>LogDate</b>	<b>Comment</b>
2003+178:14:54:57.851		Logging officially started
2003+185:13:50:24.976		Logging officially ends

#### Trimble NT300D

**logging interval:** 2 seconds  
**file id:** gp2

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

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

<b>Log Date</b>	<b>LogDate</b>	<b>Comment</b>
2003+178:14:55:00.345		Logging officially started
2003+185:13:50:25.399		Logging Ends

#### C-Nav

**logging interval:** 2 seconds  
**file id:** gp2

The C-Nav is a global satellite-based differential receiver.

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

<b>Log Date</b>	<b>LogDate</b>	<b>Comment</b>
2003+180:19:53:17.740		Logging officially started
2003+185:13:50:24.759		Logging Ends

#### POS/MV

**logging interval:** 2 seconds  
**file id:** gp4

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

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

Log Date	LogDate	Comment
2003+178:14:55:05.981		Logging officially started
2003+185:13:50:25.800		Logging 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
2003+178:14:55:16.831		Official start date
2003+185:13:50:24.956		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:** 0.019

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
2003+178:14:55:31.710		Official start date
2003+185:13:50:25.016		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
2003+178:14:57:44.000		Official start logging
2003+185:13:50:48.000		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
2003+178:14:56:11.120		Official start logging
2003+185:13:50:00.700		Official end logging

---

## Magnetics

---

### Varian Magnetometer

**logging interval:** 12 seconds  
**file id:** mg

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

---

<b>Log Date</b>	<b>LogDate</b>	<b>Comment</b>
		Official start logging
		Official end logging

---

# Gravity Ties

## LOCATION 1

### EW0302 Gulfport, Mississippi

Pier/Ship	Latitude	Longitude
	30 21.330 N	089 05.555 W
Western Terminal, Section 5, btw doors 5B & 5C		
Reference	Latitude	Longitude
	30 21.441 N	089 05.647 W
No noticeable mark, using reference point 5629-2, Eastern edge of the Western Terminal just opposite NE corner of Pier warehouse btw 10th and 11th bollards		

	Id	Julian	Date	Mistie	Drift/Day	Prev Mistie
Pre Cruise	EW0301	133	13. May 03	18.39	0.59	3.05
Post Cruise	EW0302	143	23. May 03	25.76	0.737	0.00
Total Days			10.00	7.37		

Time	Entry	Value	
17:35:00	CDeck Level BELOW Pier	1.40	
16:00:00	Pier 1 L&R Value	2945.66	L&R
17:35:00	Reference L&R Value	2944.49	L&R
17:45:00	Pier 2 L&R Value	2944.48	L&R
	Reference Gravity	979316.19	mGals
	Gravity Meter Value (BGM Reading)	979344.70	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	6.90	meters
Height Cor = Pier Height* FAA Constant	6.90	0.31
	2.14	mGals/min

Difference in mGals between Pier and Gravity Meter

Pier (avg) - Reference * 1.06 L&R/mGal	Delta L&R
2945.07	2944.49
1.06	0.61
	mGals

Gravity in mGals at Pierside

Reference + Delta mGals [+ Potsdam]	IGSN-71 Referenced Pier (
979316.19	0.61
0.00	979316.80
	mGals

Gravity in mGals at Meter

Pier Gravity+ Height Correction	Gravity @meter
979316.80	2.14
	979318.94
	mGals

Current Mistie

BGM Reading	Calculated Gravity	Current Mistie
979344.70	979318.94	25.76
		mGals

# Gravity Ties

## Location 2

### EW0304 Balboa, Panama

Pier/Ship	Latitude	Longitude
	30 21.330 N	089 05.555 W
Pier 15, Balboa container terminal		
Reference	Latitude	Longitude
	8 57.325N	079 33.934W
Used tie from March 1995, between two nearby known reference points with low deviation between them.		

	Id	Julian	Date	Mistie	Drift/Day	Prev Mistie
Pre Cruise	EW0302	143	23. May 03	25.76	0.74	0.00
Post Cruise	EW0304	186	05. Jul 03	24.64	-0.026	0.00
Total Days			43.00	-1.12		

Time	Entry	Value	
17:35:00	CDeck Level BELOW Pier	6.00	
16:00:00	Pier 1 L&R Value	0.00	L&R
17:35:00	Reference L&R Value	0.00	L&R
17:45:00	Pier 2 L&R Value	0.00	L&R
	Reference Gravity	978223.50	mGals
	Gravity Meter Value (BGM Reading)	978251.70	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 **11.50** meters

Height Cor = Pier Height\* FAA Constant

<b>11.50</b>	<b>0.31</b>		<b>3.57</b> mGals/min
--------------	-------------	--	-----------------------

**Difference in mGals between Pier and Gravity Meter**

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

<b>0.00</b>	<b>0.00</b>	<b>1.06</b>	<b>0.00</b> mGals
-------------	-------------	-------------	-------------------

**Gravity in mGals at Pierside**

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

<b>978223.50</b>	<b>0.00</b>	<b>0.00</b>	<b>978223.50</b> mGals
------------------	-------------	-------------	------------------------

**Gravity in mGals at Meter**

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

<b>978223.50</b>	<b>3.57</b>		<b>978227.07</b> mGals
------------------	-------------	--	------------------------

**Current Mistie**

BGM Reading Calculated Gravity **Current Mistie**

<b>978251.70</b>	<b>978227.07</b>		<b>24.64</b> mGals
------------------	------------------	--	--------------------

# File Formats

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

---

## 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>Latitude</u>	<u>Centerbeam Longitude</u>	<u>Depth</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 Used</u>	<u>Set</u>	<u>Drift</u>	<u>Depth</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

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

---

## Navigation File

n

<u>CPU Time Stamp</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Used</u>	<u>Set</u>	<u>Drift</u>
2000+074:00:03:00.000	N 13	6.2214 W 59 37.9399	gp1	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:
  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:
Speed              Direction
Inst 60sA 60mA 60sM Inst 60sA 60mA
Bird 2
Speed              Direction
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
Inst 60mA 60mm 60mM      Humidity
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

---

EW0304/	
EW0304.pdf	this document
ew0304.cdf	NetCDF database file of this cruise
ew0304.cdf_nav	NetCDF database file of this cruise' navigation
ew0304_offsets.tif	R/V Ewing offsets
configs/	Ewing data system logging and reduction configuration files
docs/	File Formats
hs_data/	Raw and processed hydrosweep data
mbsystem	Latest MBSystem source
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.
svps/	Derived sound velocity profiles
XBT/	XBT data