



Cruise Report
OSU R/V Oceanus

OC1306A

Cascadia Initiative Leg 2

June 17 to June 22

Newport, OR – Newport, OR

Bob Dziak

Chief Scientist

Captain & Crew

R/V Oceanus:

Captain: Jeff Crews
Chief Engineer: Mike Ribera
Chief Mate: Bob Overmon
2nd Mate: Brian Powers
Engineer: Jay Jean-Bart
Engineer: Chip Millard
AB: Eugene Otto
AB: Patrick Breshears
AB: Marc Simpson
Steward: Joy DeRosa
Cook: John Vanderbeck

Science Party:

Chief Scientist:

Bob Dziak (OSU/NOAA)

Marine Tech

Erik Arnesen (OSU)

SAIC Observer

Jake Rhodes (SAIC)

OSU Science Party

Matt Fowler (Marine Tech, OSU/NOAA)
Anna Semple (Research Assistant, OSU)
Bill Hanshumaker (Marine Educator, OSU-Sea Grant)

Scripps Institute of Oceanography OBS Team

Martin Rapa (Senior Engineer)
Paul Georgief (Asst. Engineer)

Apply to Sail Students

University of Massachusetts Amherst

Laura Fattaruso

New Mexico Institute of Mining and Technology

Edel Stanislav

Introduction

Cruise OC1306A aboard the R/V Oceanus was the second cruise of Spring-Summer 2013 to recover portions of an array of ocean bottom seismometers (OBS's) deployed in 2012 as part of the National Science Foundation funded Cascadia Initiative. This community-based experiment represents a combined onshore-offshore seismic and geodetic study of the Cascadia Margin. See the following website for details of the annual science plans and for more information about the Cascadia Initiative <http://pages.uoregon.edu/drt/CIET>.

The objectives for the cruise were to recover fifteen trawl resistant OBSs built by the Scripps Institute of Oceanography (SIO). Both the science party and OBS personnel worked a 24 hour schedule to get all of the instruments recovered as efficiently as possible. All fifteen OBS were successfully recovered; twelve instruments successfully recorded three-component seismic and Dynamic Pressure Gauge (DPG) data for the entire deployment period, one OBS recorded only DPG data, and two failed to record any data. For the majority of the six-day duration of the cruise, swells were 5-8 feet and wind waves 2-6 feet.

Deployment Site Selection.

Deployment sites were initially selected through a series of community meetings. The Cascadia Initiative Expedition Team (CIET), the Amphibious Array Steering Committee (AASC) and the co-chief scientists made slight modifications to avoid strong currents, seafloor hazards and areas of active shrimp and fish trawling (for sites < 1000 m).

Key considerations and advising personnel have been described in detail in previous deployment reports from October 2011 SIO cruise aboard the R/V Wecoma.

http://cascadia.uoregon.edu/CIET/sites/default/files/Cruise%20Report_W1110B.pdf

Final deployed locations are shown in Figure 1 and are listed in Table 1 at the end of this document.

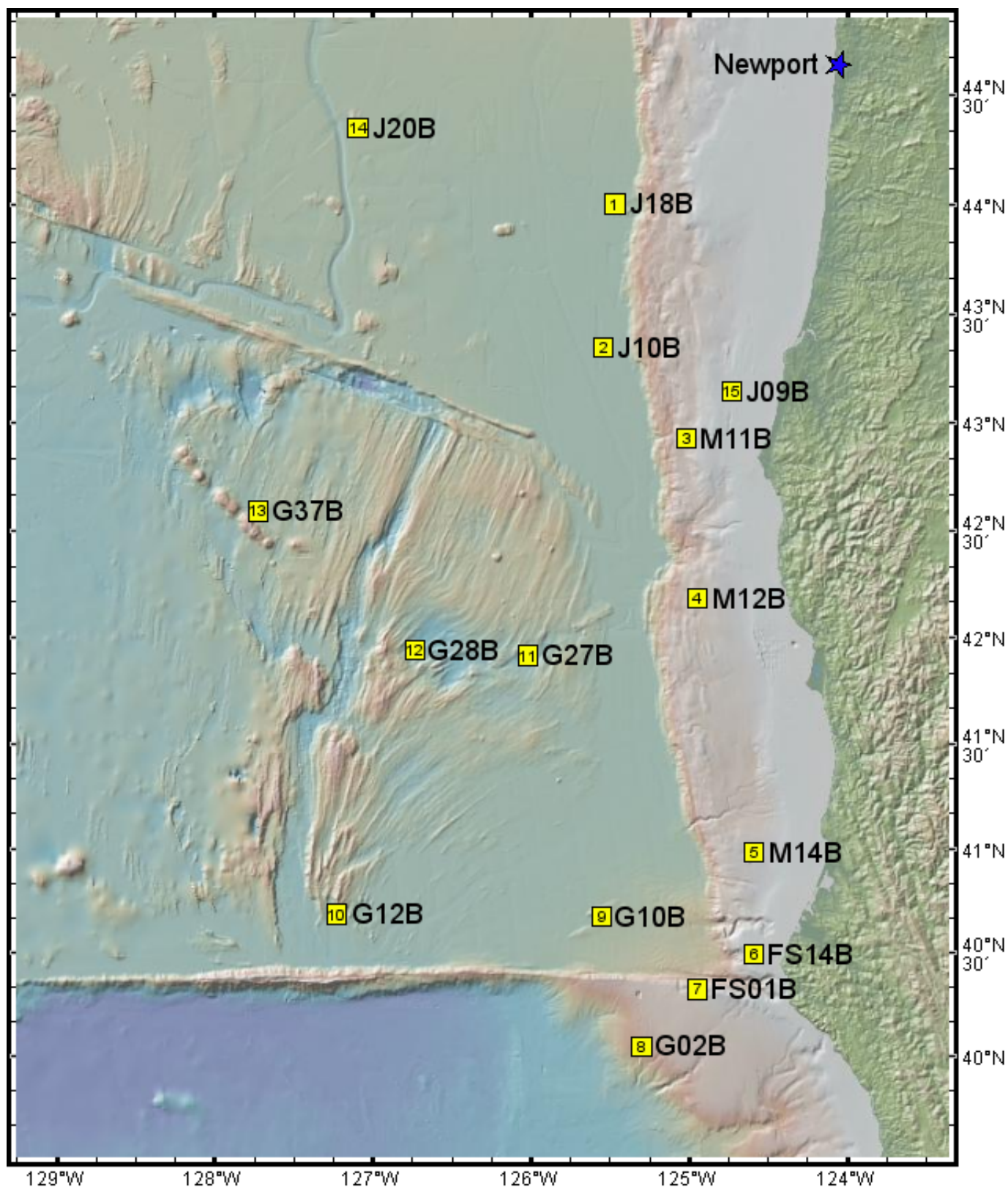


Fig 1: Map of OBS locations. All instruments recovered during this cruise were the Scripps Institute of Oceanography Abalones (picture of Abalones below). Icon lists position in recovery sequence, mooring site name listed next to icon.

OBS description and Recovery Summary

The fifteen “Abalone” OBSs built by SIO (Fig 2) have a trawl-resistant mount. Each instrument has a beacon and flag that are designed to be “break-away” so as to minimize disturbance by trawlers or damage to trawling equipment. Abalone CPU and clock sync information are available at the end of this document (Table 2). The Abalone instrument package includes a three-axis broadband Trillium Compact OBS (3-channels, each with 24-bit resolution) and a dynamic pressure gauge (24-bit resolution). All four channels are sampled continuously at 50 Hz. All fifteen OBS were successfully recovered; twelve instruments recorded three-component seismic and Dynamic Pressure Gauge (DPG) data for the entire deployment period, one OBS (M02A) recorded only DPG data, and two (M04A, M05A) failed to record any data (Table 3).

All fifteen instruments fit on the fantail of the *R/V Oceanus* without stacking, and only required minor shuffling to organize the instruments on the fantail. All of the instruments are designed to operate autonomously; they are battery powered, with ~ 1-year longevity. They were drop-deployed and were brought to the surface using an acoustically triggered release. Each has a radio beacon, flasher and flag to aid in locating them on the sea surface. When the Abalone OBS were deployed in 2012 their position on the seafloor was determined using the ship’s hull-mounted transducer to range on the release while the ship circled the drop site at a radius of 0.5 times the local water depth. Final locations were derived from the recorded acoustic ranges using the MCal software package (<http://www.seanav.com>).

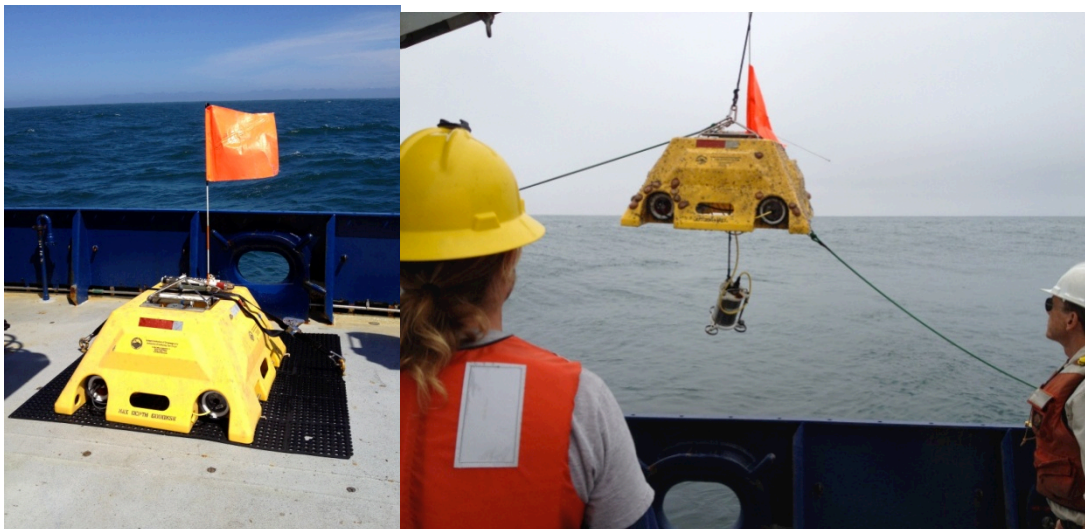


Fig 2: Pictures of SIO Abalone Ocean Bottom Seismometer once on deck and during the recovery procedures. Right shows seismometer instrument cylinder as tethered to the OBS frame.

Outreach

A marine educator from OSU Sea Grant (Bill Hanshumaker) participated on our cruise and maintained a cruise blog (<http://blogs.oregonstate.edu/billgoestosea>). The blog summarized the day to day operations of the cruise.

CRUISE NARRATIVE:

Day 1: Monday June 17, 2013 (Recovered J18)

We departed Newport at 11:00 AM PDT (JD: 169) after 1 hour lifeboat and fire drills. The first recovery is ~6 hours from Newport at 10 kns. Wind is out of northwest at 10 kns, swells are ~ 4 ft.

First recovery location is **J18**. We will be recovering SIO Abalones during the entire cruise. Depth at site is 3047 m. On site at 17:45. Release enabled, instrument released at 17:56 PDT. Instrument at surface at 19:22 PDT. Ascent took 24 minutes longer than the 51 minute estimate. Slow ascent rate was attributed to extra battery pack installed in 2012. Ascent rate modified from 55 mpm to 40 mpm. On deck at 19:30 PDT. The instrument was recovered smoothly, with little jostling during recovery and tie down. This is SIO Abalone instrument number 10.

J18 recorded data for duration of deployment (18.6 Gbytes)

This site is of interest to the Navy and some data was embargoed.

J18 recovered position: 44 0.498' N; 125 27.959'W depth = 3047.0

Began transit to site J10 at 19:50 PDT. Arrive at site at 23:14 PDT (JD 169). Winds 15 kns, seas 3-4 feet. Release enabled and instrument released to surface at 23:26 PDT. ETA to surface at 77 minutes, range is 2954m.

Day 2: Tuesday June 18, 2012 (Recovered J10;M11; M12; M14; FS10)

OBS onboard at 01:00 PDT. SIO OBS number 5.

J10 had full data record (19 Gbytes).

Data from J10 was embargoed by the Navy.

J10 recovered position: 43 20.964; 125 32.612'W, depth= 3093

J10 also had a 60 second time drift. SIO believes this was caused by an incorrect logging of the time at deployment.

Begin transit to M11. ETA 04:11 AM. Arrived at site at 04:00 PDT (JD 169). Wind out of northwest at 15 kns. Seas 3-4 feet. Confirmed release at 04:15 PDT. OBS onboard at 04:57 PDT. This is an SIO Abalone number 14.

M11 had a full data record (19 Gbytes).

This is not a site of interest to the Navy and the data was not embargoed.

M11 recovered position: 42 55.922'N; 125 01.027'W depth = 1109 m

05:05 PDT began transit for site M12. Arrived at the fourth recovery site, **M12**, at 9:10 PDT. Weather continues to be good, with winds out of the northeast at 14 kns and swells of 2-4 ft. Instrument was enabled and released at 9:15 PDT., on deck at 09:50 PDT. This is SIO Abalone number 7.

M12 recorded data for duration of the deployment (18.6 Gbytes).

Data from this site was not embargoed by the Navy

M12 recovered position: 42 11.04'N; 124 56.766'W, depth=1045m

Begin transit to next site **M14** at 10:10 PDT. Arrive on site **M14** at 16:40 PDT. JD:169, 23:40Z. Instrument release enabled. Wind is 9 kns out of the northwest. Swells 1-2 feet. Instrument released to surface as of 16:45 PDT., this is a shallow water site, instrument should be at surface with 20 minutes. Instrument on surface at 17:07 PDT. Instrument on deck at 17:14 PDT. No issues during recovery. This is SIO Abalone number 11.

Data recorded during entire duration of the deployment (19.05 Gbytes).

Data from M14 was not embargoed by the Navy.

M14 recovered position: 40 59.103'N; 124 35.385.'W depth = 638 m

Begin transit to FS14 at 17:26 PDT, ETA 20:10 PDT. Instrument FS14 enabled at 19:55 PDT. Instrument did not release on first command at distance of 300m. Second release sent at 20:20. OBS on deck at 20:30. This is SIO instrument 4.

FS14 recorded only 6 Gbytes of data during entire duration of the deployment (19.05 Gbytes total)

Data from FS14 was not embargoed by the Navy.

FS14 recovered position: 40 29.730'N, 124 35.505'W depth = 107 m

Begin transit to J9 at 20:40 PDT (03:42Z). Arrive at J9 site at 19:10 PDT(JD170; 05:10Z). Begin instrument interrogation. Mistake was found on spreadsheet, this is not J9 site. Will recover later in cruise.

Now heading to FS01. Arrived at FS01 at 11:50 PDT. Released at 00:00, should be at surface at 00:30 PDT

Day 3: Wednesday June 19, 2013; JD170 (recovered FS 01; G02, G10; G12B)

On deck at 00:43 PDT (JD 170, 07:43Z). This was SIO OBS 3.

FS01 had a bad DPG channel, and no data was recorded.

FS01 will not be embargoed by the Navy.

FS01 recovered position: 40 19.606'N; 124 56.95W; Depth = 940 m.

Begin transit to G02, arrive at 02:00 PDT. Winds are 12 kns out of northwest, swells are 1-2 feet. Instrument released at 02:59 PDT. Instrument on board by 04:10 PDT. This is SIO Abalone 8.

G02 recorded during the entire duration of the deployment (19.91 Gbytes total)

Data will not be embargoed by the Navy.

G02 recovered position: 40 2.916'N, 125 17.815 'W depth= 1920 m

Next site is G10, begin transit at 0420 PDT, ETA is 0800 PDT. Arrive at station **G10** at 0800 PDT. Begin communication, release enables immediately Instrument on deck at 09:28 PDT (16:28Z). Recovery uneventful, seas are rougher (4-6 ft swells), with winds at 15 kns. This is SIO instrument number 15.

G10 recorded during the entire duration of the deployment (19.89 Gbytes total)

G10 not embargoed by the Navy.

G10 recovered position at 40 40.672N; 125 33.200W, depth= 1920 m

Depart for **G12B** at 09:35 PDT. Arrive on site for **G12B** at released at 16:30 PDT (JD 170; 23:30Z). Release enable, 7 out of 7 pings confirmed. Off bottom at 16:42Z. Instrument at surface at 17:47 PDT, on deck at 17:54 PDT. SIO instrument number 004.

G12 only recorded 4 of 19 Gbytes.

G12 data was embargoed by the Navy. Data will be returned within 30 days.

G12 surveyed position at 40 41.216N; 127 13.732W, depth = 3080

Begin transit to site **G27** at 18:05 PDT.

Day 4: Thursday June 20, 2013-(recovered G27; G28)

Arrive at **G27** at 02:17 PDT on Thursday June 20 (09:17, JD 171). Release enabled 02:20 and confirmed, on its way to the surface. Weather is good, 11 kn wind, 4-5 foot seas. Instrument expected at the surface in 87 minutes. On deck at 04:21 PDT (11:29Z). This is SIO OBS #9.

G27 recorded data for duration of deployment (18.7 Gbytes)

G27 data was embargoed by the Navy.

G27 surveyed position: 41 54.995'N 126 1.002 'W . depth = 3480 m

G27 Seismometer recorded as expected, DPG channel did not record.

Begin transit at 04:31 PDT to **G28**. ETA 07:30 PDT On site at 17:25 PDT. Seas calm than earlier in the day, 2-3 ft, wind 7 kns. Instrument enabled at 17:27 PDT.

We begin a re-survey of the instrument location site at 07:30 prior to recovery. Previous surveyed locations seem to be offset from positions where they were recovered. This re-survey is to check locations. the previous year survey location and this year's location agree.

Instrument released to surface, at surface at 09:10 PDT. On deck at 09:25 PDT. This is SIO instrument number 6.

G28 recorded data for duration of deployment (18.6 Gbytes).

G28 data was embargoed by the Navy.

G28 surveyed position: 41 56.565'N 126 44.031 'W . depth = 3327 m

Begin transit to **G37**, on site at 14:40 PDT. Started communication with release. Confirmed release at 14:40 PDT, instrument off bottom. Winds light at 10 kns, 2-3 foot seas. This is SIO instrument 13

Day 5: Friday June 21, 2013-(J20B).

At surface 03:06 PDT (10:06Z), on deck at 03:14 PDT. This is SIO instrument #001.

G37 recorded data for duration of deployment (18.6 Gbytes).

G37 data was embargoed by the Navy as per their protocol.

G37 surveyed position: 42 35.478'N 127 43.280 'W . depth = 3004 m

03:30 PDT, begin transit to J20B. Seas remain calm, 3-6 foot swells, winds 7 kns out of the north.

Transiting to **J20B**, arrive on station at 01:45 PDT (JD:172; 08:45Z). Instrument released at 01:50 PDT, off bottom. At surface at 03:00 PDT, 03:14 PDT SIO OBS # 1.

J20B recorded data for the duration of the deployment (18.5 Gbytes).

J20 data embargoed by Navy. Data will be reviewed and held by the Navy using established NSF-Navy protocols. Data will be released back to the CIET after 90 days.

J20B recovered position: 44 21.251'N 127 05.710'W depth=2654 m

Begin transit to next site J09 ETA PDT. Arrived at site **J09** at 14:12 PDT (JD:172, 21:12Z). Winds out of the north 2 kns, swell 3-6 feet. Instrument released at 14:15 PDT, at surface at 1 PDT, on deck at 14:43 PDT. This is SIO OBS instrument number 16.

J09 all data (18.6 Gbytes) was recorded for the duration of the deployment.

J09 data embargoed by Navy. Data will be reviewed and held by the Navy using established NSF-Navy protocols.

J09 surveyed position: 43 09.087 N 124 43.644'W, depth = 252 m

This is final mooring. Begin transit to Newport at 18:30 PDT.

Day 6: Saturday June 22

Arrive Newport at NOAA dock at 08:00 PDT.

Table 1: SIO OBS Abalone Location and Instrument Identification

* = FILTERED DATA ONLY (Navy Approved). We are not allowed any type of unfiltered data.

Number	Site Name	Data Logger	Frame	Trillium	Lat			Lon			Water Depth
1	J18 (*)	8	10	10	44	0.498	44.0083	-125	27.9588	-125.46598	3047
2	J10 (*)	12	5	11	43	20.9637	43.349395	-125	32.6119	125.5435317	3093
3	M11	7	14	9	42	55.9222	42.93203667	-125	1.0273	125.0171217	1109
4	M12	2	7	2	42	11.0396	42.18399333	-124	56.7662	124.9461033	1045
5	M14	9	11	4 (Dup?)	40	59.1026	40.98504333	-124	35.3849	124.5897483	638
6	FS14	4	4	8	40	29.7303	40.495505	-124	35.5049	124.5917483	107
7	FS01	10	3	7	40	19.6063	40.32677167	-124	56.9501	124.9491683	940
8	G02	1	8	14	40	2.9164	40.04860667	-125	17.8155	-125.296925	1920
9	G10	3	15	12	40	40.6723	40.67787167	-125	33.2004	-125.55334	2936
10	G12B (*)	1001	2	4	40	41.2162	40.68693667	-127	13.7315	127.2288583	3080
11	G27 (*)	1000	9	5	41	54.9946	41.91657667	-126	1.0016	126.0166933	3480
12	G28 (*)	6	6	3	41	56.5654	41.94275667	-126	44.0311	126.7338517	3327
13	G37 (*)	11	13	1	42	35.4778	42.59129667	-127	43.2803	127.7213383	3004
14	J20 (*)	13	1	15	44	21.2511	44.354185	-127	5.71	127.0951667	2934
15	J09	5	5	13	43	09.067	43.15.1117	-124	43.644	124.7270183	252

Table 2: SIO OBS Abalone Clock and CPU Synchronism Information

CPU Clock Sync (only active if batteries do not fail)						
Number	CPU Sync	CPU Recovery Time	Difference between CPU Recovery Time and CPU Sync Time	Difference between CPU Recovery Time and CPU Sync Time (s)	CPU Time Tag (s)	Drift Correction (Hex Count - CPU Diff) (seconds)
1	2012:244:19:03:00	2013:169:03:13:00	290d:08h:10m:00s	25085400	25085400.05662650	0.05662647
2	2012:244:20:00:00	2013:169:08:09:00	290d:12h:09m:00s	25099740	25099677.46610770	-62.53389230
3	2012:245:07:06:00	2013:169:12:20:00	290d:05h:14m:00s	25074840	25074841.77229280	1.77229279
4	2012:245:12:31:00	2013:169:17:12:00	290d:04h:41m:00s	25072860	25072856.73578030	-3.26421973
5	2012:245:22:56:00	2013:170:00:28:00	290d:01h:32m:00s	25061520	25061522.89938340	2.89938339
6	2012:245:23:24:00	2013:170:03:54:00	290d:04h:30m:00s	25072200	N/A	N/A
7	2012:245:23:59:00	2013:170:08:00:00	290d:08h:01m:00s	25084860	25084860.07532280	0.07532281
8	2012:246:01:23:00	2013:170:11:27:00	290d:10h:04m:00s	25092240	25092239.26744860	-0.73255142
9	2012:246:15:08:00	2013:170:16:44:00	290d:01h:36m:00s	25061760	25061760.03478520	0.03478522
10	2012:246:22:22:00	2013:171:01:11:00	290d:02h:49m:00s	25066140	N/A	N/A
11	2012:246:23:38:00	2013:171:11:43:00	290d:12h:05m:00s	25099500	25099500.24978720	0.24978717
12	2012:248:01:44:00	2013:171:16:35:00	289d:14h:51m:00s	25023060	25023059.22973150	-0.77026846
13	2012:248:07:02:00	2013:171:23:23:00	289d:16h:21m:00s	25028460	25028460.50508480	0.50508478
14	2012:249:17:30:00	2013:172:10:34:00	288d:17h:04m:00s	24944640	24944640.79321890	0.79321893
15	2012:245:02:19:00	2013:172:22:07:00	293d:19h:48m:00s	25386480	25386480.91804100	0.918040983

Table 3: SIO OBS Abalone Clock Drift, Gain Settings, and Instrument Status When Recovered

Rec. #	Hardware Clock Sync NOT USED - Hardware Backup		(Low Power Battery Backup for Clock)					File Sizes (GB)	Status
	CLOCK Recovery/Tag	Drift	Num Chan	SPS	Gain 1,2,3 (X, Y, Z)	Gain 4 (DPG)			
1	2013:169:03:19:59.9434096	0.0565904	4	50	1	64	19.91	OK.	
2	2013:169:08:14:02.5339444	2.5339444	4	50	1	64	19.92	Large drift of 62+ seconds - typo? Clock backup and CPU are 60 seconds off - using -2.53389230 second drift correction in database files. This matches clock board correction.	
3	2013:169:12:25:58.2276907	1.7723093	4	50	1	64	19.90	OK. Z channel looks noisy.	
4	2013:169:17:17:03.2643304	3.2643304	4	50	1	64	19.90	OK. Z channel looks noisy.	
5	2013:170:00:29:57.1005857	2.8994143	4	50	1	64	19.89	OK. Z channel looks noisy.	
6	2013:170:03:57:00.7526043	0.7526043	4	50	1	64	6.69	FPGA had been cycled - could not get system time. Using clock backup (matches with generated pulse from system time clock). Data only exists up to 2012:343. Battery Bottle not connected? Data Looks OK.	
7	2013:170:08:02:59.9246883	0.0753117	4	50	1	64	19.90	DPG channel bad. Other channels appear good.	
8	2013:170:11:30:00.7325638	0.7325638	4	50	1	64	19.91	DPG looks fine. Tril-X,Y, and Z have lots of noise.	
9	2013:170:16:47:59.9652285	0.0347715	4	50	1	64	19.89	OK. Check channel 1 (Tril-Y) - weird noise.	
10	2013:171:01:20:58.0108636	1.9891364	4	50	1	64	4.62	FPGA has been cycled - could not get system time. Using clock backup. Data only exists up to 2012:314. Data looks OK.	
11	2013:171:11:44:59.7502314	0.2497686	4	50	1	64	19.91	Bad DPG.	
12	2013:171:16:37:00.7703058	0.7703058	4	50	1	64	19.86	OK.	
13	2013:171:23:23:59.4949400	-0.50506	4	50	1	64	19.86	OK.	
14	2013:172:10:38:59.2067851	0.7932149	4	50	1	64	16.66	Power fluctuations - data collection stopped early. Check wiring of packs/cables. Bad DPG. Noisy, low amplitude, signal on X,Y,Z.	
15	2013:172:22:09:59.0819484	0.9180516	4	50	1	64	20.15	OK.	