RV Langseth Data Reduction Summary

MGL0910 Astoria, Oregon – Astoria, Oregon

PRELIMINARY

v0.3, 2009-09-19 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



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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*2 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 <u>RIDGE2000 Integrated Study Site (ISS)</u>. 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 <u>Dr. Douglas Toomey</u> and <u>Dr. Emilie Hooft</u> (University of Oregon) and Professor <u>Dr. William Wilcock</u> (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 <u>RIDGE2000 program</u> and it is a primary science node for <u>NEPTUNE Canada</u>.



Figure 2 – Source & Multibeam Survey Area



Figure 3 - OBS Deploy Plan





Figure 4 - OBS Recovery Plan

Figure 5 – Neptune Survey Area







Figure 6 – Northeast Pacific Ocean Topography & Bathymetry

II. Personnel

Shipboard Technical Staff

1	Anthony Johnson	Technician-in-charge
2	Bern McKiernan	Watch Leader
3	Ryan Eaton	Watch Leader
4	David Martinson	Chief Navigation
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 nd Mate
4	Nicholas Gasper	3 rd 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 st Asst. Engineer
13	Michael Caseria	2 nd Asst. Engineer
14	Ryan Vetting	3 rd 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

ммо

1	Giovanni Caltavuturo	MMO
2	Joe Beland	MMO
3	John Nicolas	ММО
4	Brad Dawe	ММО
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	Description	Data Set	Data Outputs	Files	Interval
FE700	Furuno FE700 Echosounder	Partial	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		raw output to file	See below	n/a
			converted output to file	See below	
WX1	RM Young 5103 Weather Bird and	Full	serial logs	MGL-wx01.*	1s
	Translator		mwv conversion	MGL-mwv01.*	
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	Partial	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	Konsberg 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

Instrument Data Files

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	<pre>\$PFEC,Alarm,0,0*6F</pre>
bath01	2008:220:13:45:42.1483	<pre>\$PFEC,xdr,FORE,050*79</pre>

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 MGL0903/multibeam. Center beam depth is recorded separately to serial log. MicroSV sound velocity was used up through Feb 28. TSG sound velocity was used beginning 0900 on Feb 28.

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	a Secured for OBS drop		
2009:237:19:39:13.8331 - 2009:237:19:43:52.5135	Missing data	ssing 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, need 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 specific		
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 OB 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
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
2009:233:00:00.9610		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 specififed
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 specififed
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 mwv01 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: mwv01 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 32	21 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 32	21 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 32	21 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
2009:233:00:00:6022		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
2009:233:00:00:2345		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 , 0000000
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

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