RV Langseth
Data Reduction Summary

MGL1212

Astoria, OR – Astoria, OR

FINAL

V1.0, 2012-07-24

Lamont-Doherty Earth Observatory, Columbia University

Tuesday July 24th 2012 17:00:00L

Date	Julian Date	Time	Port
2012-07-10	2012-192	0000 UTC, 1700L	Astoria, OR
2012-07-24	2012-206	2359 UTC, 1659L	Astoria, OR

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Table of Contents

Table of Contents 5
I. Background and Scientific Objectives 7
II. Personnel 11
III. Instrumentation Summary 13
IV. Seismic Summary 26
A. Acquisition Parameter Table 26
B. Seismic Overview 30
V. RV Langseth Gravity Tie Information 31
VI. Archive Contents 32
VII. Data Formats 33
Gravimeter data 33
CNAV GPS receiver data 33
$GPVTG, xxx.x, T,, M, m.mm, N, n.nn, K*hh 33
$GPGGA,hhmmss.ss, ddmm.mmmmm, a, ddmm.mmmmm, a, x, xx, x.x, xx.xx, M, xx.xx, M, x.x, xyy*hh 34
CNAV 3050 GPS receiver data 35
$GPVTG, xxx.x, T,, M, m.mm, N, n.nn, K*hh 35
$GPGGA,hhmmss.ss, ddmm.mmmmm, a, ddmm.mmmmm, a, x, xx, x.x, xx.xx, M, xx.xx, M, x.x, xyy*hh 35
EM122 Center Beam Depth 36
FE700 Navigational Echosounder data 36
Gyroscope data 37
$PCICM,HEALM,xxxx,x,xx*hh 37
$HEHDT,xxx.x,T*hh 37
$HEROT,-xxx.x,A*hh 37
Geometrics 882 Magnetometer Data 38
RM Young Meteorological Station Data 38
OBSIP Shotlog Format (not used on MGL1212) 39
Shot records are in the following format: 39
LDEO PCO2 System 40
yyyyjjj.jjj aaaa.aa bb.bb cccc.cc ddd.dd e.ee fff.f gggg.gg hh i k 40
LDEO PCO2 + CNav + TSG + WX01 + SBE38 Systems 41
yyyyjjj.jjj aaaa.aa bb.bb cccc.cc ddd.dd e.ee fff.f gggg.gg hh i k, llll.llllllm, nnnnn.nnnnnno, pppp.pp, q.qq, r.rr, s.ss, tt.tt, uu.u, vvv, w.w, xxx.x, y.yy, zzz.z, @@.@@@@@ 41
POS/MV Position and Orientation System for Marine Vessels 43
$INGGA, hhmmss.sss, llll.llllll, a, yyyyy.yyyyy, b, t, nn, v.v, x.x, M,,,c.c,rrrr*hh 43
$INHDT, x.x, T*hh 44
$INVTG, x.x, T,, M, n.n, N, k.k, K*hh 44
$INGST, hhmmss,sss,,smjr.smjr,smnr.smnr, o.o, l.l, y.y, a.a *hh 44
$PRDID, PPP.PP, RRR.RR, xxx.xx*hh 45
$INZDA, hhmmss.ss, DD, MM, YYYY,, *hh 45
RM Young Rain Gauge & Eppley PSP data 46
x.xxxxxx,y.y 46

Seabird SBE-45 Thermosalinograph Data 46
SEAPATH 200 Intertial Navigation System 46
$INGGA, hhmmss.sss, llll.llll, a, yyyyy.yyyyy, b, t, nn, v.v, x.x, M,,,c.c,rrrr*hh 47
$INHDT, x.x, T*hh 47
$INVTG, x.x, T,, M, n.n, N, k.k, K*hh 48
$INZDA, hhmmss.ss, DD, MM, YYYY,, *hh 48
Speed log data 49
$VHW,x.x,T,x.x,M,x.x,N,x.x,K*hh 49
$VBW,x.x,x.x,A,x.x,x.x,A*hh 49
Streamer Tension Unit Data 50
aaa bbb cc dd ee f g hhhh iiii jjjj kkkk l m nnnn oooo pppp qqqq r s tttt uuuu vvvv wwww x y zzzz !!!! @@@@ #### 50
Applied Microsystems Sound Velocity Probe Data 51
Seabird SBE38 Thermometer Probe Data 51
RM Young Meteorological Station Data 51

I. Background and Scientific Objectives

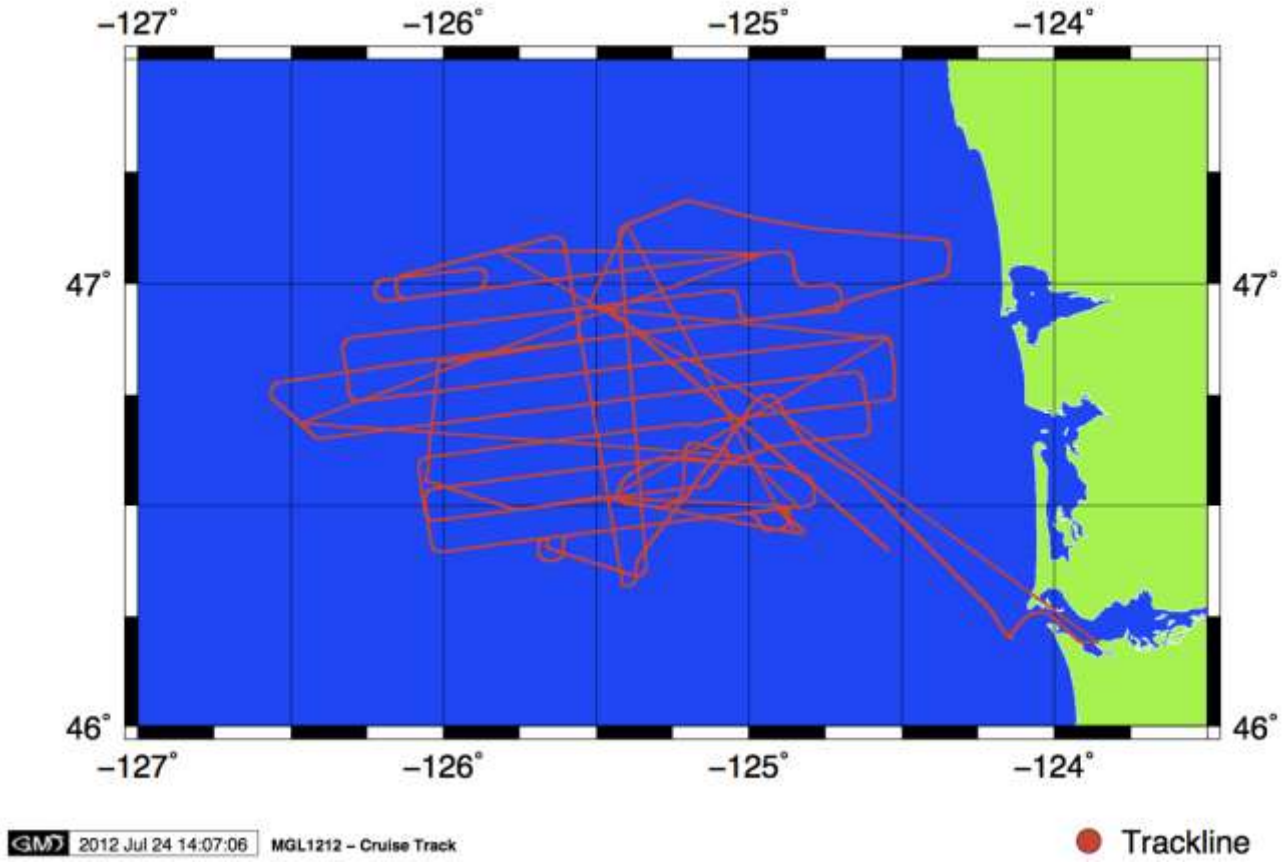
(Pulled from foreign clearance application information submitted by the PI)

The Cascadia margin is the site of active subduction, with the Juan de Fuca plate subducting under the North American plate at a rate of ~35 mm/yr. This system is of great scientific and societal interest, as it is capable of very large (Mw~9) earthquakes, creates volcanic hazards in the Cascades, and hosts periodic episodic tremor and slip (ETS) episodes. Despite evidence that the system has generated large megathrust earthquakes, limited seismicity creates large uncertainties in the position, structure, and physical state of the plate boundary.

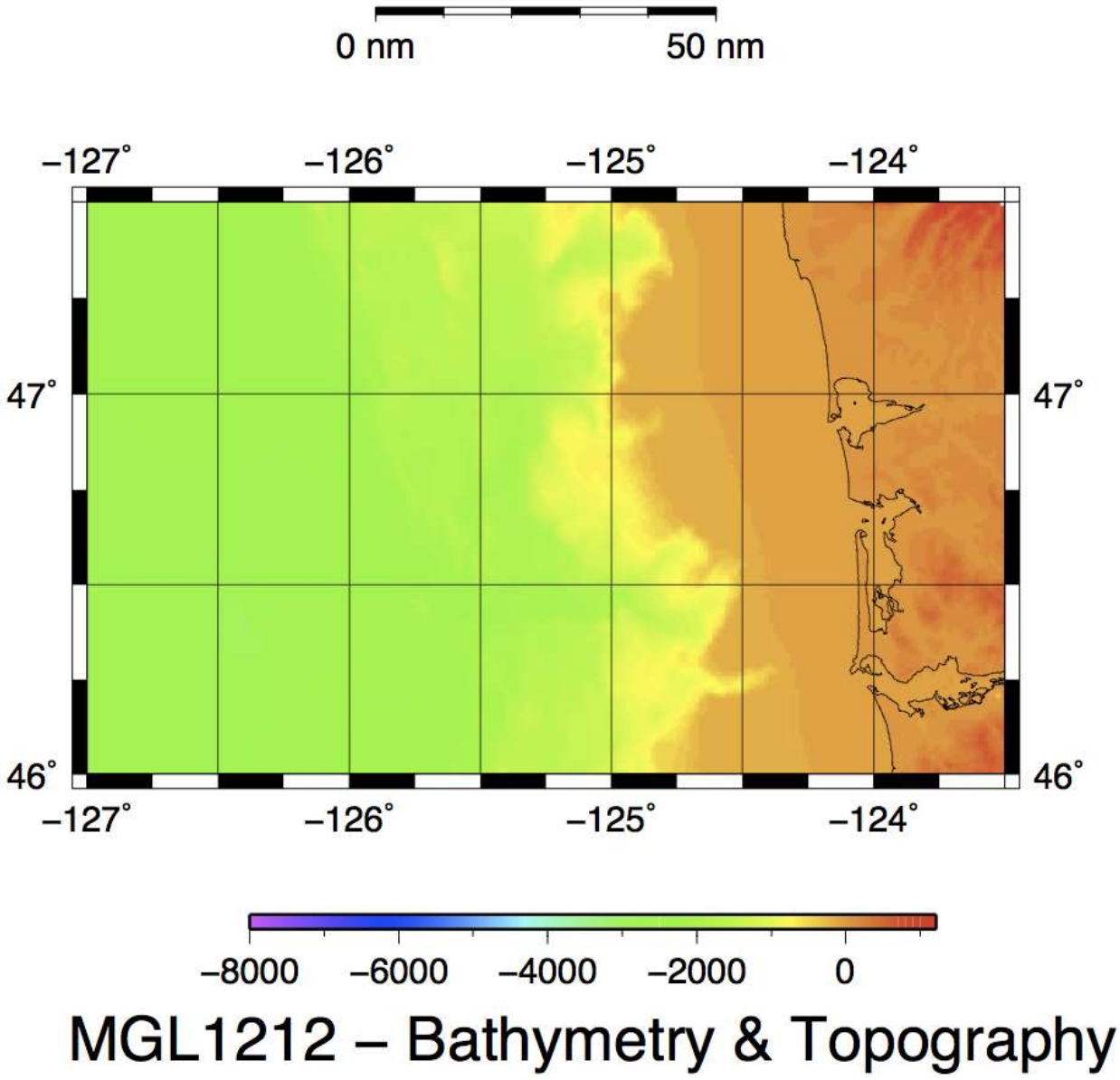
This project is an open-access, open-participation 2D seismic survey of the Cascadia subduction margin off Grays Harbor, WA, that will provide benchmark seismic images to address key scientific issues regarding the location, physical state, fluid budget, and associated methane systems of the subducting plate boundary and overlying crust. These include: (1) Where is the offshore plate boundary beneath a segment of the Cascadia margin that appears to rupture only in very large, infrequent earthquakes? (2) How do subducting sediments and plate boundary roughness control megathrust earthquakes? (3) What are pore fluid pressures, fluid budgets, and upstream inputs to the ETS zone above the subducting slab? (4) What are the geological controls on methane distribution on the margin? (5) How do compressional and extensional structures in the accretionary prism and shelf sediments contribute to geohazards on the Cascadia margin?

This program will support several new and ongoing infrastructure and scientific initiatives, including GeoPRISMs (the MARGINS successor program, which has just selected Cascadia as a focus site), the ARRA seismometer deployment (whose current plan calls for a concentration of OBS instruments to coincide with our proposed active-source corridor), Earthscope, portable seismometer deployments onshore (e.g., the CAFÉ project), and the Ocean Observatories Initiative (our corridor lies adjacent to the proposed Grays Harbor array). This confluence of assets in one region will produce a highly leveraged scientific return and ensure a long shelf life of these data.

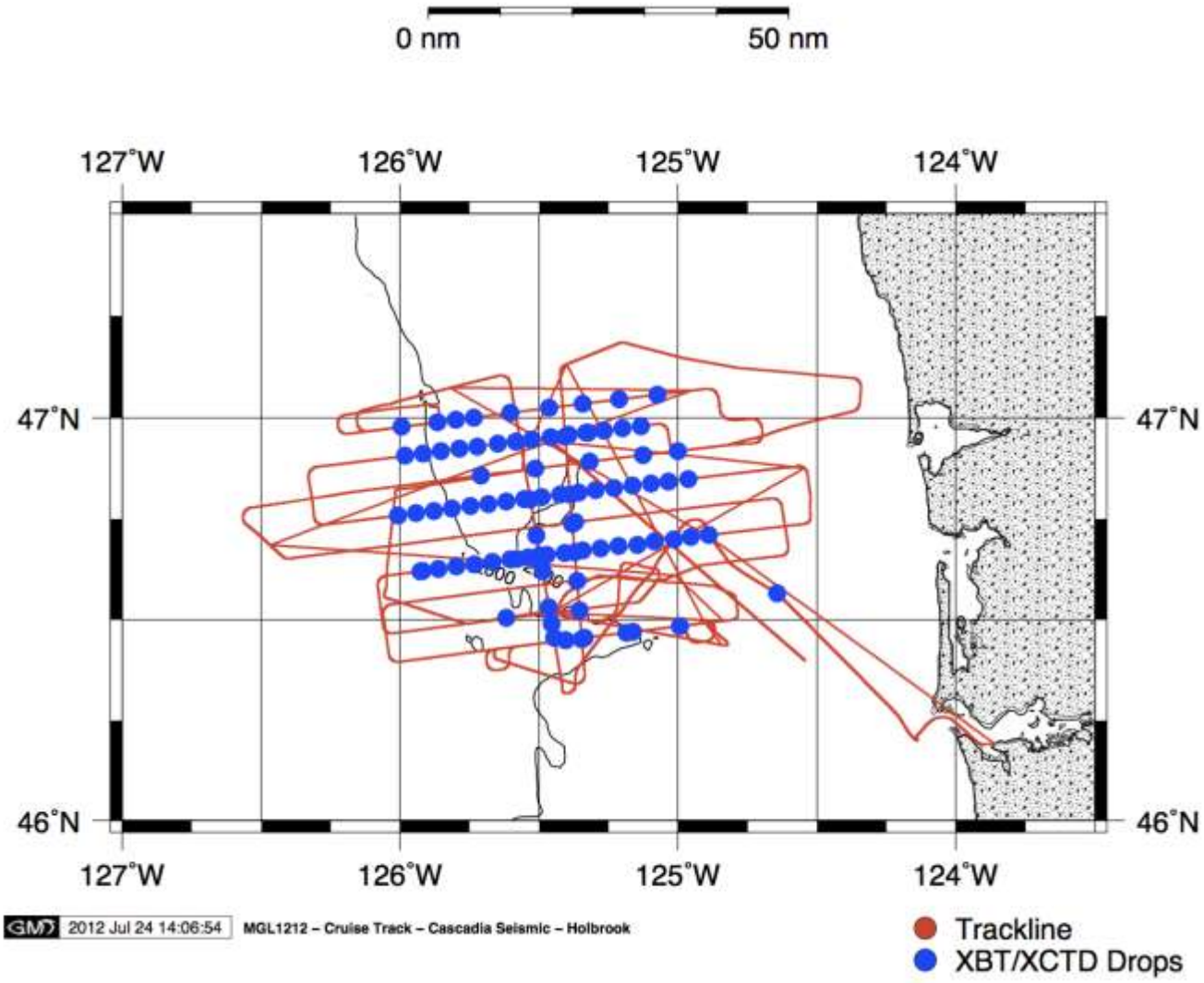
Cruise Track



MGL1212 Bathymetry



XBT Drops


0 nm
50 nm
127°W
126°W
125°W
124°W
47°N
46°N
GMT 2012 Jul 24 14:06:54
MGL1212 – Cruise Track – Cascadia Seismic – Holbrook
Trackline
XBT/XCTD Drops

II. Personnel

Ship's Crew

1	O'Loughlin, James E.	Master
2	Zeigler, Stanley P. Jr.	Chief Mate
3	Wolford, David H.	2nd Mate
4	Lemite, Zachary D.	3rd Mate
5	Woronowicz, Jason J.	Bosun
6	Piscitello, Peter C.	AB
7	Cereno, George G.	AB
8	Hodgson, Douglas	AB
9	Webster, Jeromiel J.	OS
10	Jordan, Lakia M.	OS
11	Karlyn, Albert D.	Chief Engr.
12	Vetting, Ryan P.	2nd Engr.
13	Guilas, Chrisse A.	3rd Engr.
14	Ruth, Cameron H.	3rd Engr.
15	Neis, Philip D.	Electrician
16	Chase, Jerald F.	Oiler
17	Buchanan, William R.	Oiler
18	Mendoza, Denise Y.	Oiler
19	McCoy, Michael G.	Steward
20	Rios, Ricardo	Cook

Shipboard Technical Staff

1	Johnstone, Jay D.	Science Officer
2	Martinson, David	Science Officer
3	Henley, Grady C.	Navigator
4	Martello, Michael C.	Navigator
5	McKiernan, Bernard K.	Acquisition Tech
6	Hawkins, Lisa K.	Acquisition Tech
7	Gutierrez, Carlos D.	Gun Mechanic
8	Francis, Christopher T.	Gun Mechanic

9	Tatro, Michael P.	Gun Mechanic
10	Groves, Weston B.	Gun Mechanic

Science Party

1	Holbrook, W. Steven	Chief Scientist
2	Kent, Graham M.	Co-Chief Sci
3	Keranen, Kathleen M.	Co-Chief Sci
4	Allstadt, Kate E.	Scientist
5	Anthony, Robert E.	Scientist
6	Barak, Shahar	Scientist
7	Beeson, Jeffrey W.	Scientist
8	Buehler, Janine S.	Scientist
9	Caplan-Auerbach, Jacqueline	Scientist
10	Covellone, Brian M.	Scientist
11	Flinchum, Brady A.	Scientist
12	Flinders, Ashton F.	Scientist
13	Fortin, Will F.	Scientist
14	Hawkins, Dalton W.	Scientist
15	Kell, Anna M.	Scientist
16	Merz, Dara K.	Scientist
17	Roland, Emily C.	Scientist
18	Salmi, Marie S.	Scientist
19	Sumy, Danielle F.	Scientist
20	Tobin, Harold J.	Scientist

Protected Species Observers

1	Ingram, Heidi	Lead PSO (RPS-Geocet)
2	Harris, Emily	PAM/PSO (RPS-Geocet)
3	Moreno, Tatiana	PSO (RPS-Geocet)
4	Douglas, Katherine	PSO (RPS-Geocet)
5	Cummings, Meagan	PSO (LDEO)

III. Instrumentation Summary

All science instruments aboard the Langseth are listed below with data formats in section VII. Summary notes on operation during this cruise are listed below. Seismic equipment is not listed here; refer to Part IV for the seismic summary. Other instruments not listed were not in operation.

Instrument Data Files

Instrument	Description	Data Set	Data Outputs	Files	Interval
FE700	Furuno FE700 Echosounder	N/A	serial logs	MGL-bath01.*	1s
EM122	Kongsberg EM122 Multibeam Sonar	Partial	raw output to file	See below	variable
			centerbeam serial logs	MGL-bath02.*	variable
KNUDSEN	Knudsen Engineering 3260 Sub-bottom Profiler	Full	KEA, KEB, SEG-Y	See below	variable
DS50	Furuno DS50 Doppler Speedlog	Full	serial logs	MGL-slog01.*	1s
XBT/XCT	Sippican MK21 XBT/XCTD Launcher	N/A	raw output to file	See below	n/a
			converted output to file	See below	n/a
WX1	RM Young 5103 Weather Bird and	Full	serial logs	MGL-wx01.*	1s
			mwv conversion	MGL-mwv01.*	1s
TSG	SeaBird SBE45 Thermosalinograph	Full	raw serial logs	MGL-tsgraw.*	1s
CNAV	C&C Tech. CNAV 2000 DGPS Receiver	Full	serial logs	MGL-cnav.*	1s
CNAV3050	C&C Tech. CNAV 3050 DGPS Receiver	Full	raw serial logs	MGL-cnav3050all.*	1s
			converted data	MGL-cnav3050.*	1s
MAG01	GeoMetrics 882 Magnetometer	N/A	serial logs	MGL-mag01.*	1s
BGM	Bell Aerospace BGM-3 Gravimeter	Full	serial logs	MGL-vc01.*	1s
GYRO	Simrad GC80 Gyrocompass/AD100	Full	serial logs	MGL-gy01.*	1s
POSMV	Applanix POSMV Integrated Nav System	N/A	serial logs	MGL-posmv.*	1s
SEAPATH	Konsberg SeaPath Integrated Nav System	Full	serial logs	MGL-seapath.*	1s
STU	Sercel Streamer Tension	Partial	serial logs	MGL-stu1.*	15s
MICROSV	Applied Microsystems Sound Velocity Pod Unit #1	Full	serial logs	MGL-svpod01.*	1s
MICROSV	Applied Microsystems Sound Velocity Pod Unit #2	Full	serial logs	MGL-svpod02.*	1s
SBE38	SeaBird SBE38 Pod Thermometer Pod Unit #1	Full	serial logs	MGL-temppod01.*	1s
SBE38	SeaBird SBE38 Pod Thermometer Pod Unit #2	Full	serial logs	MGL-temppod02.*	1s
PCO2	LDEO PCO2 System	Full	serial logs	MGL-pco2.*	~180s

All timestamps in this report are presented using UTC time and day of year in order to avoid confusion with local time changes.

Science Navigation Instrumentation

FE700

Logging interval: 1 second

File id: bath01

The FE700 only operated up to 800m depth. The echosounder is normally switched off before the unit goes out of depth.

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:194:13:06:59.5889	Start	Logging officially started
2012:195:01:57:12.4538	End	Logging officially ended

bath01 data sample:

```
bath01      2008:220:13:45:42.0681  $SDDBT,,,,,,
bath01      2008:220:13:45:42.0690  $SDDBS,,,,,,
bath01      2008:220:13:45:42.0691  $SDDPT,,0006.6*49
bath01      2008:220:13:45:42.1482  $PFEC,Alarm,0,0*6F
bath01      2008:220:13:45:42.1483  $PFEC,xdr,FORE,050*79
```

EM-122 Mutibeam

The EM122 multibeam sonar was operated throughout the cruise. The system is designed for deeper water, and does not track ground well in less than 50m of water.

EM122 swath data is saved to the cruise archive under MGL1212/raw/multibeam. Center beam depth is recorded separately to serial log. The MicroSV (svpod01) probe in the pod supplied sound velocity to the EM122. A daily built in self test (BIST) is done on the EM122 at which time logging of data is secured (see table below for date and time of data gaps)

Logging interval: variable with water depth

File id: bath02

Interruptions greater than one hundred and one seconds are displayed in the following table.

Log Date	Event	Comment
2012:194:18:52:39.0223	Start	Logging officially started
2012:194:18:57:12.2192 - 2012:194:19:06:53.7756	BIST	

2012:194:19:06:53.7756 - 2012:194:19:13:13.7242	Restart	System restart
2012:195:16:17:58.8806 - 2012:195:16:25:34.1124	BIST	
2012:196:06:01:04.9052 - 2012:196:06:43:06.4916	Power	Power down in lab
2012:196:07:04:49.3020 - 2012:196:07:07:10.6251	Restart	System restart
2012:196:08:09:15.8375 - 2012:196:08:29:21.7503	BIST	
2012:196:12:15:14.1778 - 2012:196:12:41:27.5225	Restart	System restart
2012:197:12:00:06.6756 - 2012:197:12:08:53.7907	BIST	
2012:197:19:25:34.5316 - 2012:197:21:29:38.7109	Restart	System restart
2012:198:09:16:05.6759 - 2012:198:09:24:43.4525	BIST	
2012:199:18:26:22.1606 - 2012:199:18:34:05.0927	BIST	
2012:200:05:05:35.3416 - 2012:200:08:50:40.5105	Repair	PS replacement
2012:200:08:51:13.2650 - 2012:200:09:10:26.4634	BIST	
2012:200:10:45:46.0822 - 2012:200:11:22:14.4288	Restart	System restart
2012:201:02:15:45.7650 - 2012:201:02:21:42.2336	BIST	
2012:203:07:48:56.1327 - 2012:203:07:59:44.1030	BIST	
2012:204:01:54:18.3096 - 2012:204:02:01:01.9702	BIST	
2012:204:18:05:25.2880 - 2012:204:18:13:40.1116	Restart	System restart
2012:204:23:37:19.2556 - 2012:204:23:50:47.5564	Restart	System restart
2012:205:08:59:21.1666 - 2012:205:09:11:22.6391	BIST	
2012:205:09:14:13.9396 - 2012:205:09:35:48.4491	Restart	System restart
2012:206:17:08:01.6043	End	Logging officially ended

bath02 data format:

```
bath02      2008:192:00:00:12.6663  $KGDPT,2938.25,0.0,12000.0*4a
bath02      2008:192:00:00:30.3301  $KGDPT,2954.08,0.0,12000.0*4f
```

Knudsen Engineering 3260 Sub-bottom Profiler

File id: n/a
Logging interval: Variable with water depth

The Knudsen 3260 is a chirp echosounder/sub-bottom profiler. It was in operation for the length of the cruise. Unit was secured while on station for coring operations and CTD casts.

There are two sets of segy data recorded/processed this cruise. The segy set in the /raw/knudsen directory are generated by the knudsen software. The segy set in the /processed/knudsen directory are post-processed in the SEGY-Rev0 format.

DS50 Speedlog

File id: slog01
Logging interval: 1 second

The Furuno DS-50 is a Doppler speed log. It was in operation for the length of the cruise.

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:194:13:33:07.0432	Start	Logging officially started
2012:196:06:07:42.2925 - 2012:196:06:33:31.9603	Power	Power down in lab
2012:197:19:52:24.6459 - 2012:197:20:46:56.2260	Power	Power down in lab
2012:197:20:58:13.6305 - 2012:197:21:00:44.0751	Power	Power down in lab
2012:197:21:26:38.0989 - 2012:197:21:57:01.8025	Power	Power down in lab
2012:206:17:20:34.3211	End	Logging officially ended

slog01 data format:

```
slog01      2008:231:00:00:00.0744  $VDVHW,,T,,M,09.68,N,17.93,K*4C
slog01      2008:231:00:00:00.1906  $VDVBW,009.68,000.09,A,009.68,000.09,V*46
slog01      2008:231:00:00:00.1908  $VDVLW,0005960.30,N,0005960.30,N*5F
```

RMYoung Integrated Weather

File id: wx01
Logging interval: 1 second

The weather station is used to log wind speed, direction, air temperature, and barometric pressure. The unit was functioning during the cruise.

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:192:00:00:00.4632	Start	Logging officially started
2012:196:06:07:42.6445 - 2012:196:06:33:31.6183	Power	Power down in lab
2012:206:17:20:36.3752	End	Logging officially ended

wx01 data format:

```
wx01  2011:130:00:00:00.3553   19.0  18.6  19.3  22.5 328 328   2  16.6  17.1   3.7
21.1 355 355   0  28.2  31.1  28.0  31.2  96  85  97 1006

wx01  2011:130:00:00:01.2983   18.8  18.6  19.3  22.5 331 328   2  16.2  17.1   3.7
21.1 355 355   0  28.2  31.1  28.0  31.2  96  85  97 1006
```

CNAV2000

File id: cnav

Logging interval: 1 second

The C-NAV is a global satellite-based differential receiver. This was used as a secondary GPS system on the ship. This system was operational during the cruise.

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:192:00:00:00.0042	Start	Logging officially started
2012:196:06:07:43.0125 - 2012:196:06:33:27.6251	Power	Power down in lab
2012:197:19:23:33.0212 - 2012:197:20:46:22.6425	Power	Power down in lab
2012:197:20:49:23.0154 - 2012:197:20:51:06.6369	Power	Power down in lab
2012:197:20:55:09.9995 - 2012:197:21:04:42.7515	Power	Power down in lab
2012:206:17:20:31.9240	End	Logging officially ended

cnav data format:

```
cnav  2008:231:00:00:00.6936
$GPGGA,000000.00,1434.94372,N,10444.85748,W,2,8,1.1,15.52,M,-20.60,M,9,0108*65
cnav  2008:231:00:00:00.7137  $GPVTG,006.5,T,,M,9.64,N,17.85,K*53
```

CNAV3050

File id: cnav3050all

Logging interval: 1 second

The C-NAV 3050 is a global satellite-based differential receiver. This is the best individual receiver currently on the ship. This system was operational during the cruise.

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:192:00:00:00.0612	Start	Logging officially started
2012:196:06:05:05.6037 - 2012:196:06:33:34.0243	Power	Power down in lab
2012:197:19:23:33.1472 - 2012:197:20:46:22.5615	Power	Power down in lab
2012:197:20:49:23.1344 - 2012:197:20:51:06.1029	Power	Power down in lab
2012:197:20:55:10.1386 - 2012:197:21:04:42.5585	Power	Power down in lab
2012:206:17:20:33.1460	End	Logging officially ended

cnav3050 data format:

```
cnav3050    2011:132:00:00:00.0717
      $GNGGA,000000.00,0842.538264,N,08427.839561,W,2,16,0.9,28.395,M,0.0,M,9.0,035
8*48
cnav3050    2011:132:00:00:00.0877  $GNVTG,338.4,T,,M,5.78,N,10.71,K,D*27
```

GC80 Gyrocompass

The GC80 gyrocompass is installed on the bridge and used for ship and seismic navigation.

File id: gy01
Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:192:00:00:00.2532	Start	Logging officially started
2012:196:06:07:42.7245 - 2012:196:06:33:27.1421	Power	Power down in lab
2012:197:19:23:33.4712 - 2012:197:20:47:42.4010	Power	Power down in lab
2012:197:20:49:23.4324 - 2012:197:20:51:06.3649	Power	Power down in lab
2012:197:20:55:10.3566 - 2012:197:21:04:43.0185	Power	Power down in lab
2012:197:21:26:38.9759 - 2012:197:21:57:01.5564	Power	Power down in lab
2012:206:17:20:33.9641	End	Logging officially ended

gy01 data format:

```
gy01  2008:231:00:00:00.4110  $PTKM,HEALM,0000,0,G1*09
gy01  2008:231:00:00:00.6395  $HEHDT,005.8,T*22
gy01  2008:231:00:00:00.6396  $HEROT,-005.25,A*34
gy01  2008:231:00:00:01.6394  $HEHDT,005.7,T*2D
gy01  2008:231:00:00:01.6395  $HEROT,-004.53,A*34
```

POSMV Integrated Nav

The POS/MV is a receiver that uses CNAV input in addition to its own antennae, an inertial sensor and optional RTG, WTC, or WAAS corrections and a Kalman filter to produce a smooth navigation output and very accurate heading. System was not in operation for MGL1212. It has been decommissioned and is awaiting upgrade.

File id: posmv
Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
N/A	N/A	decommissioned
N/A	N/A	Instrument failure

posmv data format:

```
posmv 2008:231:00:00:00.0885
      $INGGA,235959.842,1434.95002,N,10444.85734,W,2,,1.1,12.71,M,,,9.0,0108*2E
posmv 2008:231:00:00:00.0889  $INHDT,15.0,T*11
posmv 2008:231:00:00:00.2047  $INVTG,7.0,T,,M,9.7,N,17.9,K*46
posmv 2008:231:00:00:00.3208  $INGST,235959.842,,0.9,0.9,0.0,0.9,0.9,2.5*51
posmv 2008:231:00:00:00.4411  $PASHR,235959.842,15.05,T,-
0.58,0.48,0.15,0.069,0.069,0.045,2,0*05
posmv 2008:231:00:00:00.4412  $INZDA,235959.0000,17,08,2008,,*73
```

SeaPath Integrated Nav

The Kongsberg Seapath is an inertial navigation system. Operational for the duration of the cruise.

Logging interval: 1 second

File id: seapath

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:192:00:00:00.2662	Start	Logging officially started
2012:196:06:05:05.2517 - 2012:196:06:33:30.1442	Power	Power down in lab
2012:197:19:23:33.3872 - 2012:197:20:46:22.5045	Power	Power down in lab
2012:197:20:49:23.3744 - 2012:197:20:51:06.2589	Power	Power down in lab

2012:197:20:55:10.3646 - 2012:197:21:04:43.1186	Power	Power down in lab
2012:206:17:20:34.8321	End	Logging officially ended

seapath data format:

```
seapath     2008:231:00:00:00.0504  $INZDA,235959.99,17,08,2008,,*73
seapath     2008:231:00:00:00.1686
      $INGGA,235959.99,1434.953109,N,10444.859147,W,2,08,1.1,-
16.30,M,,M,1.0,0291*70
seapath     2008:231:00:00:00.1687  $INVTG,5.97,T,,M,9.7,N,,K,D*03
seapath     2008:231:00:00:00.1688  $INHDT,5.82,T*1A
```

Sercel Streamer Tension Unit

The Sercel Streamer Tension Unit measures streamer tension in pounds. Not used during 1211.

Logging interval: 15 seconds

File id: stu1

Data intermittent interruptions greater than thirty seconds are displayed in the following table.

Log Date	Event	Comment
2012:195:02:23:47.9883	Start	Logging officially started
2012:196:06:02:50.5351 - 2012:196:07:15:01.7909	Power	Streamer powered off
2012:197:18:59:08.5774 - 2012:197:22:05:06.3757	Power	Streamer powered off
2012:205:17:22:14.8586	End	Logging officially ended

stu1 data format:

```
stu1  2011:130:00:02:12.8968  111 129  22  0 49   1  0     3360     3472     -179
33  1  1     3643     3643     -157       31  1  2     3964     3994     -157
34  1  3     3487     3584     -157       32

stu1  2011:130:00:02:27.8994  111 129  22  1  4   1  0     3375     3487     -164
33  1  1     3643     3793     -157       31  1  2     3950     4002     -164
34  1  3     3509     3606     -179       32
```

Geometrics 882 Magnetometer

The Geometrics 882 magnetometer is towed behind the ship. Raw serial output is logged using LDS. Deployment is dependent upon seismic operations. See the deployment/retrieval data gaps in the table below. For further information, see the elog files in docs/elog.

Magnetometer deployment/retrieval data gaps

Time	Event
2012:195:10:13:12.0028	Data collected only when Magnetometer is deployed
2012:196:06:07:42.8075 - 2012:196:06:33:36.7013	Lab power off
2012:197:11:25:53.9325 - 2012:197:11:58:36.6856	Lab power off
2012:197:11:59:39.6793 - 2012:198:14:03:17.6260	Magnetometer recovered
2012:200:02:43:28.2779 - 2012:200:22:50:16.4443	Magnetometer recovered
2012:205:00:27:44.4556 - 2012:205:02:02:24.2957	Magnetometer recovered
2012:205:08:36:08.5016	Magnetometer onboard for transit to port

Logging interval: 1 second

File id: mag01
mag01 data sample:

```
mag01 2008:185:09:45:58.1820  $107714.673,0042,0024,0110,3533,1143
mag01 2008:185:09:46:01.0333  $ 63703.933,0042,0024,0110,3533,1143
mag01 2008:185:09:46:04.0330  $ 44031.029,0042,0027,0110,3533,1143
```

SBE-45 Thermosalinograph

The Seabird TSG output is logged by LDS to the "tsg" set.

File id: tsgraw

Logging interval: 1 second

Data intermittent interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:194:17:46:35.1243	Start	Logging officially started
2012:196:06:07:38.0893 - 2012:196:06:33:38.0434	Power	Power down in lab
2012:206:17:05:44.7433	End	Logging officially ended

tsgraw data sample:

```
tsgraw      2012:050:05:59:11.0312   27.3455,  5.52201,  34.7764

tsgraw      2012:050:05:59:21.0406   27.3435,  5.52175,  34.7760

tsgraw      2012:050:05:59:31.0341   27.3304,  5.52027,  34.7753
```

BGM-3 Gravimeter

The Bell Aerospace BGM-3 Gravimeter operated normally during the length of this cruise.

File id: vc01
Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:192:00:00:00.3512	Start	Logging officially started
2012:196:06:07:42.6465 - 2012:196:06:33:26.6141	Power	Power down in lab
2012:206:17:20:36.4852	End	Logging officially ended

vc01 data format:

```
vc01  2011:130:00:00:08.2866  01:024436 00

vc01  2011:130:00:00:09.2926  01:024548 00
```

Applied Microsystems MicroSV Pod Unit #1

The Applied Microsystems MicroSV probe #1 in the pod was functional and logging during the length of the cruise.

File id: svpod01
Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:192:00:00:00.5212	Start	Logging officially started
2012:196:06:07:42.8625 - 2012:196:07:16:55.5256	Power	Power down in lab
2012:206:17:20:36.3962	End	Logging officially ended

svpod01 data format:

```
svpod01     2011:130:00:00:08.6626   1540.52

svpod01     2011:130:00:00:09.6527   1540.53
```

Applied Microsystems MicroSV Pod Unit #2

The Applied Microsystems MicroSV probe #2 in the pod was functional and logging during the length of the cruise.

File id: svpod02
Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:192:00:00:00.0632	Start	Logging officially started
2012:196:06:07:42.8675 - 2012:196:07:16:54.5215	Power	Power down in lab
2012:206:17:20:36.3672	End	Logging officially ended

svpod02 data format:

```
svpod02     2011:130:00:00:08.0686   1541.87

svpod02     2011:130:00:00:09.0746   1541.88
```

Seabird SBE38 Temperature Probe Pod Unit #1

The Seabird SBE38 temperature probe #1 in the pod was functional and logging during the length of the cruise.

File id: temppod01
Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:192:00:00:00.8272	Start	Logging officially started
2012:196:06:07:42.6195 - 2012:196:06:33:37.0983	Power	Power down in lab
2012:206:17:20:36.5512	End	Logging officially ended

temppod01 data format:

```
temppod01   2011:130:00:00:07.0855  29.4851

temppod01   2011:130:00:00:07.9476  29.4850
```

Seabird SBE38 Temperature Probe Pod Unit #2

The Seabird SBE38 temperature probe #2 in the pod was functional and logging during the length of the cruise.

File id: temppod02
Logging interval: 1 second

Interruptions greater than ten seconds are displayed in the following table.

Log Date	Event	Comment
2012:192:00:00:00.1512	Start	Logging officially started
2012:196:06:07:42.6515 - 2012:196:06:33:38.0913	Power	Power down in lab
2012:206:17:20:36.6962	End	Logging officially ended

temppod02 data format:

```
temppod02   2011:130:00:00:07.2015  29.4884

temppod02   2011:130:00:00:08.0786  29.4883
```

LDEO PCO2 System

The LDEO PCO2 system output is logged by LDS to the "pco2" set.

See below for more information.

File id: pco2
Logging interval: ~240 seconds

Interruptions greater than three hundred seconds are displayed in the following table.

Log Date	Event	Comment
2012:194:17:54:04.1349	Start	Logging officially started
2012:196:06:05:32.9439 - 2012:196:06:36:30.4136	Power	Power down in lab
2012:206:17:04:45.9988	End	Logging officially ended

pco2 data format:

```
pco2  2011:130:00:27:11.9162  2011130.02002        2370.39      37.54     1007.07
          404.51      28.42       386.9   5000.00         19           0
Equil

pco2  2011:130:00:30:00.5374  2011130.02198        2370.02      37.53     1007.14
          404.42      28.46       386.8   5000.00         19           0
Equil
```

Mk21 XBT System

Files: *.RDF,*.EDF

Ninety (90) XBT drops were made during this cruise. The type breakdown is as follows: 75 – T5, 5 – XCDT-1, 10 – T7, and 1 – T4. The data set is saved to the docs directory in the cruise archive. Refer to the MGL1212_Expendable_Drops.xls spreadsheet in the docs/operations directory of the cruise archive for more information.

IV. Seismic Summary

A. Acquisition Parameter Table

Sequences 1-10

Acquisition Parameter Table	
AcquisitionParameterID	MGL1212_ACQ01
FieldActivityID	MGL1212
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	Sercel Syntrak 960
Acquisition System Type	MCS
Seismic_Nav_System	C-Nav 3050 primary
Survey_datum	WGS84
Navigation Reference Point	Fore/Aft+29.5 m, Stb/pt +0.00 m, vertical +16.9 m Keel, centerline, ~frame 42 (Seapath 200 calculated center of gravity) waterline
NRP to source	240.00 m
Source_to_Near_Channel	264.00 m
Number _of_channels_recorded	636
Number _of_cables	1
Number_of_channels_each_cable	636
Channel_length	12.5 m
Cable_length	8.1 km
Cable_spacing	N/A
Near_Channel_Number	636
Cable_depth	15.0 m
Number_sources	1
Sub-arrays_per_source	4
Alternate_Shooting	No
Source_separation	N/A
Sub-array_separation	8 m
Source_volume	6600 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt Gun
Source_number	1
Source_depth	15.0 m
Shot_control	Distance
Shot_Interval	50.0 m
Sample_interval	2.0ms
Record_length	16s
Compass_birds	30 Digicourse 5011
Recording_delay	N/A

Sequences 11-23

Acquisition Parameter Table	
AcquisitionParameterID	MGL1212_ACQ02
FieldActivityID	MGL1212
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	Sercel Syntrak 960
Acquisition System Type	MCS
Seismic_Nav_System	C-Nav 3050 primary
Survey_datum	WGS84
Navigation Reference Point	Fore/Aft+29.5 m, Stb/pt +0.00 m, vertical +16.9 m Keel, centerline, ~frame 42 (Seapath 200 calculated center of gravity) waterline
NRP to source	240.00 m
Source_to_Near_Channel	264.00 m
Number _of_channels_recorded	636
Number _of_cables	1
Number_of_channels_each_cable	636
Channel_length	12.5 m
Cable_length	8.1 km
Cable_spacing	N/A
Near_Channel_Number	636
Cable_depth	9.0 m
Number_sources	1
Sub-arrays_per_source	4
Alternate_Shooting	No
Source_separation	N/A
Sub-array_separation	8 m
Source_volume	6600 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt Gun
Source_number	1
Source_depth	9.0 m
Shot_control	Distance
Shot_Interval	50.0 m
Sample_interval	2.0ms
Record_length	16s
Compass_birds	30 Digicourse 5011
Recording_delay	N/A

Sequence 24

Acquisition Parameter Table	
AcquisitionParameterID	MGL1212_ACQ03
FieldActivityID	MGL1212
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	Sercel Syntrak 960
Acquisition System Type	MCS
Seismic_Nav_System	C-Nav 3050 primary
Survey_datum	WGS84
Navigation Reference Point	Fore/Aft+29.5 m, Stb/pt +0.00 m, vertical +16.9 m Keel, centerline, ~frame 42 (Seapath 200 calculated center of gravity) waterline
NRP to source	240.00 m
Source_to_Near_Channel	264.00 m
Number _of_channels_recorded	636
Number _of_cables	1
Number_of_channels_each_cable	636
Channel_length	12.5 m
Cable_length	8.1 km
Cable_spacing	N/A
Near_Channel_Number	636
Cable_depth	9.0 m
Number_sources	1
Sub-arrays_per_source	2
Alternate_Shooting	No
Source_separation	N/A
Sub-array_separation	8 m
Source_volume	3300 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt Gun
Source_number	1
Source_depth	9.0 m
Shot_control	Distance
Shot_Interval	50.0 m
Sample_interval	2.0ms
Record_length	16s
Compass_birds	30 Digicourse 5011
Recording_delay	N/A

Sequences 25

Acquisition Parameter Table	
AcquisitionParameterID	MGL1212_ACQ04
FieldActivityID	MGL1212
ReceiverType	Sentry Solid Streamer
SourceType	Airgun
Acquisition System Name	Sercel Syntrak 960
Acquisition System Type	MCS
Seismic_Nav_System	C-Nav 3050 primary
Survey_datum	WGS84
Navigation Reference Point	Fore/Aft+29.5 m, Stb/pt +0.00 m, vertical +16.9 m Keel, centerline, ~frame 42 (Seapath 200 calculated center of gravity) waterline
NRP to source	240.00 m
Source_to_Near_Channel	264.00 m
Number _of_channels_recorded	636
Number _of_cables	1
Number_of_channels_each_cable	636
Channel_length	12.5 m
Cable_length	8.1 km
Cable_spacing	N/A
Near_Channel_Number	636
Cable_depth	15.0 m
Number_sources	1
Sub-arrays_per_source	2
Alternate_Shooting	No
Source_separation	N/A
Sub-array_separation	8 m
Source_volume	3300 cu in
Source_pressure	2000 psi nominal
Source_make,model	Bolt Gun
Source_number	1
Source_depth	15.0 m
Shot_control	Distance
Shot_Interval	50.0 m
Sample_interval	2.0ms
Record_length	16s
Compass_birds	30 Digicourse 5011
Recording_delay	N/A

B. Seismic Overview

Physical Configuration
The towing configuration for the air guns and streamers is detailed in the document titled ***MGL1212_Offsets.xls***.

Offsets
All antenna and in-water offset drawings are in the file ***MGL1212_Offsets.xls***

Spectra
Spectra was used for all timing and navigation during the cruise. Spectra generated UKOOA P294 and P190 files for each MCS line acquired.

Sprint
Sprint was used for post processing of Spectra UKOOA P294 files to produce UKOOA P190 files with improved postioning.

V. RV Langseth Gravity Tie Information

A gravity tie was done before and after the cruise in Astoria, Oregon. Please refer to the documents located under MGL1212/docs/gravity_tie for detailed records.

VI. Archive Contents

Key files are bolded.

MGL1212/docs	Cruise documents and logs
MGL1212/docs/config	Configuration archive
MGL1212/docs/elog	Cruise elog
MGL1212/docs/gravity_tie	Gravity Tie information
MGL1212/docs/map	Cruise maps, track map
MGL1212/docs/offsets	Vessel/sensor offsets
MGL1212/docs/operations/	Operations documents
MGL1212/docs/operations/Daily_Reports	Cruise Daily Reports from Chief Science Officer
MGL1212/docs/operations/NavLogs	Seismic navigation logs (spectra)
MGL1212/docs/operations/ObsLogs	Seismic acquisition logs (gun controller)
MGL1212/docs/operations/MGL1212_B15_line_log_multi_channel_seismics.xls	**Master line log table**
MGL1212/docs/permits	Clearance Documents
MGL1212/docs/waypoints	Waypoint files
MGL1212/docs/personnel	Personnel rosters, org chart, bunk and phone lists
MGL1212/docs/reports	Cruise Report and supplemental docs
MGL1212/docs/reports/MGL1212_DataReport_v1.0.doc	**This file**
MGL1212/docs/offsets/MGL1212_Offsets.xls	**Vessel/sensor offsets**
MGL1212/docs/screencaps	Screen captures
MGL1212/processed	Processed data
MGL1212/processed/reflex (3D data-sets only, not applicable to OBS and 2D)	Spectra reflex files
MGL1212/processed/shotlogs	Shot log files
MGL1212/processed/sprint	Sprint files
MGL1212/processed/svp	Sound velocity profiles
MGL1212/raw	Raw data
MGL1212/raw/adcp	Raw ADCP data
MGL1212/raw/knudsen	Raw Knudsen sub-bottom profiler data
MGL1212/raw/multibeam	Raw EM122 data
MGL1212/raw/serial	Underway serial data: gps, tsg, weather, etc.
MGL1212/raw/spectra/P1	Spectra p190
MGL1212/raw/spectra/P2	Spectra p294
MGL1212/raw/XBT	Raw XBT data

VII. Data Formats

Gravimeter data

The gravimeter serial data is output in the following format:

01:025610 01

01:xxxxxx ff

Item	Definition	Units
01	output frequency	Hz
xxxxxx	raw counts	n/a
ff	sensor status	n/a

CNAV GPS receiver data

CNAV outputs data in NMEA 0183 compatible format. Currently* the following sentence types are enabled:

- $GPVTG-GPS Velocity, Track made good and Ground speed data (computed by the CNAV GPS receiver).
- $GPGGA-Gobal Positioning System Fix data (computed by the CNAV GPS receiver).

  *Note: there are other sentence types available from CNAV. Please consult the software manual for more options.

$GPVTG, xxx.x, T,, M, m.mm, N, n.nn, K*hh

$GPVTG Sentence Fields

Item	Definition	Units
xxx.x	Course over ground (COG)	Degrees from True North
T	Indicates course relative to True North	n/a
M	COG	Degrees from Magnetic North
m.mm	Speed over ground (SOG)	Nautical miles per hour (knots)
N	Indicates that the speed over ground is in knots	n/a
n.nn	SOG	km/h
K	Indicates that the SOG is in km/h	n/a /td>
*hh	Checksum (hexadecimal representation)	n/a

$GPGGA,hhmmss.ss, ddmm.mmmmm, a, ddmm.mmmmm, a, x, xx, x.x, xx.xx, M, xx.xx, M, x.x, xyy*hh

$GPGGA Sentence Fields

Item	Definition	Units
hhmms.ss	UTC time of position	Hours/Minutes/Seconds.decimal.
ddmm.mmmmm	Latitude	Degrees/Minutes.decimal.
a	Direction of Latitude N = North S = South	n/a
ddmm.mmmmm	Longitude	Degrees/Minutes.decimal
a	Direction of Longitude E = East W = West	n/a
x	GPS Quality indicator 0 = fix not valid 1 = GPS Autonomous fix 2 = GcGPS Corrected Fix	n/a
xx	Number of GPS satellites used in solution fix	n/a
x.x	Horizontal Dilution of Precision (HDOP)	n/a
xx.xx	C-NAV GPS receiver antenna altitude reference to Mean Sea Level (MSL)	n/a
M	Altitude units--M indicates meters	n/a
xx.xx	WGS-84 Geoidal separation distance from MSL based on the NIMA/NASA EGM96 15-minute (Earth Gravity Model)	Meters
M	Geosoidal separation units--M indicates meters	n/a
x.x	Age of GcGPS corrections used in solution fix	n/a
xyy	C-NAV GPS receiver reference identification	x is downlink satellite communication beam in use yy is the GPS correction signal mode/type being used
*hh	Checksum (hexadecimal representation) followed by CRLF terminator pair	n/a

CNAV 3050 GPS receiver data

CNAV 3050 outputs data in NMEA 0183 compatible format. Currently* the following sentence types are enabled:

- $GPVTG-GPS Velocity, Track made good and Ground speed data (computed by the CNAV GPS receiver).
- $GPGGA-Gobal Positioning System Fix data (computed by the CNAV GPS receiver).

*Note: there are other sentence types available from CNAV. Please consult the software manual for more options.

$GPVTG, xxx.x, T,, M, m.mm, N, n.nn, K*hh

$GPVTG Sentence Fields

Item	Definition	Units
xxx.x	Course over ground (COG)	Degrees from True North
T	Indicates course relative to True North	n/a
M	COG	Degrees from Magnetic North
m.mm	Speed over ground (SOG)	Nautical miles per hour (knots)
N	Indicates that the speed over ground is in knots	n/a
n.nn	SOG	km/h
K	Indicates that the SOG is in km/h	n/a /td>
*hh	Checksum (hexadecimal representation)	n/a

$GPGGA,hhmmss.ss, ddmm.mmmmm, a, ddmm.mmmmm, a, x, xx, x.x, xx.xx, M, xx.xx, M, x.x, xyy*hh

$GPGGA Sentence Fields

Item	Definition	Units
hhmms.ss	UTC time of position	Hours/Minutes/Seconds.decimal.
ddmm.mmmmm	Latitude	Degrees/Minutes.decimal.
a	Direction of Latitude N = North S = South	n/a
ddmm.mmmmm	Longitude	Degrees/Minutes.decimal
a	Direction of Longitude E = East W = West	n/a
x	GPS Quality indicator 0 = fix not valid 1 = GPS Autonomous fix 2 = GcGPS Corrected Fix	n/a
xx	Number of GPS satellites used in solution fix	n/a
x.x	Horizontal Dilution of Precision (HDOP)	n/a
xx.xx	C-NAV GPS receiver antenna altitude reference to Mean Sea Level (MSL)	n/a
M	Altitude units--M indicates meters	n/a

xx.xx	WGS-84 Geoidal separation distance from MSL based on the NIMA/NASA EGM96 15-minute (Earth Gravity Model)	Meters
M	Geosoidal separation units--M indicates meters	n/a
x.x	Age of GcGPS corrections used in solution fix	n/a
xyy	C-NAV GPS receiver reference identification	x is downlink satellite communication beam in use yy is the GPS correction signal mode/type being used
*hh	Checksum (hexadecimal representation) followed by CRLF terminator pair	n/a

EM122 Center Beam Depth

This page describes the EM122 centerbeam depth serial output, used for real-time depth display. For fulll multibeam data, please see the multibeam page.

The EM122 outputs serial data in the following formats:

- KIDPT - Depth below transducer

$KIDBT,x.x,x.x,x.x,*hh

SDDBT sentence format

Item	Definition	Units
x.x	Water depth	feet
x.x	Water depth	meters
x.x	Water depth	fathoms
*hh	Checksum	n/a

FE700 Navigational Echosounder data

The FE700 Navigational Echosounder outputs data in the following formats

- $PFEC - unspecified
- $SDDBT - Depth Below Transducer
- $SDDBS - Depth Below Surface

$PFEC ,aaaa,x,x*hF

PFEC sentence format

Item	Definition	Units
aaaa	unspecified	unspecified
x	unspecified	unspecified
x	unspecified	unspecified
*hF	unspecified	unspecified

$DBT,x.x,f,x.x,M,x.x,F*hh

SDDBT sentence format

Item	Definition	Units
x.x	Water depth	feet
f	f = feet	n/a
x.x	Water depth	meters

M	M = meters	n/a
x.x	Water depth	fathoms
F	F = fathoms	n/a
*hh	Checksum	n/a

$DBS,x.x,f,x.x,M,x.x,F*hh

SDDBS sentence format

Item	Definition	Units
x.x	Water depth	feet
f	f = feet	n/a
x.x	Water depth	meters
M	M = meters	n/a
x.x	Water depth	fathoms
F	F = fathoms	n/a
*hh	Checksum	n/a

Gyroscope data

The gyroscope serial data is output in the following sentence formats:

- PTKM,HEALM -- Unspecified
- HEHDT -- Heading - True
- HEROT -- Rate Of Turn

$PCICM,HEALM,xxxx,x,xx*hh

ALM sentence format

Item	Definition	Units
xxxx	unspecified	n/a
x	unspecified	n/a
*hh	unspecified	n/a

$HEHDT,xxx.x,T*hh

HDT sentence format

Item	Definition	Units
xxx.x	Heading true	degrees
T	T = true	n/a
*hh	Checksum	n/a

$HEROT,-xxx.x,A*hh

HEROT sentence format

Item	Definition	Units
xxxx.x	Rate of turn	Degrees per minute, Note: "-" means bow turns to port
A	A = data valid	n/a
*hh	Checksum	n/a

Geometrics 882 Magnetometer Data

The magnetometer serial data is output in the following format:

```
$ 53863.927,0652


$ xxxxx.xxx,vvvv
```

Item	Definition	Units
xxxxx.xxx	Magnetic field intensity	nT
vvvv	Reserved for future use	n/a

RM Young Meteorological Station Data

The meteorological data from the RMYoung integrated weather station is output in the following sentence format:

```
 12.6  13.2  12.6  16.9   1 335   2   0.0   0.0   0.0   0.0 355 355   0 -11.9 -23.8 *****  7.3  8  4  9 1006.9
aaa.a bbb.b ccc.c  dd.d eee fff ggg hhh.h iii.i jjj.j kkk.k lll mmm nnn -oo.o -pp.p -qq.q -rr.r ss tt uu vvvv.v
```

Langseth WX station sentence format

Item	Definition	Units
aaa.a	bird 1 speed, instantaneous	knots
bbb.b	bird 1 speed, 60 second average	knots
ccc.c	bird 1 speed, 60 minute average	knots
ddd.d	bird 1 speed, 60 second peak	knots
eee	bird 1 direction, instantaneous	knots
fff	bird 1 direction, 60 second average	knots
ggg	bird 1 direction, 60 minute average	knots
hhh.h	bird 2 speed, instantaneous	knots
iii.i	bird 2 speed, 60 second average	knots
jjj.j	bird 2 speed, 60 minute average	knots
kkk.k	bird 2 speed, 60 second peak	knots
lll	bird 2 direction, instantaneous	knots
mmm	bird 2 direction, 60 second average	knots
nnn	bird 2 direction, 60 minute average	knots
ooo.o	temperature, instantaneous	Degrees C
ppp.p	temperature, 60 minute average	Degrees C
qqq.q	temperature, 60 minute low	Degrees C
rrr.r	temperature, 60 minute high	Degrees C
ss	relative humidity, instantaneous	%
tt	relative humidity, 60 minute low	%
uu	relative humidity, 60 minute high	%
vvvv.v	Baromoeter, instantaneous	knots

OBSIP Shotlog Format (not used on MGL1212)

Each OBSIP shotlog contains a header followed by shot records:

```
#obsipshotfile v1.0
#shotnumber date time sourceLat sourceLon shipLat shipLon waterDepth sciTag
0001280 2009-08-27 05:08:49.807873  48.495334 -129.201444  48.494097 -129.203017 2530.6
MGL0910_05
0001279 2009-08-27 05:12:33.961869  48.491860 -129.204474  48.490060 -129.205425 2526.4
MGL0910_05
0001278 2009-08-27 05:16:36.302883  48.488608 -129.206115  48.486807 -129.206944 2530.3
MGL0910_05
0001277 2009-08-27 05:19:51.053880  48.485157 -129.209212  48.483406 -129.209755 2526.1
MGL0910_05
0001276 2009-08-27 05:24:01.863875  48.480813 -129.212118  48.479293 -129.213152 2516.1
MGL0910_05
```

Shot records are in the following format:

```
0001276 2009-08-27 05:24:01.863875  48.480813 -129.212118  48.479293 -129.213152 2516.1
MGL0910_05
sssssss yyyy-mm-dd hh:mm:ss.ssssss  xx.xxxxxx  yyy.yyyyyy  vv.vvvvvv  www.wwwwww dddd.d lllllllllllllll
```

OBSIP record format

Item	Definition	Units
sssssss	shot number	n/a
yyyy-mm-dd	date	ISO8601 format
hh:mm:ss.ssssss	time	ISO8601 format
xx.xxxxxx	source lat	degrees, WGS84
yy.yyyyyy	source lon	degrees, WGS84
vv.vvvvvv	vessel lat	degrees, WGS84
ww.wwwwww	vessel lon	degrees, WGS84
dddd.d	depth	meters
lllllllllllllll	linename	n/a

LDEO PCO2 System

PCO2 outputs data in the following sentence format:

yyyyjjj.jjj aaaa.aa bb.bb cccc.cc ddd.dd e.ee fff.f gggg.gg hh i k

PCO2 Data

Item	Definition	Value	Units
yyyyjjj.jjj	pco2 Computer Date/Time	n/a	Year/Julian Day.decimal Four fixed digits of year. Three fixed digits of julian day. Five fixed digits for decimal fractions of a julian day.
aaaa.aa	CO2 Raw Signal	n/a	mVolts
bb.bb	CO2 Analyzer Cell Temperature	n/a	Celcius
cccc.cc	PCO2 Barometer	n/a	mbar
ddd.dd	VCO2	n/a	ppm
e.ee	Equilibrator Water Temp	n/a	Celcius
fff.f	pCO2	n/a	uatm
gggg.gg	Flow Controller	n/a	mVolts
hh	Flow Meter	n/a	cc/min
i	Sample ID #	0 to 16	integer
k	Sample ID	Equil, Atmos, Nitrogen, CC18798, CA07163, CC15551, or CC63668	alphanumeric

LDEO PCO2 + CNav + TSG + WX01 + SBE38 Systems

PCO2 merge is a combination of outputs of various serial data in the following sentence format:

yyyyjjj.jjj aaaa.aa bb.bb cccc.cc ddd.dd e.ee fff.f gggg.gg hh i k, llll.llllllm, nnnnn.nnnnnno, pppp.pp, q.qq, r.rr, s.ss, tt.tt, uu.u, vvv, w.w, xxx.x, y.yy, zzz.z, @@.@@@@

PCO2 Data

Item	Definition	Value	Units
yyyyjjj.jjj	pco2 Computer Date/Time	n/a	Year/Julian Day.decimal Four fixed digits of year. Three fixed digits of julian day. Five fixed digits for decimal fractions of a julian day.
aaaa.aa	CO2 Raw Signal	n/a	mVolts
bb.bb	CO2 Analyzer Cell Temperature	n/a	Celcius
cccc.cc	PCO2 Barometer	n/a	mbar
ddd.dd	VCO2	n/a	ppm
e.ee	Equilibrator Water Temp	n/a	Celcius
fff.f	pCO2	n/a	uatm
gggg.gg	Flow Controller	n/a	mVolts
hh	Flow Meter	n/a	cc/min
i	Sample ID #	0 to 16	integer
k	Sample ID	Equil, Atmos, Nitrogen, CC18798, CA07163, CC15551, or CC63668	alphanumeric
llll.llllllm	CNav Latitude	0 to 90, N/S	degrees/minutes.decimal/direction
nnnnn.nnnnnno	CNav Longitude	0 to 180, E/W	degrees/minutes.decimal/direction
pppp.pp	TSG Speed of Sound	n/a	m/s
q.qq	TSG Internal Temperature	n/a	Celcius
r.rr	TSG External Temperature	n/a	Celcius
s.ss	TSG Conductivity	n/a	S/m
tt.tt	TSG Salinity	25 to 40	ppm
uu.u	WX01 Bird 1 Wind Speed 60 sec avg	n/a	knots
vvv	WX01 Bird 1 Wind Direction 60 sec avg	0 to 360	degrees
w.w	WX01 Temperature Instantaneous	n/a	Celcius
xxx.x	WX01 Ship Barometer Instantaneous	n/a	mbar

y.yy	CNav Speed Over Ground / Speed Made Good	0 to 15	knots
zzz.z	CNav Course Made Good	0 to 360	degrees
@@.@@@@	SBE38 Temperature Probe	n/a	Celcius

POS/MV Position and Orientation System for Marine Vessels

POS/MV outputs data using the NMEA 0183 format at rates of up to fifty sentences per second. The following seven different sentence formats are available.

- 1. $INGGA-Global System Position Fix Data
- 2. $INHDT-Heading - True data
- 3. $INVTG-Course over ground and Ground speed data
- 4. $INGST-GPS pseudorange noise statistics
- 6. $PRDID-Attitude data
- 7. $INZDA-Time and date

$INGGA, hhmmss.sss, llll.llll, a, yyyyy.yyyyy, b, t, nn, v.v, x.x, M,,,c.c,rrrr*hh

$INGGA-Global System Position Fix Data

Item	Definition	Value	Units
$INGGA	Header	$INGGA	
hhmmss.sss	UTC time of position	n/a	Hours/Minutes/Seconds.decimal. Two fixed digits of hours. Two fixed digits of minutes. Two fixed digits of seconds. Three digits for decimal fractions of a second.
llll.llll	Latitude	-90 to +90	DegreeslMinutes.decimal. Two fixed digits of degrees Two fixed digits of minutes Five digits for decimal minutes.
a	N (north) or S (south)	N or S	
yyyyy.yyyyy	Longitude	-180 to +180	Degrees/Minutes.decimal. Three fixed digits of degrees. Two fixed digits of minutes. Five digits for decimal minutes.
b	E (east) or W (west)	E or W	
t	GPS Quality Indicator	0 = Fix not available or invalid 1 = CIA standard GPS; fix valid. 2 = DGS mode; fix valid. 3 = PPP mode; fix valid. 4 = RTK fixed 5 = RTK float 6 = free inertial	
nn	Number of satellites used in fix	0 to 32	
v.v	Horizontal dilution of precision		
x.x	Altitude of the IMU above or below the mean sea level. A negative value	n/a	Metres

	indicates below sea level.		
M	Units of measure = metres	M	
Null	Null		
Null	Null		
c.c	Age of differential corrections in records since last RTCM-104 message.	0 to 99.9	Seconds
rrr	DGPS reference station identity	0000 to 1023	
*hh	Checksum	00 - FF	
/CR/LF	Carriage return and line feed	/CR/LF	

Note that, in the case of the HDOP, IMU altitude and age of differential connections, POS/MV adds leading digits as required (i.e. if the value exceeds 9.9). Also, note that commas separate all items, including null fields. The information is valid at the location of the vessel frame.

$INHDT, x.x, T*hh

$INHDT-Heading - True data

Item	Definition	Value	Units
$INHDT	Header	$INHDT	
x.x	True vessel heading in the vessel frame	o to 359.99	degrees
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

$INVTG, x.x, T,, M, n.n, N, k.k, K*hh

$INVTG-Course over ground and Ground speed data

Item	Definition	Value	Units
%INVTG	Header	$INVTG	
x.x	True vessel track in the vessel frame	0 to 359.99	degrees
T	True	T	
null	Not supported	null	
M		M	
n.n	Speed in the vessel frame	n/a	Knots
N	Knots	N	
k.k	Kilometres	K	
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

Note that, in the case of the track and the speed fields, POS/MV adds the leading digits as required (i.e. if the value exceeds 9.9). ALso, note that commas separate all items in the including null fields.

$INGST, hhmmss,sss,,smjr.smjr,smnr.smnr, o.o, l.l, y.y, a.a *hh

$INGST-GPS pseudorange noise statistics

Item	Definition	Value	Units
$INGST	Header	$INGST	
hhmmss.sss	UTC time of position	n/a	Hours/Minutes/Seconds.decimal.

			2 fixed digits of hours. 2 fixed digits of minutes. 2 fixed digits of seconds. Three digits for decimal fractions of a second.
null	Not supported	null	
smjr.smjr	Standard Deviation of semi-major axis of error ellipse	n/a	Metres
smnr.smnr	Standard deviation of semi-minor axis of error ellipse	n/a	Metres
o.o	Orientaion of semi-major axis ellipse	0 to 359.9	Degrees from true north
l.l	Standard deviation of latitude	n/a	Metres
y.y	Standard deviation of longitude	n/a	Metres
a.a	Standard deviation of Altitude	n/a	Metres
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

Note that, in the case of all fields POS/MV adds leading digits as required (i.e. if the value exceeds 9.9). Also, note that commas separate all items, including null fields. The information is valid at the location of the vessel frame.

Note that commas separate all items

Two attitude data strings are available. The strings are identical except for the definition of roll and pitch angles. One string uses Tate-Bryant angles and the

other uses TSS angles. Use the POS/MV Controller program to set the required angle convention.

$PRDID, PPP.PP, RRR.RR, xxx.xx*hh

$PRDID-Attitude data

Item	Definition	Value	Units
$PRDID	Header	$PRDID	
PPP.PP	Pitch	-90.00 to +90.00	Degrees
RRR.RR	Roll	-90.00 to +90.00	Degrees
xxx.xx	Sensor heading	0 to 359.99	Degrees
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

Note that commas separate all items

Two attitude data strings are available. The strings are identical except for the definition of roll and pitch angles. One string uses Tate-Bryant angles and the

other uses TSS angles. Use the POS/MV Controller program to set the required angle convention.

$INZDA, hhmmss.ss, DD, MM, YYYY,, *hh

$INZDA-Time and date

Item	Definition	Value	Units
$INZDA	Header	$INZDA	

hhmmss.sss	UTC time	n/a	Hours/Minutes/Seconds.decimal. 2 fixed digits of hours 2 fixed digits of minutes 2 fixed digits of seconds Three digits for decimal fractions of a second
DD	Day of month	01 to 31	
MM	Month of year	01 to 12	
YYYY	Year		
Null	Null		
Null	Null		
*hh	Checksum	n/a	/CR/LF

RM Young Rain Gauge & Eppley PSP data

RM Young Rain Gauge & Eppley PSP data is formatted in the following sentences:

x.xxxxxx,y.y

Sentence field

Instrument	Item	definition	units
Eppley PSP	x.xxxxxx	voltage	mV
RM Young Rain Gauge	y.y	amount of rain	mm

Seabird SBE-45 Thermosalinograph Data

Data from the SBE-45 TSG is output in the following format:

```
2012:050:06:02:01.0294      27.2958, 5.51684, 34.7768
```

yyyy:ddd:hh:mm:ss.ssss tttt, cccc, xxxx

Item	Definition	Units
yyyy	year	n/a
ddd	day of year	n/a
hh	hours	n/a
mm	minutes	n/a
ss.ssss	seconds	n/a
tttt	Raw internal temperature sensor data	n/a
cccc	Raw conductivity sensor data	n/a
xxxx	Raw salinity sensor data	n/a

SEAPATH 200 Intertial Navigation System

SEAPATH outputs data in NMEA format using the following sentence formats:

- 1. $INGGA-Global System Position Fix Data
- 2. $INHDT-Heading - True data
- 3. $INVTG-Course over ground and Ground speed data
- 4. $INZDA-Time and date

$INGGA, hhmmss.sss, llll.llll, a, yyyyy.yyyyy, b, t, nn, v.v, x.x, M,,,c.c,rrrr*hh

$INGGA-Global System Position Fix Data

Item	Definition	Value	Units
$INGGA	Header	$INGGA	
hhmmss.sss	UTC time of position	n/a	Hours/Minutes/Seconds.decimal. Two fixed digits of hours. Two fixed digits of minutes. Two fixed digits of seconds. Three digits for decimal fractions of a second.
llll.llll	Latitude	-90 to +90	DegreeslMinutes.decimal. Two fixed digits of degrees Two fixed digits of minutes Five digits for decimal minutes.
a	N (north) or S (south)	N or S	
yyyyy.yyyyy	Longitude	-180 to +180	Degrees/Minutes.decimal. Three fixed digits of degrees. Two fixed digits of minutes. Five digits for decimal minutes.
b	E (east) or W (west)	E or W	
t	GPS Quality Indicator	0 = Fix not available or invalid 1 = CIA standard GPS; fix valid. 2 = DGS mode; fix valid. 3 = PPP mode; fix valid. 4 = RTK fixed 5 = RTK float 6 = free inertial	
nn	Number of satellites used in fix	0 to 32	
v.v	Horizontal dilution of precision		
x.x	Altitude of the IMU above or below the mean sea level. A negative value indicates below sea level.	n/a	Metres
M	Units of measure = metres	M	
Null	Null		
Null	Null		
c.c	Age of differential corrections in records since last RTCM-104 message.	0 to 99.9	Seconds
rrr	DGPS reference station identity	0000 to 1023	
*hh	Checksum		
/CR/LF	Carriage return and line feed	/CR/LF	

$INHDT, x.x, T*hh

$INHDT-Heading - True data

Item	Definition	Value	Units
$INHDT	Header	$INHDT	
x.x	True vessel heading in the vessel frame	o to 359.99	degrees
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

$INVTG, x.x, T,, M, n.n, N, k.k, K*hh

$INVTG-Course over ground and Ground speed data

Item	Definition	Value	Units
$INVTG	Header	$INVTG	
x.x	True vessel track in the vessel frame	0 to 359.99	degrees
T	True	T	
null	Not supported	null	
M		M	
n.n	Speed in the vessel frame	n/a	Knots
N	Knots	N	
k.k	Kilometres	K	
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

$INZDA, hhmmss.ss, DD, MM, YYYY,, *hh

$INZDA-Time and date

Item	Definition	Value	Units
$INZDA	Header	$INZDA	
hhmmss.sss	UTC time	n/a	Hours/Minutes/Seconds.decimal. 2 fixed digits of hours 2 fixed digits of minutes 2 fixed digits of seconds Three digits for decimal fractions of a second
DD	Day of month	01 to 31	
MM	Month of year	01 to 12	
YYYY	Year		
Null	Null		
Null	Null		
*hh	Checksum	n/a	
/CR/LF	Carriage return and line feed	/CR/LF	

Speed log data

Speed log data is formatted in the following sentences:

- VHW - Water speed and heading
- VBW - Dual Ground/Water Speed

$VHW,x.x,T,x.x,M,x.x,N,x.x,K*hh

VHW sentence fields

Item	definition	units
x.x	degrees true	?
T	T=true	n/a
x.x	degrees Magnetic	?
M	M = Magnetic	n/a
x.x	Speed of vessel relative to water	Knots/hour
N	N = Nots	n/a
x.x	Speed of vessel relative to water	Km/hour
K	K = Kilometers	n/a
*hh	Checksum	n/a

$VBW,x.x,x.x,A,x.x,x.x,A*hh

VBW sentence fields

Item	Definition	Units
x.x	Longitudinal water speed, "-" means astern	?
x.x	Transverse water speed, "-" means port	?
A	A = Data Valid	n/a
x.x	Longitudinal ground speed, "-" means astern	?
x.x	Transverse ground speed, "-" means port	?
A	A = data valid, V = data invalid	n/a
*hh	Checksum	n/a

Streamer Tension Unit Data

STU outputs data in the following sentence format:

aaa bbb cc dd ee f g hhhh iiii jjjj kkkk l m nnnn oooo pppp qqqq r s tttt uuuu vvvv wwww x y zzzz !!!! @@@@

STU Data

Item	Definition	Value	Units
aaa	na	n/a	n/a
bbb	Julian Day	1 to 366	day
cc	Hour	0 to 24	integer
dd	Minutes	0 to 60	integer
ee	Seconds	0 to 60	integer
f	# 1 ID	1	integer
g	# 1 Channel #	0	integer
hhhh	# 1 Peak Tension	n/a	lbs
iiii	# 1 Average Tension	n/a	lbs
jjjj	# 1 Delta Tension	n/a	n/a
kkkk	# 1 Temperature	n/a	Celcius
l	# 2 ID	1	integer
m	# 2 Channel #	1	integer
nnnn	# 2 Peak Tension	n/a	lbs
oooo	# 2 Average Tension	n/a	lbs
pppp	# 2 Delta Tension	n/a	n/a
qqqq	# 2 Temperature	n/a	Celcius
r	# 3 ID	1	integer
s	# 3 Channel #	2	integer
tttt	# 3 Peak Tension	n/a	lbs
uuuu	# 3 Average Tension	n/a	lbs
vvvv	# 3 Delta Tension	n/a	n/a
wwww	# 3 Temperature	n/a	Celcius
x	# 4 ID	1	integer
y	# 4 Channel #	3	integer
zzzz	# 4 Peak Tension	n/a	lbs
!!!!	# 4 Average Tension	n/a	lbs
@@@@	# 4 Delta Tension	n/a	n/a
####	# 4 Temperature	n/a	Celcius

Applied Microsystems Sound Velocity Probe Data

The sound velocity probe serial data is output in the following format:

1479.35

xxxx.xx

Item	Definition	Units
xxxx.xx	Sound Velocity	m/s

Seabird SBE38 Thermometer Probe Data

The sound velocity probe serial data is output in the following format:

8.2221

xx.xxxx

Item	Definition	Units
xx.xxxx	Temperature	Celcius

RM Young Meteorological Station Data

The meteorological data from the RMYoung integrated weather station is output in the following sentence format:

12.6 13.2 12.6 16.9 1 335 2 0.0 0.0 0.0 0.0 355 355 0 -11.9 -23.8 ***** 7.3 8 4 9 1006.9
aaa.a bbb.b ccc.c dd.d eee fff ggg hhh.h iii.i jjj.j kkk.k lll mmm nnn -oo.o -pp.p -qq.q -rr.r ss tt uu vvvv.v

Langseth WX station sentence format

Item	Definition	Units
aaa.a	bird 1 speed, instantaneous	knots
bbb.b	bird 1 speed, 60 second average	knots
ccc.c	bird 1 speed, 60 minute average	knots
ddd.d	bird 1 speed, 60 second peak	knots
eee	bird 1 direction, instantaneous	knots
fff	bird 1 direction, 60 second average	knots
ggg	bird 1 direction, 60 minute average	knots
hhh.h	bird 2 speed, instantaneous	knots
iii.i	bird 2 speed, 60 second average	knots
jjj.j	bird 2 speed, 60 minute average	knots
kkk.k	bird 2 speed, 60 second peak	knots
lll	bird 2 direction, instantaneous	knots
mmm	bird 2 direction, 60 second average	knots
nnn	bird 2 direction, 60 minute average	knots
ooo.o	temperature, instantaneous	Degrees C
ppp.p	temperature, 60 minute average	Degrees C

qqq.q	temperature, 60 minute low	Degrees C
rrr.r	temperature, 60 minute high	Degrees C
ss	relative humidity, instantaneous	%
tt	relative humidity, 60 minute low	%
uu	relative humidity, 60 minute high	%
vvvv.v	Baromoeter, instantaneous	knots