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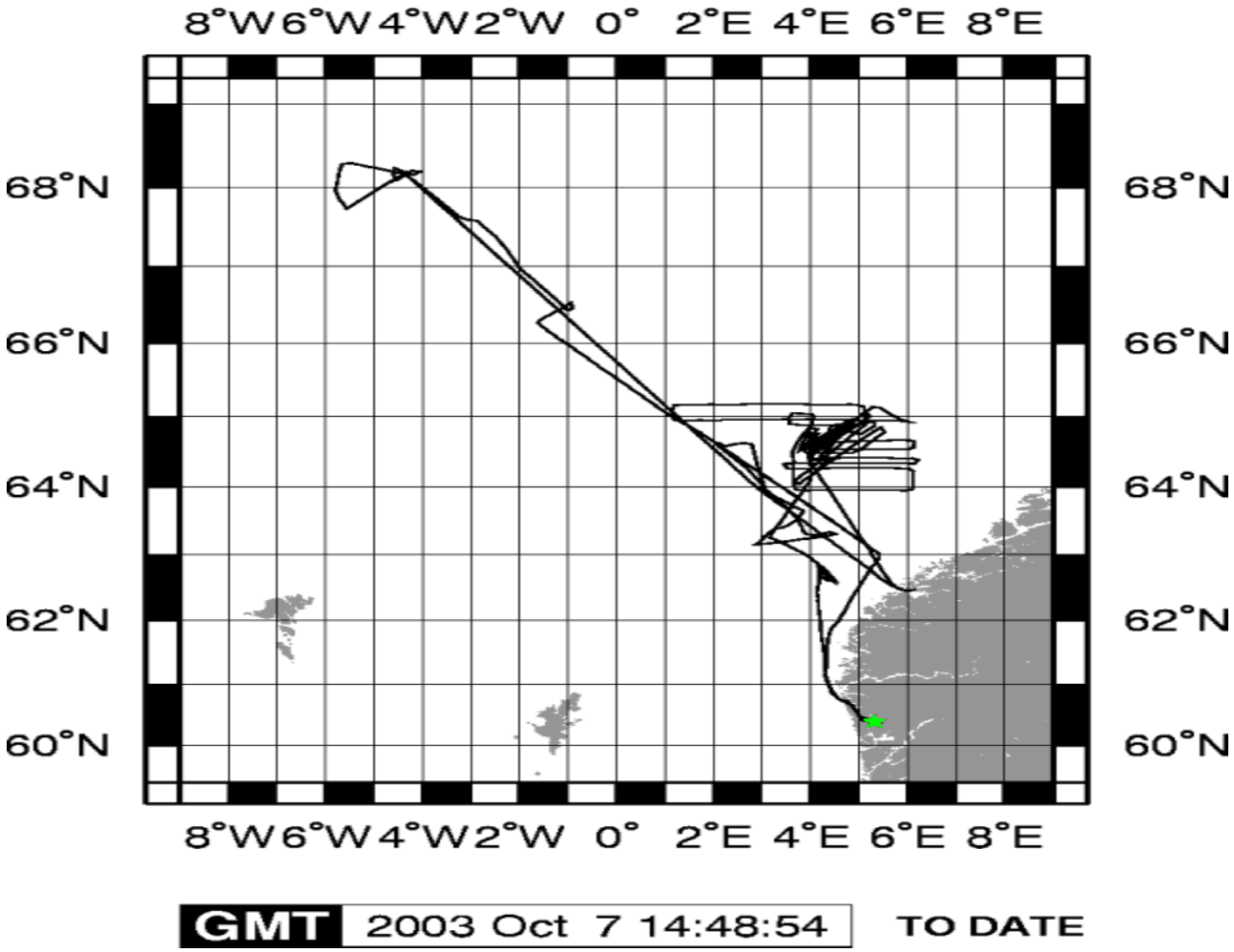
R/V Maurice Ewing Data Reduction Summary

EW–0307 Bergen, Norway – Bergen, Norway

Date	Julian Date	Time	Port
August 29, 2003	241	09:29 UTC	Bergen, Norway
September 26, 2003	269	18:17 UTC	Bergen, Norway



Project Summary

DESCRIPTION

Background and Scientific Objectives

The scientific community is engaged in a lively debate over the importance of gas hydrate. Hydrates are believed to contain an enormous quantity (~10,000 Gt) of methane, a potent greenhouse gas. A central question is whether methane in gas hydrate reservoirs is mobile and can thus affect Earth's climate. Scenarios that connect gas hydrate dynamics and climate are based on the fact that the stability of shallow gas hydrate deposits can be perturbed by temperature and pressure changes, and methane released from these deposits could contribute enough of this isotopically distinct greenhouse gas to alter global oceanic or atmospheric reservoirs. Carbon isotope excursions during the Late Paleocene and the Quaternary are believed to represent massive incursions of methane from hydrate into the world's oceans. Yet the mechanisms, sites, and timing of methane transfer from hydrate reservoirs to oceanic and/or atmospheric systems are speculative.

One appealing mechanism to release methane from hydrate reservoirs is through large−scale sediment failures on continental margins. To test the hypothesis that submarine landslides can release methane from hydrate into the oceans and/or atmosphere, we need a detailed, focused study of a large submarine slide in an area believed to contain methane hydrate. In particular, we need accurate assessment of the amounts, distribution, and lateral variability of methane hydrate and gas in and around the slide, knowledge of the mechanical properties of sediments in and around the slide, well−constrained dates of the slide event, and high−resolution images of the slide structure.

We propose a coordinated seismic and coring study of the Storegga slide, which was produced by colossal slope failures on the Norwegian continental margin in the late Quaternary. The Storegga slide developed in sediments that are believed to have contained substantial amounts of gas hydrate. Thus, this is a prime location to assess whether significant quantities of gas can vent from hydrate−bearing sediments as a consequence of slope failure. We will test hypotheses associated with three interrelated questions: (1) How much hydrate and free gas is present in the Storegga region, and how is it distributed? (2) Did methane escape, and if so, how much, when and by what mechanism? (3) Does hydrate dissociation promote and/or localize submarine landslides? We propose a 43−day cruise of the R/V *Ewing* to acquire high−resolution, long−offset (6 km) multichannel seismic reflection data, three−component ocean−bottom seismic data, and jumbo piston cores.

This program is linked to a proposal to drill the Storegga slide which was highly ranked by SCICOM last year (8th global ranking) and is currently under consideration at IODP. Our program will add significant value to any scheduled drilling leg by providing a regional seismic, sedimentological, and geochemical context. Long−offset MCS and coring data will fill several crucial data gaps in site−survey information and enable the results of the drilling program to be extended beyond the immediate drill sites. However, our data will provide important stand−alone results and test, independently of the drilling leg, hypotheses regarding methane release (amounts and mechanism) and the role of hydrates in large−scale seafloor instability.

This project is a joint effort combining researchers at the University of Wyoming, the Monterey Bay Aquarium Research Institute, and the University of Tromsø, Norway.

Cruise Members

Science Party

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Ship's Science

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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

We encountered an unusual failure of one of the gravity gyros during the cruise. Instead of the most common "complete" failure in which the data becomes obviously noisy, the gyro suffered only a "partial " failure that went undetected until Joe completed the in−port BGM procedures at the end of the cruise and discovered the problem. As a result, it is impossible to determine when the failure occurred and although, the data may be used to examine very general trends, the accuracy of the entire data set is compromised. No reprocessing of the gravity data was done. Joe replaced the gyro and the meter was subsequently zeroed.

Guns

The gun fire control pc crashed and the software became corrupted at the beginning of STOR64. Joe reinstalled the software.

Hydrosweep

Hydrosweep was logged using the vessel−referenced navigation and heading from the POS/MV. Acquisition continued to be excellent during this cruise with < 2% average dropouts. Unfortunately, after an archive tape change on jd 265, recording of raw data hung up. Although the "raw recording" toggle was "highlighted" on the hydrosweep online display, no data was logged. Fortunately, this discrepancy first occurred during a period of time when the ship was heaved to due to inclement weather on jd 265 and 266. Unfortunately, the problem reappeared on jd 268 and 269. No processing was done on the Hydrosweep bathymetry.

Navigation

The POS/MV (gp04) was used as the vessel reference for the entire cruise. The use of the POS/MV for the daily reduction means that the final nav is all vessel−referenced. Hydrosweep and SEGD/Y tape headers are also vessel referenced. ts.n shot files are vessel−referenced with the position calculated by Spectra.

Magnetics

Magnetics data was not collected during this cruise.

Seismic Acquisition

There were a couple of failures of the Syntron system this cruise, one as a result of a tape drive failure, the other related to a VME bus failure.

In addition, the Seisnet PC, responsible for passively listening to data passed to the 3490 tape drives over the Syntrak SCSI bus and subsequently writing the data over the network to Heezen, our dedicated real−time stack and tape−copy workstation, chronically hung up throughout the

cruise. Several times, these failures manifested themselves in completely freezing the Seisnet qc trace display. These instances were easily detected, the "missing shots" noted, and I was able to re−generate SEGY files from 3490 tape. More often, however, the Seisnet trace display freezes went undetected and automagically resumed displaying qc traces. Significant "shot gaps" in the data went unnoticed until more deliberate and careful examination of the SEGY files much later in the cruise. During STOR60, after another Seisnet failure, it was decided to abandon the Seisnet PC and work straight from 3490 tape. In all, over 60 SEGY "shot files" were affected and had to be re−created by hand. This problem has not been resolved.

Streamer configuration files are included on the tape in Excel 97 format.

Spectra

The beginning of the cruise was a disaster. As we approached the first waypoint of line STOR1, Spectra behaved as expected and shooting commenced normally. Difficulties associated with the setup and configuration of the new sioseis front−end gui software in addition to the usual "beginning of cruise" problems led to some data loss (mostly SEGD header information). However, after a bit of troubleshooting, we managed to get most of the systems working. Unexpectedly and chronically, however, Spectra stopped firing the gunsm throughout line STOR1, reporting the error "Syntrak FTB (field time break) not received. Outside of "FTB" error, Spectra's audit and error logs shed no light on potential problems and, in fact, the standard deviations of the manual observations (an indicator of the quality of data being fed to Spectra) were excellent. Restarting Spectra nodes and rebooting Spectra entirely provided some respite, but ultimately the "FTB" errors re−surfaced. As it turned out, the problem was related to timing related issues and the Ewing time daemon (see below). We managed to acquire the last 400 shots of STOR1 and the "FTB" problem never resurfaced.

Time

There were problems with the Ewing time daemon and the JOETIME time tagger during much of this cruise. The Ewing time daemon hung up at 11:39 on jd241, but automatically restarted at the beginning of jd242. Spurious, duplicate time stamps were reported by the JOETIME clock at 18:22 on jd242 and the time daemon subsequently died. Unfortunately, this went unnoticed until we began suffering problems with Spectra. The time daemon was restarted at 17:13 on jd243.

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 Joe Stennet's JOETIME 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+241:09:29:40.021		Logging officially started
2003+241:11:39:50.023	2003+242:00:00:00.727	Data Interruption
2003+242:14:20:20.021	2003+242:14:59:00.467	Data Interruption
2003+242:15:11:10.021	2003+242:16:04:30.079	Data Interruption
2003+242:18:43:00.021	2003+243:17:13:29.830	Data Interruption
2003+262:05:28:11.151	2003+263:05:37:46.032	Data Interruption
2003+265:17:53:00.021	2003+266:01:30:45.287	Data Interruption
2003+269:18:17:40.021		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.

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 no longer the primary gps. 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
2003+241:09:30:10.596		Logging officially started
2003+269:18:17:57.028		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.

Interruptions greater than 10 minutes are displayed in the following table

Log Date	LogDate	Comment
2003+241:09:37:00.326		Logging officially started
2003+269:18:17:57.298		Logging Ends

C−Nav

logging interval: 2 seconds
file id: gp3

The C−Nav is a global satellite−based differential receiver. This is the best individual receiver currently on the ship.

Interruptions greater than 10 minutes are displayed in the following table

Log Date	LogDate	Comment
2003+241:09:30:26.534		Logging officially started
2003+269:18:17:57.578		Logging Ends

POS/MV

logging interval: 1 second
file id: gp4

The POS/MV is a receiver which uses C−Nav 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. With the C−Nav auxiliary input, this is the most accurate receiver on the ship.

Interruptions greater than 10 minutes are displayed in the following table

Log Date	LogDate	Comment
2003+241:09:30:38.541		Logging officially started
2003+244:07:31:02.880	2003+244:09:06:48.061	Data Interruption
2003+247:06:15:28.401	2003+247:07:07:32.700	Data Interruption
2003+209:15:49:31.780		Logging Ends

Tailbuoy Garmin GP8

logging interval: 10 seconds
file id: tb1

There were an unusually large number of tailbuoy outages during this cruise. Some of these were related to other problems, i.e. Syntrak failures/reboots, while many corresponded to legitimate tailbuoy failures. For most of STOR11 and substantial portions of STOR12 and 13, the tailbuoy receiver was out. After this the tailbuoy worked, with the exception of minor blackouts during turns, until STOR 61, when the tailbuoy died again towards the end of the line and never came back on line. Data is missing for STOR62 and 63. Note that often, the tailbuoy was being logged while it was on deck for testing purposes.

Interruptions greater than 30 minutes are displayed in the following table

Log Date	Log Date	Comment
2003+242:11:51:47.239		Tailbuoy logging starts
2003+242:14:45:50.173	2003+242:15:52:39.669	Data Interruption
2003+242:18:29:06.663	2003+242:19:15:28.973	Data Interruption
2003+243:06:46:17.698	2003+243:13:10:03.844	Data Interruption
2003+243:13:10:03.844	2003+243:18:20:57.510	Data Interruption
2003+245:14:15:34.499	2003+245:18:00:06.420	Data Interruption
2003+245:18:45:30.399	2003+245:19:18:27.054	Data Interruption

Log Date	Log Date	Comment
2003+246:05:41:59.369	2003+246:21:58:09.155	Data Interruption
2003+246:23:20:29.796	2003+247:03:13:20.818	Data Interruption
2003+247:18:48:19.537	2003+247:23:33:27.143	Data Interruption
2003+248:09:03:47.566	2003+248:09:36:59.505	Data Interruption
2003+248:09:40:13.058	2003+248:20:34:27.727	Data Interruption
2003+248:21:29:43.073	2003+249:01:17:42.938	Data Interruption
2003+249:03:06:59.288	2003+249:08:28:20.621	Data Interruption
2003+255:13:18:06.349	2003+255:16:16:44.905	Data Interruption
2003+255:21:05:25.951	2003+255:22:49:43.746	Data Interruption
2003+256:13:15:51.197	2003+261:19:59:10.366	Data Interruption
2003+262:14:20:46.602	2003+262:14:51:40.130	Data Interruption
2003+262:14:52:24.199	2003+262:16:08:22.155	Data Interruption
2003+262:16:27:47.657	2003+262:17:11:56.114	Data Interruption
2003+262:17:12:15.638	2003+262:20:01:33.422	Data Interruption
2003+262:21:31:31.001	2003+262:23:32:13.941	Data Interruption
2003+263:00:28:10.883	2003+263:02:21:20.657	Data Interruption
2003+263:02:44:09.727	2003+263:04:28:24.808	Data Interruption
2003+263:10:48:33.584	2003+263:13:36:18.589	Data Interruption
2003+263:13:42:07.341	2003+268:18:17:28.283	Data Interruption
2003+268:19:30:28.389		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
2003+241:09:31:10.271		Official start date
2003+269:18:17:57.468		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
2003+241:09:32:02.497		Official start date
2003+269:18:17:57.728		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+241:14:25:14		Official start logging
2003+258:05:06:50	2003+259:10:37:09	Data Interruption
2003+269:18:19:09		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+241:09:35:38.481		Official start logging
2003+269:18:17:00.620		Official end logging

LOCATION 1

EW0306 Bergen, Norway

Pier/Ship	Latitude	Longitude
	60 23.306N	005 18.556E

West end of Dokkeskjaerskaien (Container) Pier

Reference	Latitude	Longitude

No Lat/Lon available, (see map in gravity log).

	Id	Julian	Date	Mistie	Drift/Day	Prev Mistie
Pre Cruise	EW0305	209	28. Jul 03	30.32	0.25	5.68
Post Cruise	EW0306	240	28. Aug 03	35.74	0.175	0.00
Total Days			31.00	5.42		

Time	Entry	Value	
14:45:00	CDeck Level BELOW Pier	0.30	
14:45:00	Pier 1 L&R Value	5414.20	L&R
13:15:00	Reference L&R Value	5416.97	L&R
17:45:00	Pier 2 L&R Value	5414.20	L&R
	Reference Gravity	981951.10	mGals
	Gravity Meter Value (BGM Reading)	981972.10	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: **5.80** meters

Height Cor = Pier Height* × FAA Constant

Pier Height*	FAA Constant			
5.80	0.31			1.80 mGals/min

Difference in mGals between Pier and Gravity Meter

Pier (avg) −	Reference *	1.06 L&R/mGal		Delta L&R
5414.20	5416.97	1.06		−2.94 mGals

Gravity in mGals at Pierside

Reference	+ Delta mGals [+ Potsdam]			IGSN−71 Referenced Pier (
981951.10	−2.94	−13.60		981934.56 mgals

Gravity in mGals at Meter

Pier Gravity+	Height Correction			Gravity@meter
981934.56	1.80			981936.36 mGals

Current Mistie

BGM Reading	Calculated Gravity			Current Mistie
981972.10	981936.36			35.74 mGals

Location 2

EW0307 Bergen, Norway

Pier/Ship	Latitude	Longitude
	60 23.322N	005 18.572E

West end of Dokkeskjaerskaien (Container) Pier

Reference	Latitude	Longitude

No Lat/Lon available, (see map in gravity log).

	Id	Julian	Date	Mistie	Drift/Day	Prev Mistie
Pre Cruise	EW0306	240	28. Aug 03	0.00	0.25	35.74
Post Cruise	EW0307	275	02. Oct 03	32.21	0.920	0.00
Total Days			35.00	32.21		

Time	Entry	Value	
05:30:00	CDeck Level BELOW Pier	0.30	
05:30:00	Pier 1 L&R Value	5413.85	L&R
13:15:00	Reference L&R Value	5416.97	L&R
05:30:00	Pier 2 L&R Value	5413.85	L&R
	Reference Gravity	981951.10	mGals
	Gravity Meter Value (BGM Reading	981968.20	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: **5.80** meters

Height Cor = Pier Height* FAA Constant

5.80	0.31			1.80 mGals/min

Difference in mGals between Pier and Gravity Meter

Pier (avg) − Reference *1.06 L&R/mGal — Delta L&R

5413.85	5416.97	1.06		−3.31 mGals

Gravity in mGals at Pierside

Reference + Delta mGals [+ Potsdam] — IGSN−71 Referenced Pier

981951.10	−3.31	−13.60		981934.19 mgals

Gravity in mGals at Meter

Pier Gravity+ Height Correction — Gravity@meter

981934.19	1.80			981935.99 mGals

Current Mistie

BGM Reading Calculated Gravity — Current Mistie

981968.20	981935.99			32.21 mGals

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.

```
                        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  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 — 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).

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]`

Tape Contents

EW0307/

EW0307.pdf	this document
ew0307.cdf	NetCDF database file of this cruise
ew0307.cdf_nav	NetCDF database file of this cruise' navigation
docs/	File Formats, UKOOA Formats
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
salinity_log	Raw data directly from the CTD
scripts/	Perl scripts and their friends
segy_redos	SEGY files redone to fill missing shots
sioseis_scripts	SIOui back−end sioseis scripts
spectra/	P1/90 and P2/94 files from MCS lines
streamer/	Excel spreadsheets of streamer configuration
waypoints/	Waypoints working directory
xbt_ctd/	XBT and CTD profiles from the Sippican WinMK21