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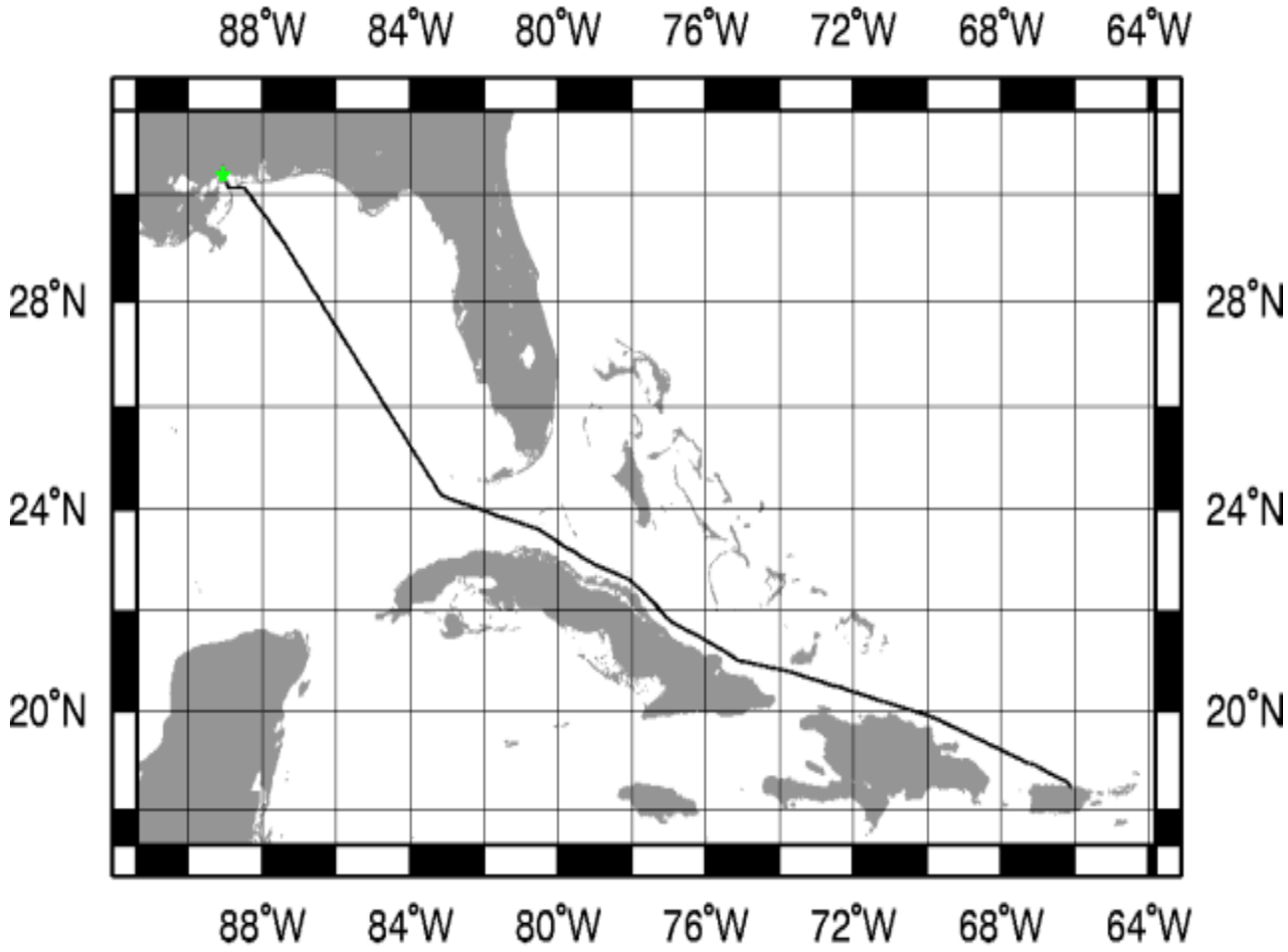
845–365–8677

R/V Maurice Ewing Data Reduction Summary

EW–0302 San Juan, P.R. – Gulfport, Missippi

Date	Julian Date	Time	Port
May 16, 2003	136	18:42 UTC	San Juan, Puerto Rico
May 22, 2003	142	UTC	Gulfport, Missippi



Project Summary

DESCRIPTION

Background and Scientific Objectives

Transit.

Review of navigation data flow, further integration of the POS/MV, UPS upgrades, other computer services upgrades, further gun depth controller work.

Cruise Members

Science Party

Ship's Science

Ted Koczynski	Science Officer	sci@ewing.ldeo.columbia.edu
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Ship Crew

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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.

Gravity

The gravimeter displayed a Sensor DNV alert for the entire cruise. Data *looks* good when cleaned so that it can be processed. Actual value of the data is unknown.

Hydrosweep

Excerpt from Val's email:

This was covered largely in another email, but for the sake of completeness,the problems we saw in the port beams have been mostly fixed by a good old fashioned power cycle.

You've also probably already seen the corrections I sent to the DS2 Hardware manual. Both the new manual and the corrections (and email text) are in the DOC tree. Volume II of the manual is in hard copy (3 ring binder) on the shelf with the others.

I've created a plot of Temperature vs. Sound Speed for the depth of the DS−2 Hydrophones, and at various salinities. The Plot has been taped to the table next to the HS−OL workstation so the watch stander can read C−Keel from the TV monitors and quickly check the value reported by the HS−OL.

I'm also working on set of procedures for the DS2. It'll include various tests to conduct before setting sail, a few things to check each day, a list to check each time the ship goes in drydock, and it has some reference material from the manuals. I'm not sure I'll have this complete before I leave. But I'll leave a copy as it is with Chris so he can try it out, mark it up, and make suggestions for additions/changes.

Magnetics

no data taken

Navigation

Excerpt from Val's status email:

Teddy and I rewired and adjusted the port configuration coming from the Bridge Trimble NT300 DGPS. Without getting into a pin by pin discussion, the upshot is that PORT 2 of the DGPS now provides RS−232 NMEA strings to the 3cm Faruno radar and the lab for logging. Also from that port comes RS−422 NMEA to the ship's auto−steering stand. The Lab also writes Faruno speed log back to the DGPS unit via RS−232. All of this is happening over PORT 2. PORT 1 is configured to transmit RS−232 RTCM correction messages (if the ship is in range to receive them). These are routed to the POS/MV in the lab.

Although everything seems to be in place to do it, the "Electronic Chart System" computer on the

bridge has not been interfaced with the auto−steering stand, which could (we think), in theory, provide a backup to the Trimble.

There's a lot of mixed feelings about this system, as there is nothing more than a pamphlet of documentation, making features difficult to utilize. To be sure, we're not really sure what all the features might be. The Mates don't like the fact that you can't "draw" on the electronic chart which they say is helpful when manually maneuvering the ship, and they'd like a system that can provide a means to track around the inside and loop around the outside of corners to follow tracks.

To compound the problem, the hardware with this machine is not in good shape. I'm not exactly sure what the problem is, but I think it's just too cheap. For example, the processor doesn't indicate to the OS what speed it's running at, and the memory doesn't indicate to the OS at what capacity its being utilized. [There is 128Mb of memory, but according to the "Task Manager" none of it is utilized.] Also the disk is PERFECTLY defragmented. [This cannot be correct.] And the system frequently freezes for up to 20 seconds and occasionally locks up altogether. I think the Mates would prefer something new, but if we intend to keep the system, my recommendation, is to call C−Map and to get more information about the details about the software, and to replace the computer for something purchased from a reputable manufacturer (Dell). It should have considerably more RAM (at least 512kByte) and a good Video Card that can offload the processing of the large charting files (and of course the necessary serial inputs).

FYI. The reported (not yet measured) error of the POS−MV with the RTCM correction input (while the ship is doing ~ 11 kts) is about .4 meters (The reported value with P−Code alone is ~3.5 times that under similar conditions.)

Serial Communications:

I have reorganized and cleaned up (a little) the navigation serial communications distribution in the Main Lab. There are now three serial broadcast boxes providing a distribution center for 1) the POS/MV, 2) the Gyro, and 3) the Auxiliary GPS (P−Code for the moment). This has allowed the following:

The POS/MV now provides input to:

1) Seanet (NeraBm)

2) Spectra

[Utilization of POS/MV data in the system solution remains to be done.]

3) Logger

4) The Bridge (− ECS computer)

The Gyro provides input to:

1) Seanet (Nera Bm)

2) Spectra

3) Logger

4) Bridge via 422 link (I'm not sure where this terminates)

The Auxiliary GPS (P−Code):

1) POS/MV

2) Logger

3) Spectra

There's lots of empty ports, so as scientists add gear we can accommodate them with little problems. There are a few lines that had been run for other things that are no longer being used. They are still in place but disconnected from the broadcast boxes so it's clear that they are available for new projects. Everything is labeled with lots of details if it's not blatantly obvious where it's going.The POS has replaced the p−code receiver

Nera B:

Fixed heading input − cable problem. Also position to the Nera unit is now provided by the POS−MV.

POS−MV:

Reconfigured output to 4800 baud to support everything that was on P−Code. Took screen shots of new settings which can be found in "My Documents" of the POS−MV computer and hard copies in front of the manual.

Spectra:

I'm not the most familiar with this system, but at the moment, everything that it is configured to receive, including P−Code and the POS−MV, are going into it and are being correctly recognized. [The exception to this is the seismic gear which hasn't been operating.) The POS−MV input to Spectra is still being provided via the logging process (read it in, and write it out) with only 2 strings written of the 5 strings logged. I suspect this connection could be made directly from the pos/mv distribution center, but I have left it as is for the moment. As I understand it, the Spectra still requires re−programming to utilize the POS−MV as its primary nav source. I leave that for others more knowledgeable.

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.

Interruption s greater than 30 minutes are displayed in the following table

Log Date	LogDate	Comment
2003+136:00:12:29.737		Logging officially started
2003+142:14:42:29.722		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: 1 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
2003+136:20:24:26.900		Logging officially started
2003+142:15:08:53.966		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
2003+136:20:24:35.429		Logging officially started
2003+138:13:50:14.329	2003+138:15:17:37.438	
2003+138:17:30:58.494	2003+139:00:17:15.327	
2003+139:18:34:18.609	2003+139:19:46:15.319	
2003+139:20:36:58.508	2003+139:21:03:04.466	
2003+142:15:08:54.578		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+136:20:25:12.674		Official start date
2003+137:00:40:48.864	2003+137:01:41:24.905	
2003+142:15:08:54.547		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+136:20:25:40.280		Official start date
2003+138:23:59:59.390	2003+140:00:00:00.403	
2003+142:15:08:54.586		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.

**During this cruise, the hydrosweep was routinely stopped in an effort to range, activate, and/or image submerged instruments and acoustic releases. Gaps corresponding to these data interruptions may not be displayed.

Interruptions greater than 10 minutes are displayed in the following table

Log Date	LogDate	Comment
2003+136:22:46:26.000		Official start logging

Log Date	LogDate	Comment
2003+142:15:08:49.000		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+136:20:26:14.570		Official start logging
2003+136:20:26:43.575	2003+136:22:46:13.681	
2003+138:23:59:00.453	2003+140:00:00:00.653	
2003+142:15:08:00.544		Official end logging

Magnetics

Varian Magnetometer

logging interval: 12 seconds
file id: mg

The following table shows the times the magnetometer was logging

Log Date	LogDate	Comment
		Official start logging
		Official end logging

LOCATION 1

EW0302 San Juan, P.R.

Pier/Ship	Latitude	Longitude
	18 27.731N	066 06.804W

Pier 1 Old San Juan

Reference	Latitude	Longitude
	18 27.75 N	066 065.64W

The tie was taken on a GPS survey marker on Puerta De Tierras street next to the jail. The Army Corps of Engineers is at the end of the street at the bottom of the hill.

	Id	Julian	Date	Mistie	Drift/Day	Prev Mistie
Pre Cruise	EW0301	102	12. Apr 03	0.00	−0.02	3.05
Post Cruise	EW0301	133	13. May 03	**18.39**	**0.593**	**0.00**
Total Days			**31.00**	**18.39**		

Time	Entry	Value	
13:30:00	**CDeck Level BELOW Pier**	0.33	
13:30:00	**Pier 1 L&R Value**	2330.44	**L&R**
10:30:00	**Reference L&R Value**	2331.95	**L&R**
14:00:00	**Pier 2 L&R Value**	2330.44	**L&R**
	Reference Gravity	978688.40	**mGals**
	Gravity Meter Value (BGM Reading)	978693.40	**mGals**
	Needs Potsdam Correction	1	**1 if Potsdam referenced**

*Gravity meter is **5.5** meters below CDeck*

Difference in meters between Gravity Meter and Pier **5.83** meters

Height Cor =	Pier Height*	FAA Constant			
	5.83	**0.31**			**1.81** mGals/min

Difference in mGals between Pier and Gravity Meter

Pier (avg) −	Reference *	1.06 L&R/mGal		Delta L&R
2330.44	**2331.95**	**1.06**		**−1.60** mGals

Gravity in mGals at Pierside

Reference + Delta mGals [+ Potsdam]				IGSN−71 Referenced Pier (
978688.40	**−1.60**	**−13.60**		**978673.20** mgals

Gravity in mGals at Meter

Pier Gravity+	Height Correction			Gravity@meter
978673.20	**1.81**			**978675.01** mGals

Current Mistie

BGM Reading	Calculated Gravity			Current Mistie
978693.40	**978675.01**			**18.39** mGals

Location 2

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 bolla

	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

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.
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
```

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)
```

Tape Contents

EW0302/

EW0302.pdf	this document
ew0302.cdf	NetCDF database file of this cruise
ew0302.cdf_nav	NetCDF database file of this cruise' navigation
ew0302_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 (*postscript*)
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