

# RV Langseth Data Reduction Summary

## MGL0910

Astoria, Oregon – Astoria, Oregon

FINAL

V1.0, 2009-09-20

Lamont-Doherty Earth Observatory, Columbia University

**Mon Sept 19 10:00:00 2009**

Date	Julian Date	Time	Port
2009-08-22	2009-234	2000 UTC, 1300L	Astoria, Oregon
2009-09-19	2009-262	2200 UTC, 1500L	Astoria, Oregon

Prepared by:

David Ng  
IT/Navigation  
[dng@ldeo.columbia.edu](mailto:dng@ldeo.columbia.edu)

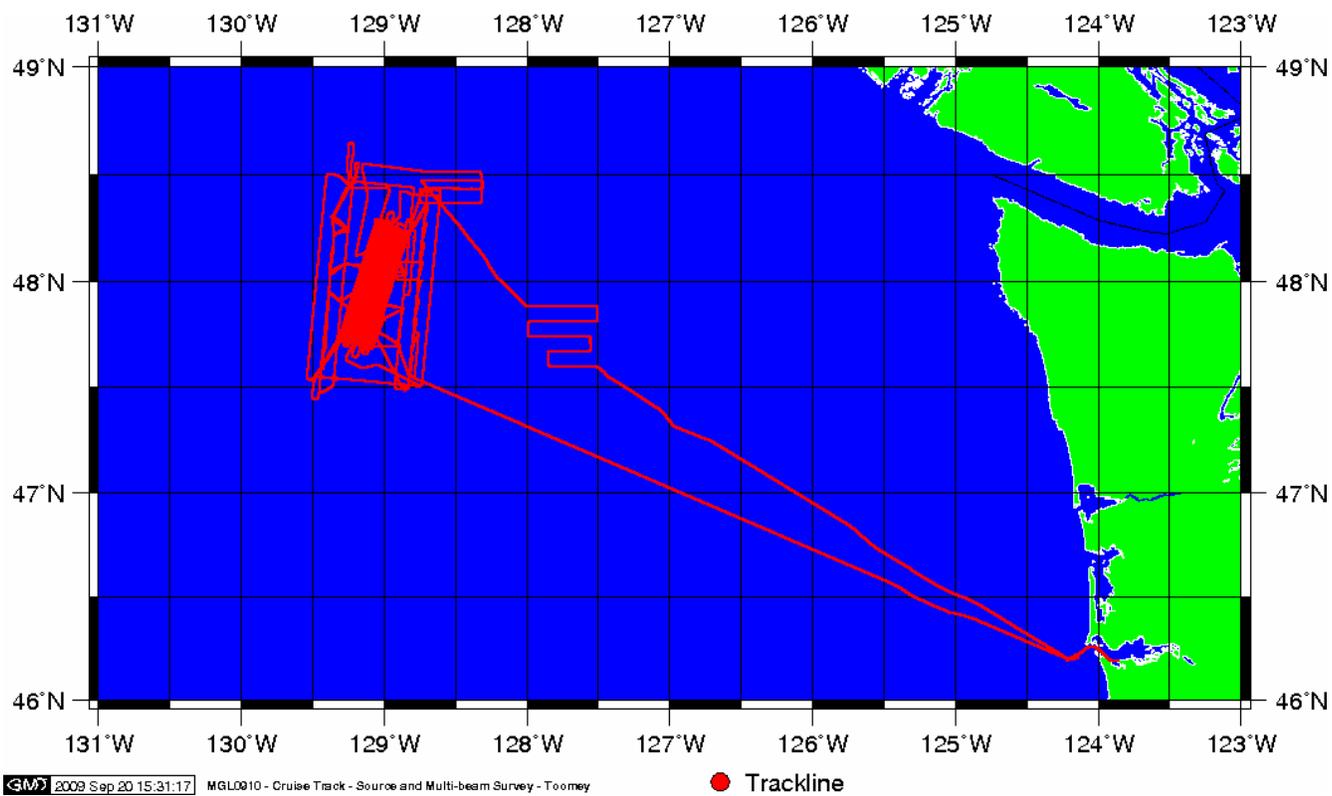
## Table of Contents

Table of Contents.....	4
Figure 1 - Cruise Track.....	6
I. Background and Scientific Objectives.....	7
Figure 2 – Source & Multibeam Survey Area.....	8
Figure 3 - OBS Deploy Plan.....	9
Figure 4 - OBS Recovery Plan.....	10
Figure 5 – Neptune Survey Area.....	11
Figure 6 – Northeast Pacific Ocean Topography & Bathymetry.....	12
II. Personnel.....	13
III. Instrumentation Summary.....	15
IV. Seismic Summary.....	32
A. Acquisition Parameter Table.....	32
B. Seismic Overview.....	32
V. Client Instrumentation.....	33
VI. RV Langseth Gravity Tie Information.....	34
VII. Archive Contents.....	34

Please refer to the Langseth Data Report Supplement for information regarding data formats.



**Figure 1 - Cruise Track**



## I. Background and Scientific Objectives

*R/V Marcus G. Langseth* leg MGL0910 conducted a multi-scale seismic tomography experiment on the Endeavour segment of the Juan de Fuca Ridge (ETOMO). During the 30-day leg, 64 four-component, ocean bottom seismometers (OBSs) were deployed throughout a 90x50 km<sup>2</sup> area to record seismic energy from the 36-element, 6600 cu. in. airgun array of the *R/V Marcus G. Langseth*. At the segment scale (~90 km along axis), the ETOMO experiment will constrain the nature of sub-ridge mantle flow and the pattern of melt transport from the topmost mantle to the crust beneath the entire Endeavour segment. These 'undershoot' data will provide a direct test of competing models for the origin of ridge crest segmentation and, in particular, provide critical data for determining if skew of mantle upwelling and melt transport is common phenomena beneath spreading centers. Also at this scale, the ETOMO data will provide direct measurements of crustal thickness which will be used to understand the history of segment-scale magma supply. At an intermediate scale of approximately 60 km along axis and 20 km across axis, the ETOMO experiment will constrain the size, shape, and distribution of crustal magma bodies that fuel the Endeavour hydrothermal system. Data from the 'crustal grid' of seismic surveying will provide one of the largest 3-D images of a crustal magmatic system for any volcano on Earth. At a smaller scale that is focused on the vent fields themselves, data from ETOMO will constrain the physical properties of the reaction zone between the magmatic and hydrothermal systems. Taken as a whole, data from the ETOMO experiment will be able to track the seismic signature of heat and mass transport from the mantle to the seafloor at the Endeavour segment, thereby achieving one of the primary goals of the [RIDGE 2000](#) program for the [Endeavour Integrated Study Site](#).

The Endeavour seismic tomography experiment (ETOMO) experiment will test competing models for what controls the segmentation and intensity of ridge crest processes. Existing models are at odds on the scale of mantle and crustal magmatic segmentation, the distribution of hydrothermal venting with respect to a volcanic segment and the properties of the thermal boundary layer that transports energy between the magmatic and hydrothermal systems. The recent discovery of an axial magma chamber (AMC) reflector beneath the Endeavour segment of the Juan de Fuca ridge, as well as systematic along axis changes in seafloor depth, ridge crest morphology and hydrothermal venting provide an ideal target for testing models of the origin of segmentation at mid-ocean ridges.

The ETOMO experimental design will investigate the 3-D structure of the crust and topmost mantle beneath the Endeavour segment, a [RIDGE2000 Integrated Study Site \(ISS\)](#). The scientific objectives are to: (1) Determine if the segmentation and intensity of the magma-hydrothermal systems at the Endeavour ridge are related to magma supply or to the magma plumbing between the mantle and crust, and (2) Constrain the thermal and magmatic structure underlying the Endeavour hydrothermal system in order to understand the patterns of energy transfer.

The results of our environmental research will also have other concrete science and societal benefits, including an improved understanding of the life cycle of deep-sea vents and of how the structure and hydration of oceanic crust contributes to earthquakes, tsunamis and volcanic hazards that threaten the Pacific Northwest (PNW). These points are explained further below.

The ETOMO expedition is collaborative between Professors [Dr. Douglas Toomey](#) and [Dr. Emilie Hoofft](#) (University of Oregon) and Professor [Dr. William Wilcock](#) (University of Washington).

The location of the ETOMO experiment is the Endeavour segment of the Juan de Fuca ridge. This mid-ocean ridge segment is one of three integrated study sites for the NSF-funded [RIDGE2000 program](#) and it is a primary science node for [NEPTUNE Canada](#).



Figure 3 - OBS Deploy Plan

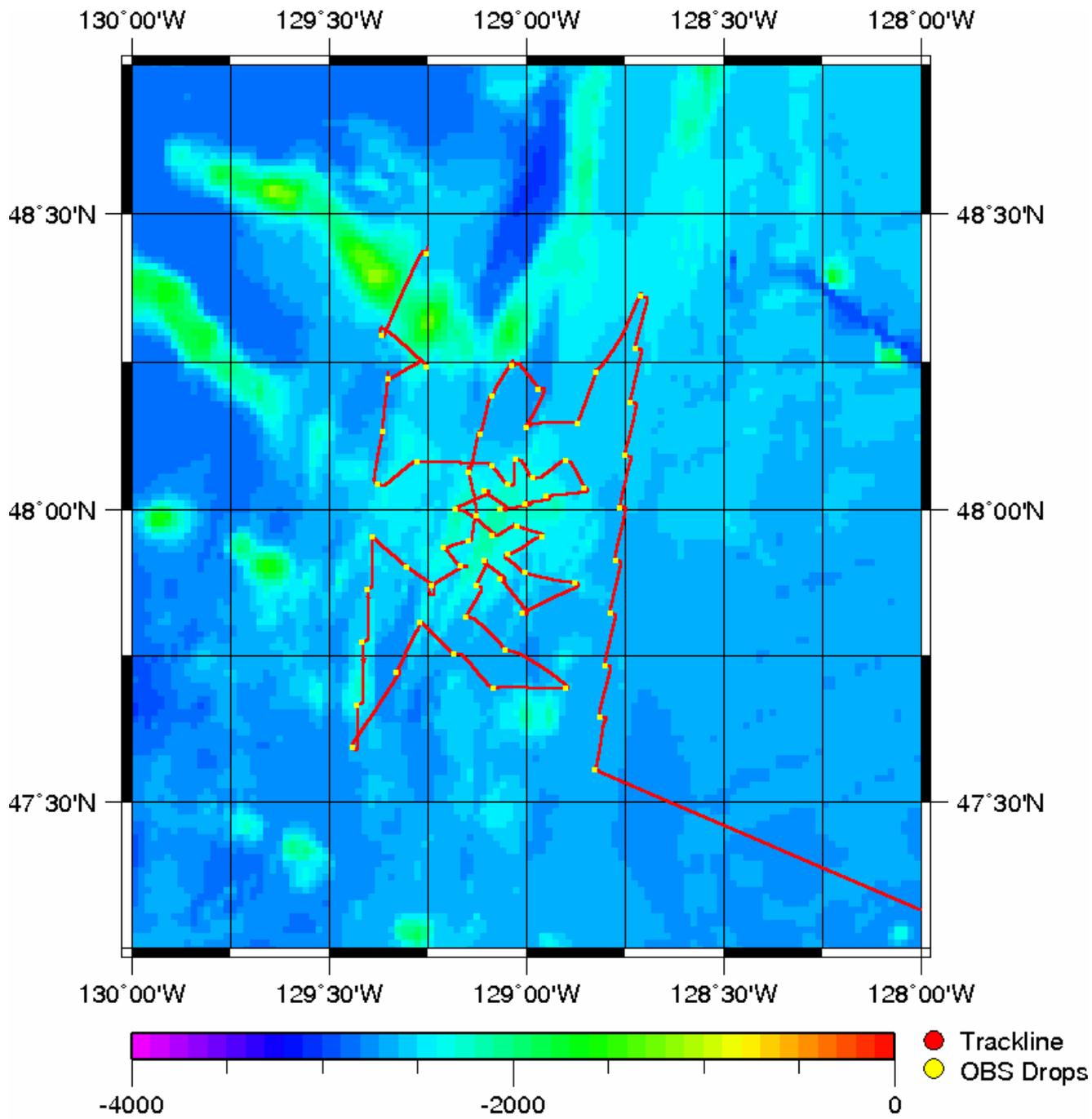
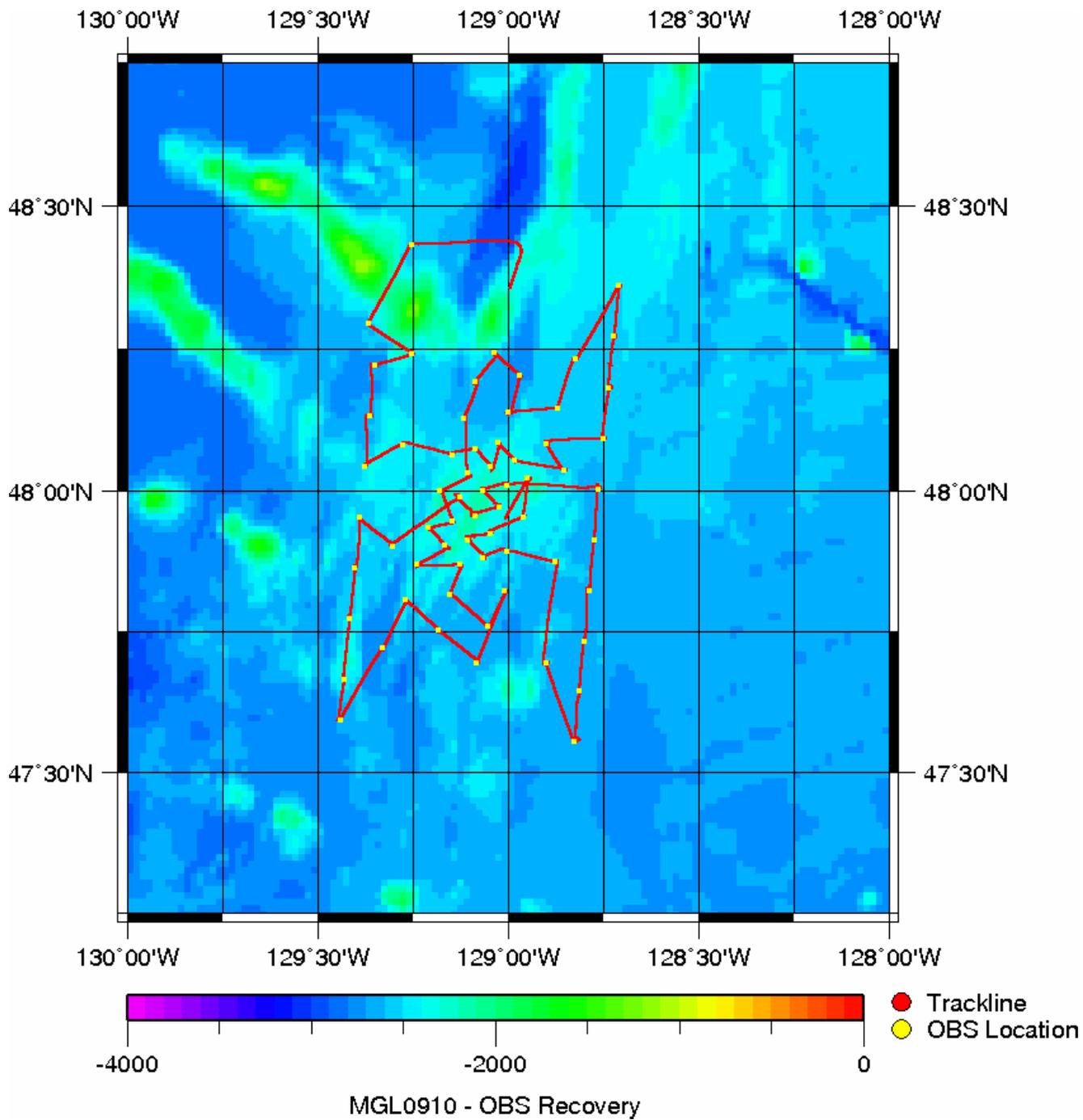
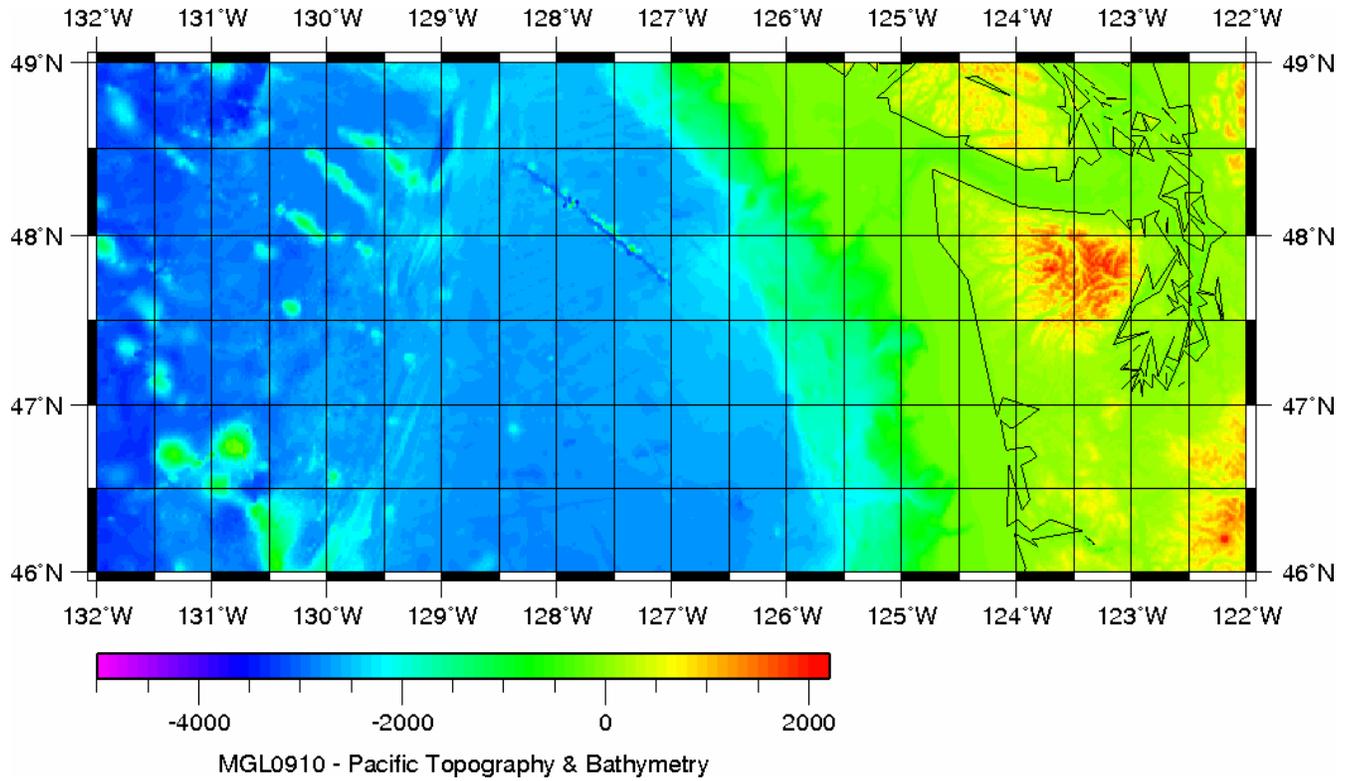


Figure 4 - OBS Recovery Plan





**Figure 6 – Northeast Pacific Ocean Topography & Bathymetry**



## II. Personnel

### Shipboard Technical Staff

1	Anthony Johnson	Technician-in-charge
2	David Martinson	Watch Leader/Chief Navigation
3	Bern McKiernan	Watch Leader/Chief Acquisition
4	Ryan Eaton	ET/Acquisition
5	David Ng	IT/Nav
6	Tom Spoto	Chief Sound Source
7	Robbie Gunn	Sound Source Mechanic
8	Brian Goodick	Sound Source Mechanic
9	Carlos Gutierrez	Sound Source Mechanic
10	Don Cucchiara	Sound Source Mechanic
11	Josef Kuenhast	Sound Source Mechanic

### Ship's Crew

1	Mark Landow	Captain
2	Matt Bakis	Chief Mate
3	David Wolford	2 <sup>nd</sup> Mate
4	Nicholas Gasper	3 <sup>rd</sup> Mate
5	Gordon Baxter	AB
6	George Cereno	AB
7	Ricardo Redito	AB
8	Ethan Bell	AB
9	Jeromie Webster	OS
10	Nicky Applewhite	OS
11	Steve Pica	Chief Engineer
12	Peter Chizmar	1 <sup>st</sup> Asst. Engineer
13	Michael Caseria	2 <sup>nd</sup> Asst. Engineer
14	Ryan Vetting	3 <sup>rd</sup> Asst. Engineer
15	Jack Schwartz	Electrician
16	Fernando Uribe	Oiler
17	Jack Billings	Oiler
18	Charles Billips	Oiler
19	Gary Brodock	Steward
20	Ricardo Rios	Cook

**OBS Techs**

1	Mark Gibaud	OBS Tech	Scripps
2	Ernie Aaron	OBS Tech	Scripps
3	Phil Thai	OBS Tech	Scripps
4	Peter Lemmond	OBS Tech	WHOI
5	Dave Dubois	OBS Tech	WHOI

**MMO**

1	Giovanni Caltavuturo	MMO
2	Joe Beland	MMO
3	John Nicolas	MMO
4	Brad Dawe	MMO
5	Kyla Graham	MMO
6	Megan Meyer	MMO

**Science Party**

1	Doug Toomey	Chief Scientist	Univ. of Oregon
2	Emilie Hooft	Co-chief Scientist	Univ. of Oregon
3	William Wilcock	Co-chief Scientist	Univ. of Washington
4	Dax Soule	Grad Student	Univ. of Washington
5	Robert Weekly	Grad Student	Univ. of Washington
6	Troy Durant	Grad Student	Univ. of Oregon
7	Kohtaro Araragi	Grad Student	Univ. of Oregon
8	Anne Wells	Grad Student	Univ. of Oregon
9	Ruth Price	Grad Student	Univ. of Oregon

### III. Instrumentation Summary

All science instruments aboard the Langseth are listed in the science\_sensors spreadsheet in the docs section of the cruise archive. 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.

For details on the data formats and interpretation notes, see Appendix A, Data Formats, included on the cruise archive.

#### Instrument Data Files

Instrument	Description	Data Set	Data Outputs	Files	Interval
FE700	Furuno FE700 Echosounder	None	serial logs	MGL-bath01.*	1s
EM120	Kongsberg EM120 Multibeam Sonar	Full	raw output to file	See below	variable
			centerbeam serial logs	MGL-bath02.*	variable
DS50	Furuno DS50 Doppler Speedlog	Full	serial logs	MGL-slog01.*	1s
XBT	Sippican MK21 XBT Launcher	39 Drops	raw output to file	See below	n/a
			converted output to file	See below	n/a
WX1	RM Young 5103 Weather Bird and Translator	Full	serial logs	MGL-wx01.*	1s
			mwv conversion	MGL-mwv01.*	1s
TSG	SeaBird SBE23 Thermosalinograph	Full	raw serial logs	MGL-tsg.*	1s
			converted data	MGL-tsgconv.*	
CNAV	C&C Tech. CNAV DGPS Receiver	Full	serial logs	MGL-cnav.*	1s
MAG01	GeoMetrics 882 Magnetometer	On Deploy	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	Full	serial logs	MGL-posmv.*	1s
SEAPATH	Kongsberg SeaPath Integrated Nav System	Full	serial logs	MGL-seapath.*	1s
STU	Sercel Streamer Tension	None	serial logs	MGL-stu1.*	10s
TAGGER	Spectrum Instruments intelligent reference TM-4	Full	serial logs	MGL-tagger01.*	shot
			filtered logs	MGL-shot01.*	shot

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 to 800m depth. The echosounder is normally switched off before the unit goes out of depth. The unit was not logged during this cruise.

*Interruptions greater than twenty seconds are displayed in the following table.*

Log Date	Event	Comment
2009:233:00:00:00.5070		Logging officially started
2009:263:00:05:01.8282		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 MGL0910/multibeam. Center beam depth is recorded separately to serial log. TSG sound velocity was used during this cruise.

**Logging interval:** variable with water depth

**File id:** bath02

*Interruptions greater than sixty seconds are displayed in the following table.*

Log Date	Event	Comment
2009:234:21:00:16.8246		Logging officially started
2009:234:22:00:26.1656 – 2009:234:22:41:51.2812	Missing data	Pre-cruise set-up of EM122
2009:235:01:00:37.8770 – 2009:235:01:04:25.4964	Missing data	Secured for OBS drop
2009:235:01:04:51.5436 – 2009:235:01:21:16.0846	Missing data	Secured for OBS drop
2009:236:06:10:11.9619 – 2009:236:06:18:33.4357	Missing data	Secured for OBS drop
2009:236:07:10:08.2584 – 2009:236:07:19:19.5121	Missing data	Secured for OBS drop
2009:236:08:01:06.2542 – 2009:236:08:10:38.1312	Missing data	Secured for OBS drop
2009:236:08:50:26.0643 – 2009:236:08:57:16.1487	Missing data	Secured for OBS drop

2009:236:09:36:46.8003 – 2009:236:09:45:00.7266	Missing data	Secured for OBS drop
2009:236:10:24:37.6599 – 2009:236:10:38:28.6253	Missing data	Secured for OBS drop
2009:236:11:22:19.3798 – 2009:236:11:30:53.8692	Missing data	Secured for OBS drop
2009:236:12:14:03.9526 – 2009:236:12:23:40.5336	Missing data	Secured for OBS drop
2009:236:13:07:16.1339 – 2009:236:13:16:30.4161	Missing data	Secured for OBS drop
2009:236:14:01:12.9338 – 2009:236:14:13:45.7166	Missing data	Secured for OBS drop
2009:236:15:22:22.4317 – 2009:236:15:34:50.8690	Missing data	Secured for OBS drop
2009:236:16:18:01.6698 – 2009:236:16:23:01.2397	Missing data	Secured for OBS drop
2009:236:17:02:24.8115 – 2009:236:17:06:47.7129	Missing data	Secured for OBS drop
2009:236:17:42:40.1011 – 2009:236:17:48:06.2199	Missing data	Secured for OBS drop
2009:236:18:17:47.5226 – 2009:236:18:40:47.1327	Missing data	Secured for OBS drop
2009:236:19:16:31.3504 – 2009:236:19:21:07.8918	Missing data	Secured for OBS drop
2009:236:20:00:59.4623 – 2009:236:20:06:18.4706	Missing data	Secured for OBS drop
2009:236:20:38:11.3356 – 2009:236:20:40:18.7226	Missing data	Reason not specified
2009:236:20:56:47.4676 – 2009:236:21:00:21.3832	Missing data	Secured for OBS drop
2009:236:22:06:55.5296 – 2009:236:22:13:49.3798	Missing data	Secured for OBS drop
2009:236:22:44:40.5098 – 2009:236:22:49:23.3011	Missing data	Secured for OBS drop
2009:236:23:26:35.4855 – 2009:236:23:30:50.2463	Missing data	Secured for OBS drop
2009:237:00:14:00.8910 – 2009:237:00:35:25.6138	Missing data	Secured for OBS drop
2009:237:01:50:37.4346 – 2009:237:02:00:06.8738	Missing data	Secured for OBS drop
2009:237:02:35:57.6077 – 2009:237:02:42:30.8027	Missing data	Secured for OBS drop
2009:237:03:26:34.5412 – 2009:237:03:35:46.3565	Missing data	Secured for OBS drop
2009:237:04:22:32.4339 – 2009:237:04:31:42.1883	Missing data	Secured for OBS drop
2009:237:05:19:16.5299 – 2009:237:05:27:10.3337	Missing data	Secured for OBS drop
2009:237:06:27:16.7212 – 2009:237:06:36:00.6173	Missing data	Secured for OBS drop
2009:237:07:22:57.8521 – 2009:237:07:36:43.4357	Missing data	Secured for OBS drop
2009:237:08:53:11.5602 – 2009:237:10:33:39.8960	Missing data	Secured for OBS drop
2009:237:10:53:56.7448 – 2009:237:11:02:03.7034	Missing data	Secured for OBS drop
2009:237:12:33:26.4422 – 2009:237:12:42:24.8517	Missing data	Secured for OBS drop
2009:237:13:50:33.2313 – 2009:237:14:05:01.4773	Missing data	Secured for OBS drop
2009:237:14:51:34.1665 – 2009:237:14:57:45.1116	Missing data	Secured for OBS drop
2009:237:16:01:25.8711 – 2009:237:16:05:37.5689	Missing data	Secured for OBS drop
2009:237:17:22:12.3110 – 2009:237:17:25:34.8532	Missing data	Secured for OBS drop

2009:237:18:20:09.9220 – 2009:237:18:25:52.9768	Missing data	Secured for OBS drop
2009:237:19:04:00.9405 – 2009:237:19:09:04.7469	Missing data	Secured for OBS drop
2009:237:19:39:13.8331 – 2009:237:19:43:52.5135	Missing data	Secured for OBS drop
2009:237:20:28:49.4699 – 2009:237:20:32:46.9805	Missing data	Secured for OBS drop
2009:237:21:24:21.0547 – 2009:237:21:28:41.7044	Missing data	Secured for OBS drop
2009:237:22:32:41.6519 – 2009:237:22:37:40.5663	Missing data	Secured for OBS drop
2009:237:22:46:12.1478 – 2009:237:22:48:51.1771	Missing data	Graphics froze, needed restart
2009:237:23:39:40.6686 – 2009:237:23:44:30.3662	Missing data	Secured for OBS drop
2009:238:00:19:58.0835 – 2009:238:00:24:25.0602	Missing data	Secured for OBS drop
2009:238:01:05:21.4416 – 2009:238:01:09:48.7803	Missing data	Secured for OBS drop
2009:238:01:53:43.5638 – 2009:238:01:59:13.5712	Missing data	Secured for OBS drop
2009:238:02:41:13.7648 – 2009:238:03:14:54.5167	Missing data	Secured for OBS drop
2009:238:04:03:02.9361 – 2009:238:04:15:03.7476	Missing data	Secured for OBS drop
2009:238:04:59:32.5629 – 2009:238:05:14:21.1515	Missing data	Secured for OBS drop
2009:238:05:49:25.7122 – 2009:238:06:13:34.3208	Missing data	Secured for OBS drop
2009:238:06:43:46.8114 – 2009:238:06:51:37.1294	Missing data	Secured for OBS drop
2009:238:07:25:35.3798 – 2009:238:07:32:47.2140	Missing data	Secured for OBS drop
2009:238:08:18:02.1832 – 2009:238:08:21:19.6958	Missing data	Secured for OBS drop
2009:238:09:00:15.4863 – 2009:238:09:13:42.3743	Missing data	Secured for OBS drop
2009:238:09:52:01.1967 – 2009:238:09:57:00.3782	Missing data	Secured for OBS drop
2009:238:10:26:45.4320 – 2009:238:10:30:58.8000	Missing data	Secured for OBS drop
2009:238:11:05:03.0666 – 2009:238:11:08:52.3108	Missing data	Secured for OBS drop
2009:238:11:37:30.4768 – 2009:238:11:41:31.2985	Missing data	Secured for OBS drop
2009:238:12:47:41.2710 – 2009:238:12:50:48.7830	Missing data	Secured for OBS drop
2009:238:13:47:15.9244 – 2009:238:13:55:00.8050	Missing data	Secured for OBS drop
2009:238:14:44:26.9265 – 2009:238:14:51:28.0726	Missing data	Secured for OBS drop
2009:238:15:47:40.7618 – 2009:238:15:57:23.4987	Missing data	Secured for OBS drop
2009:238:16:35:02.4487 – 2009:238:16:39:55.7704	Missing data	Secured for OBS drop
2009:238:17:40:35.3605 – 2009:238:17:48:25.1156	Missing data	Secured for OBS drop
2009:238:19:20:25.2881 – 2009:238:19:30:44.7111	Missing data	Secured for OBS drop
2009:239:05:20:01.4421 – 2009:239:05:22:08.0318	Missing data	Reason not specified
2009:239:15:40:50.1379 – 2009:239:15:43:21.3235	Missing data	Reason not specified
2009:241:03:48:38.0196 – 2009:241:04:10:26.6771	Missing data	Timing/position error

		on EM122
2009:241:10:09:48.8786 – 2009:241:10:41:17.5403	Missing data	Communication error
2009:245:21:38:12.7029 – 2009:245:21:50:40.0149	Missing data	PU lost PPS
2009:247:05:50:39.4236 – 2009:247:05:52:49.4683	Missing data	Rough weather
2009:247:06:21:00.2594 – 2009:247:06:23:02.4431	Missing data	Rough weather
2009:251:19:26:02.2842 – 2009:251:19:34:12.8838	Missing data	Ship power failure
2009:252:00:25:38.8209 – 2009:252:00:27:40.3813	Missing data	Rough weather
2009:254:13:37:12.2415 – 2009:254:14:51:49.7160	Missing data	Secured for OBS recovery
2009:254:15:56:42.0779 – 2009:254:17:13:52.7026	Missing data	Secured for OBS recovery
2009:254:17:47:58.6230 – 2009:254:20:36:31.2929	Missing data	Secured for OBS recovery
2009:254:20:51:53.3977 – 2009:254:22:01:09.7700	Missing data	Secured for OBS recovery
2009:254:22:33:43.3671 – 2009:254:23:48:30.4147	Missing data	Secured for OBS recovery
2009:255:00:26:00.2154 – 2009:255:01:49:49.1643	Missing data	Secured for OBS recovery
2009:255:02:24:09.8843 – 2009:255:03:33:01.8069	Missing data	Secured for OBS recovery
2009:255:04:05:04.1220 – 2009:255:05:29:06.2732	Missing data	Secured for OBS recovery
2009:255:05:44:32.7531 – 2009:255:06:54:56.4535	Missing data	Secured for OBS recovery
2009:255:07:17:04.2677 – 2009:255:09:02:42.7016	Missing data	Secured for OBS recovery
2009:255:09:27:50.6357 – 2009:255:10:29:08.1753	Missing data	Secured for OBS recovery
2009:255:10:53:34.7371 – 2009:255:12:01:16.6291	Missing data	Secured for OBS recovery
2009:255:12:53:55.1512 – 2009:255:14:53:41.7370	Missing data	Secured for OBS recovery
2009:255:15:07:55.5764 – 2009:255:18:08:53.5194	Missing data	Secured for OBS recovery
2009:255:18:45:27.2519 – 2009:255:19:51:08.3658	Missing data	Secured for OBS recovery
2009:255:20:22:35.0747 – 2009:255:22:01:40.9908	Missing data	Secured for OBS

		recovery
2009:255:22:36:03.9469 – 2009:255:23:43:27.9528	Missing data	Secured for OBS recovery
2009:256:00:49:17.2703 – 2009:256:01:53:19.6073	Missing data	Secured for OBS recovery
2009:256:02:40:37.5272 – 2009:256:03:56:46.6436	Missing data	Secured for OBS recovery
2009:256:04:41:24.0373 – 2009:256:05:50:30.0216	Missing data	Secured for OBS recovery
2009:256:06:27:34.7356 – 2009:256:07:47:41.9424	Missing data	Secured for OBS recovery
2009:256:08:13:49.1260 – 2009:256:09:35:10.6253	Missing data	Secured for OBS recovery
2009:256:09:48:45.1850 – 2009:256:10:47:26.3716	Missing data	Secured for OBS recovery
2009:256:11:32:31.7318 – 2009:256:12:54:18.7616	Missing data	Secured for OBS recovery
2009:256:13:48:18.9683 – 2009:256:14:59:03.2776	Missing data	Secured for OBS recovery
2009:256:15:18:13.4377 – 2009:256:16:48:35.5313	Missing data	Secured for OBS recovery
2009:256:16:53:05.2447 – 2009:256:17:56:32.0316	Missing data	Secured for OBS recovery
2009:256:18:21:42.8406 – 2009:256:19:12:58.4112	Missing data	Secured for OBS recovery
2009:256:19:34:23.9301 – 2009:256:20:30:33.9470	Missing data	Secured for OBS recovery
2009:256:20:59:56.1710 – 2009:256:21:55:13.9719	Missing data	Secured for OBS recovery
2009:256:22:27:15.4601 – 2009:256:23:25:36.6298	Missing data	Secured for OBS recovery
2009:257:00:00:37.5819 – 2009:257:01:05:14.0388	Missing data	Secured for OBS recovery
2009:257:01:53:22.5026 – 2009:257:02:56:39.6332	Missing data	Secured for OBS recovery
2009:257:03:29:27.1330 – 2009:257:04:38:22.4759	Missing data	Secured for OBS recovery
2009:257:05:37:26.3156 – 2009:257:06:38:27.0734	Missing data	Secured for OBS recovery

2009:257:07:25:53.8823 – 2009:257:08:27:44.3430	Missing data	Secured for OBS recovery
2009:257:09:09:15.2076 – 2009:257:10:06:09.5980	Missing data	Secured for OBS recovery
2009:257:10:47:47.6957 – 2009:257:15:32:29.0062	Missing data	Secured for OBS recovery
2009:257:16:29:37.4576 – 2009:257:17:44:13.0882	Missing data	Secured for OBS recovery
2009:257:18:12:06.0346 – 2009:257:19:28:10.6020	Missing data	Secured for OBS recovery
2009:257:20:13:12.5861 – 2009:257:21:28:20.5326	Missing data	Secured for OBS recovery
2009:257:22:03:18.9534 – 2009:257:23:14:53.4984	Missing data	Secured for OBS recovery
2009:258:01:42:34.0864 – 2009:258:03:09:00.1139	Missing data	Secured for OBS recovery
2009:258:04:16:54.2526 – 2009:258:05:17:20.9761	Missing data	Secured for OBS recovery
2009:258:05:49:13.0109 – 2009:258:06:51:28.4463	Missing data	Secured for OBS recovery
2009:258:06:54:44.9415 – 2009:258:07:55:20.8162	Missing data	Secured for OBS recovery
2009:258:08:27:52.9304 – 2009:258:10:29:21.5538	Missing data	Secured for OBS recovery
2009:258:10:39:46.2590 – 2009:258:13:18:23.6455	Missing data	Secured for OBS recovery
2009:258:14:37:05.7930 – 2009:258:15:42:47.5507	Missing data	Secured for OBS recovery
2009:258:16:35:40.6193 – 2009:258:17:37:29.0394	Missing data	Secured for OBS recovery
2009:258:18:29:18.6346 – 2009:258:19:41:49.7693	Missing data	Secured for OBS recovery
2009:258:20:37:55.1514 – 2009:258:21:53:22.3213	Missing data	Secured for OBS recovery
2009:259:00:52:02.9704 – 2009:259:00:54:16.2468	Missing data	Secured for OBS recovery
2009:259:01:25:01.8494 – 2009:259:01:27:40.5658	Missing data	Secured for OBS recovery
2009:259:07:56:18.3148 – 2009:259:09:32:32.6712	Missing data	Secured for OBS recovery

		recovery
2009:259:10:42:45.5314 – 2009:259:11:48:15.1610	Missing data	Secured for OBS recovery
2009:259:13:14:04.6702 – 2009:259:14:22:20.1863	Missing data	Secured for OBS recovery
2009:259:15:01:53.1326 – 2009:259:16:24:05.5829	Missing data	Secured for OBS recovery
2009:259:16:28:05.4370 – 2009:259:18:46:12.8757	Missing data	Secured for OBS recovery
2009:259:19:07:57.5321 – 2009:259:20:08:25.0310	Missing data	Secured for OBS recovery
2009:259:20:42:42.2341 – 2009:259:21:43:13.2013	Missing data	Secured for OBS recovery
2009:259:22:14:03.3182 – 2009:259:23:10:51.8391	Missing data	Secured for OBS recovery
2009:262:21:13:59.3550		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
bath02	2008:192:00:00:46.5831	\$KGDPT,2958.32,0.0,12000.0*4a
bath02	2008:192:00:01:03.0606	\$KGDPT,2954.18,0.0,12000.0*4e

#### 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
2009:233:00:00:00.9610		Logging officially started
2009:244:17:46:55.6210 – 2009:244:17:47:20.2525	Missing data	Equipment may be tipping over during turns
2009:244:17:57:45.4231 – 2009:244:17:59:00.6005	Missing data	Equipment may be

		tipping over during turns
2009:244:18:14:23.3833 – 2009:244:18:14:48.0149	Missing data	Equipment may be tipping over during turns
2009:248:18:02:47.5895 – 2009:248:18:03:13.2623	Missing data	Reason not specified
2009:251:19:26:03.5296 – 2009:251:19:26:37.7021	Missing data	Ship power failure
2009:252:18:02:38.5484 – 2009:252:18:03:04.6380	Missing data	Reason not specified
2009:252:19:08:29.5474 – 2009:252:19:09:06.2669	Missing data	Tech staff power cycled equipment
2009:252:19:09:50.2448 – 2009:252:19:11:24.5353	Missing data	Tech staff power cycled equipment
2009:263:00:05:28.8894		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. See also mww01 below.

Log Date	Event	Comment
2009:233:00:00:00.3388		Logging officially started
2009:263:00:05:46.0901		Logging officially ended

**File id:** mww01

**Logging interval:** 1 second

The weather station is used to log wind speed, direction, air temperature, and barometric pressure. The wx01 strings are converted in real-time to produce mwv strings for the DP. The mwv output is strictly a derivative of the w01 output. See also the wx01 description above.

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

Log Date	Event	Comment
2009:233:00:00:00.3388		Logging officially started
2009:263:00:05:12.0893		Logging officially ended

Mwv01 data sample:

mwv01 2008:231:00:00:00.5173	6.1	6.6	6.6	8.8	354	321	5	0.0	0.0	0.0
0.0 355 355	0	*****	*****	*****	*****	8	8	8	1009.7	
mwv01 2008:231:00:00:01.5172	5.9	6.6	6.6	8.8	353	321	5	0.0	0.0	0.0
0.0 355 355	0	*****	*****	*****	*****	8	8	8	1009.6	
mwv01 2008:231:00:00:02.5190	6.3	6.6	6.6	8.8	354	321	5	0.0	0.0	0.0
0.0 355 355	0	*****	*****	*****	*****	8	8	8	1009.8	

## CNAV

**Logging interval:** 1 second

**File id:** cnav

The C-NAV 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
2009:233:00:00:00.6022		Logging officially started
2009:263:00:05:08.1247		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

## GC80 Gyrocompass

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

**File id:** gy01

**Logging interval:** 1 second

The GC80 gyrocompass operated normally.

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

Log Date	Event	Comment
2009:233:00:00:00.4099		Logging officially started
2009:263:00:05:10.1725		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.

The PosMV operated normally during the cruise.

**File id:** posmv

**Logging interval:** 1 second

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

Log Date	Event	Comment
2009:233:00:00:00.2345		Logging officially started
2009:263:00:05:23.6860		Logging officially ended

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 integrated navigation system. It was in operation for the length 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
2009:233:00:00:00.3929		Logging officially started
2009:241:03:25:54.4588 – 2009:241:03:26:39.9852	Missing data	Position error
2009:263:00:05:27.8012		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
```

## Spectrum Instruments TDM-4 Event Logger

The Event logger time stamps time-break triggers from DigiShot in all fire modes.

**File id:** tagger1

**Logging interval:** 1 second

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

Log Date	Event	Comment
2009:233:00:00:00.0301		Logging officially started
2009:251:19:25:56.6884 – 2009:251:19:27:12.3215	Missing data	Ship power failure
2009:263:00:05:43.3868		Logging officially ended

Tagger1 data format:

tagger1	2008:231:00:00:00.0383	#51,08182008,000001
tagger1	2008:231:00:00:00.2027	#79,00000000
tagger1	2008:231:00:00:00.2948	#68,2
tagger1	2008:231:00:00:00.3689	#70,0
tagger1	2008:231:00:00:00.4010	#56,-00000
tagger1	2008:231:00:00:00.4210	#72,FF

## 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 notes below. Except where noted, the source was not deployed when the magnetometer was at 300m, and the source was deployed when the magnetometer was at 100m.

### *Magnetometer Deployment Notes*

Time	Event
2009:239:05:02:00.0000	Begin deployment
2009:239:05:07:00.0000	In position and activated
2009:240:14:18:46.2760	Maggie recovered
2009:240:18:47:00.0000	Maggie deployed
2009:240:18:48:00.0000	Maggie powered up and logging
2009:247:11:34:00.0000	Maggie recovered
2009:247:11:50:00.0000	Maggie deployed
2009:247:12:08:00.0000	Maggie powered and logging
2009:251:23:30:00.0000	Recovered due to rough weather
2009:252:00:21:00.0000	Secured for repairs and weather
2009:252:21:41:00.0000	Maggie deployed
2009:254:11:48:00.0000	Begin recovery
2009:254:11:49:00.0000	Maggie recovered

**Logging interval:** 1 second

**File id:** mag01

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

Log Date	Event	Comment
2009:238:22:19:45.2305		Logging officially started
2009:239:04:37:44.0571 – 2009:239:05:06:52.7156	Missing data	Maggie deployed
2009:240:14:18:46.2760 – 2009:240:18:47:33.4880	Missing data	Maggie recovered for maintenance

2009:247:11:41:39.1299 – 2009:247:12:07:04.4530	Missing data	Maggie recovered for maintenance
2009:254:11:29:23.4936		Logging officially ended

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-23 Thermosalinograph

The Seabird TSG output is logged by LDS to the “tsg” set. Output is also converted in real-time and recorded to the “tsgconv” data set.

**File id:** tsg

**Logging interval:** 1 second

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

2009:234:23:10:48.2300		Logging officially started
2009:261:15:04:54.0969 – 2009:261:15:09:40.6997	Missing data	Equipment needed to be restarted Equipment needed to be restarted
2009:261:15:09:52.8057 – 2009:261:15:11:04.8173	Missing data	Equipment needed to be restarted
2009:261:15:12:13.6181 – 2009:261:15:13:09.0494	Missing data	Equipment needed to be restarted
2009:261:15:13:09.0494 – 2009:261:15:14:37.5396	Missing data	Equipment needed to be restarted
2009:261:15:14:42.8952 – 2009:261:15:15:37.8507	Missing data	Equipment needed to be restarted
2009:261:15:15:43.2605 – 2009:261:15:23:11.6102	Missing data	Equipment needed to be restarted
2009:261:15:23:19.7203 – 2009:261:15:24:46.2961	Missing data	Equipment needed to be restarted
2009:261:15:24:46.3261 – 2009:261:15:25:39.0433	Missing data	Equipment needed to be restarted
2009:261:15:25:44.9670 – 2009:261:15:26:21.7747	Missing data	Equipment needed to

		be restarted
2009:261:15:26:53.5520 – 2009:261:15:27:35.8995	Missing data	Equipment needed to be restarted
2009:261:15:27:50.4618 – 2009:261:15:37:47.3239	Missing data	Equipment needed to be restarted
2009:261:15:38:34.1705 – 2009:261:15:46:14.7529	Missing data	Equipment needed to be restarted
2009:261:15:46:15.1386 – 2009:261:15:46:50.2278	Missing data	Equipment needed to be restarted
2009:261:15:47:55.4198 – 2009:261:15:49:31.1917	Missing data	Equipment needed to be restarted
2009:261:15:49:57.9860 – 2009:261:15:51:10.0638	Missing data	Equipment needed to be restarted
2009:261:15:51:37.9895 – 2009:261:15:52:50.0423	Missing data	Equipment needed to be restarted
2009:261:15:52:56.1443 – 2009:261:15:54:51.9253	Missing data	Equipment needed to be restarted
2009:261:15:55:17.4654 – 2009:261:16:13:16.0104	Missing data	Equipment needed to be restarted
2009:262:18:36:56.9228		Logging officially ended

tsg data sample:

tsg	2008:231:00:00:01.9179	B479CB5528A6D6ABFB2D
tsg	2008:231:00:00:11.9187	B474CB5428A799ABBB2D
tsg	2008:231:00:00:21.9176	B46FCB5328A70CAB8B2D

**File id:** tsgconv

**Logging interval:** 1 second

2009:234:23:10:48.2300		Logging officially started
2009:261:15:04:54.0969 – 2009:261:15:09:40.6997	Missing data	Equipment needed to be restarted Equipment needed to be restarted
2009:261:15:09:52.8057 – 2009:261:15:11:04.8173	Missing data	Equipment needed to be restarted
2009:261:15:12:13.6181 – 2009:261:15:13:09.0494	Missing data	Equipment needed to be restarted
2009:261:15:13:09.0494 – 2009:261:15:14:37.5396	Missing data	Equipment needed to be restarted

2009:261:15:14:42.8952 – 2009:261:15:15:37.8507	Missing data	Equipment needed to be restarted
2009:261:15:15:43.2605 – 2009:261:15:23:11.6102	Missing data	Equipment needed to be restarted
2009:261:15:23:19.7203 – 2009:261:15:24:46.2961	Missing data	Equipment needed to be restarted
2009:261:15:24:46.3261 – 2009:261:15:25:39.0433	Missing data	Equipment needed to be restarted
2009:261:15:25:44.9670 – 2009:261:15:26:21.7747	Missing data	Equipment needed to be restarted
2009:261:15:26:53.5520 – 2009:261:15:27:35.8995	Missing data	Equipment needed to be restarted
2009:261:15:27:50.4618 – 2009:261:15:37:47.3239	Missing data	Equipment needed to be restarted
2009:261:15:38:34.1705 – 2009:261:15:46:14.7529	Missing data	Equipment needed to be restarted
2009:261:15:46:15.1386 – 2009:261:15:46:50.2278	Missing data	Equipment needed to be restarted
2009:261:15:47:55.4198 – 2009:261:15:49:31.1917	Missing data	Equipment needed to be restarted
2009:261:15:49:57.9860 – 2009:261:15:51:10.0638	Missing data	Equipment needed to be restarted
2009:261:15:51:37.9895 – 2009:261:15:52:50.0423	Missing data	Equipment needed to be restarted
2009:261:15:52:56.1443 – 2009:261:15:54:51.9253	Missing data	Equipment needed to be restarted
2009:261:15:55:17.4654 – 2009:261:16:13:16.0104	Missing data	Equipment needed to be restarted
2009:262:18:36:56.9228		Logging officially ended

tsgconv data sample:

tsgconv	2008:231:00:00:01.9179	B479CB5528A6D6ABFB2D	1531.59	28.85	24.35	5.53	33.74
tsgconv	2008:231:00:00:11.9187	B474CB5428A799ABBB2D	1531.61	28.85	24.36	5.53	33.74
tsgconv	2008:231:00:00:21.9176	B46FCB5328A70CAB8B2D	1531.60	28.85	24.35	5.53	33.74

**BGM-3 Gravimeter**

**File id:** vc01

**Logging interval:** 1 second

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

2009:233:00:00:00.2407		Logging officially started
2009:236:21:47:58.4216 – 2009:236:21:48:09.1702	Missing data	Reason not specified
2009:250:23:20:35.8083 – 2009:250:23:21:20.0573	Missing data	Reason not specified
2009:257:16:27:47.8662 – 2009:257:16:28:07.8671	Missing data	Reason not specified
2009:263:00:05:44.1091		Logging officially ended

### **Mk21 XBT System**

**Files: \*.RDF,\*.EDF**

Many XBT drops were made during this cruise. Refer to the Expendable\_Drops spreadsheet in the operations directory of the cruise archive.

## IV. Seismic Summary

### A. Acquisition Parameter Table

<b>Acquisition Parameter Table</b>	
<b>AcquisitionParameterID</b>	MGL0910_ACQ01
<b>FieldActivityID</b>	MGL0910
<b>ReceiverType</b>	Ocean-Bottom Seismometer
<b>SourceType</b>	Airgun
<b>Acquisition System Name</b>	SIO, WHOI OBS
<b>Acquisition System Type</b>	OBS
<b>Seismic_Nav_System</b>	Spectra
<b>Survey_datum</b>	WGS84
<b>Navigation Reference Point</b>	Fore/Aft+4.87 m, Stb/pt +8.055 m, vertical +14.5 m Keel, centerline, frame 0 (rudder posts) waterline
<b>NRP to source</b>	193.7 m
<b>Source_to_Near_Channel</b>	N/A
<b>Number_of_channels_recorded</b>	N/A
<b>Number_of_cables</b>	0
<b>Number_of_channels_each_cable</b>	N/A
<b>Channel_length</b>	N/A
<b>Cable_length</b>	N/A
<b>Cable_spacing</b>	N/A
<b>Near_Channel_Number</b>	N/A
<b>Cable_depth</b>	N/A
<b>Number_sources</b>	1
<b>Sub-arrays_per_source</b>	4
<b>Alternate Shooting</b>	No
<b>Source_separation</b>	N/A
<b>Sub-array_separation</b>	6m
<b>Source_volume</b>	6600 cu in
<b>Source_pressure</b>	2000 psi nominal
<b>Source_make,model</b>	Bolt 1500LL & 1900LL
<b>Source_number</b>	36 + 4 spare
<b>Source_depth</b>	9m, 15m
<b>Shot_control</b>	Distance
<b>Shot_interval</b>	420m, 450m, 500m
<b>Sample_interval</b>	N/A
<b>Record_length</b>	N/A
<b>Compass_birds</b>	N/A
<b>Tail_buoy_Positioning</b>	N/A
<b>Recording_delay</b>	N/A

### B. Seismic Overview

The primary objectives of the cruise were survey lines in a 2D survey block using one source with four sub-array set up deployed by Lamont-Doherty Earth Observatory.

### **Physical Configuration**

The towing configuration for the air guns and streamers is detailed in the document titled *MGL0910\_TowConfig.doc*.

### **Offsets**

All antenna and in-water offset drawings are in the file *MGL0910\_Offsets.xls*

### **Spectra**

Spectra was used for all timing and navigation during the cruise. Shotlogs were generated from spectra header logs, P190 and P294 files using shotlog processing code contained on the archive in /supplemental/code/shotlog.

## **V. Client Instrumentation**

68 OBS instruments were deployed. No OBS data was received by Langseth technical staff.

## VI. RV Langseth Gravity Tie Information

The Gravimeter was tied before and after the cruise at the tie point located at the pier in Astoria.

Date / Time	Ship Location	Reference Location	Mistie
2009-08-21T19:40	Astoria, OR, Pier 1 46 11.41995 N 123 51.61406 W	Astoria, OR, Pier 1 46 11.42 N 123 51.52 W	0.21
2009-09-20T00:39	Astoria, OR, Pier 1 46 11.43544 123 51.53282	Astoria, OR, Pier 1 46 11.42 N 123 51.52 W	-0.21

Please refer to the documents located under MGL0910/docs/gravtie for detailed records.

## VII. Archive Contents

Key files are bolded.

MGL0910/docs	Cruise documents and logs
MGL0910/docs/config/spectra/survey	Spectra configuration archive
MGL0910/docs/elog	Cruise elog
MGL0910/docs/map	Cruise maps, track map
MGL0910/docs/Operations/	Operations documents
MGL0910/docs/Operations/Daily Reports	Cruise Daily Reports from Tech-in-charge
MGL0910/docs/Operations/Nav_Logs	Seismic navigation logs (spectra)
MGL0910/docs/Operations/Observer_Logs	Seismic acquisition logs (gun controller)
<b>MGL0910/docs/Operations/MGL0910_B15_line_log_multi_chan el_seismics.xls</b>	<b>Master line log table</b>
MGL0910/docs/Permits	Clearance Documents
MGL0910/docs/Waypoints	Waypoint files
MGL0910/docs/Personnel	Personnel rosters, org chart, bunk and phone lists
MGL0910/docs/Reports	Cruise Report and supplemental docs
<b>MGL0910/docs/Reports/MGL0910_Nav &amp; Technical Support Final Report.doc</b>	<b>Seismic navigation &amp; technical support final report</b>
<b>MGL0910/docs/Reports/MGL0910_DataReport.doc</b>	<b>This file</b>
<b>MGL0910/docs/Offsets/MGL0910_TowOffset.xls</b>	<b>Seismic tow drawings</b>
MGL0910/docs/ScreenCaps	Screen captures
MGL0910/docs/tapelogs	Backup tape index / log files
MGL0910/processed	Processed data
MGL0910/processed/obsip_shotlogs	Original Spectra shot time files
MGL0910/processed/shotlogs	Spectra shot log files in CSV format
MGL0910/processed/svp	Sound velocity profiles
MGL0910/raw	Raw data
MGL0910/raw/knudsen	Raw Knudsen sub-bottom profiler data
MGL0910/raw/multibeam	Raw EM120 data
MGL0910/raw/serial	Underway data: gps, tsg, weather, etc.
MGL0910/raw/spectra/P1	Spectra underway p190
MGL0910/raw/spectra/P2	Raw seismic navigation, p294
MGL0910/raw/XBT	Raw XBT data

