Cruise Report

OSU R/V Oceanus

OC1308A

Cascadia Initiative Leg 5, 2013

August 18 to 24, 2013

Newport, OR – Newport, OR

Emilie Hooft

Chief Scientist

Captain & Crew

R/V Oceanus:

Captain: Jeff Crews
Chief Engineer: Mike Ribera
Chief Mate: Todd Dussault
2nd Mate: Tony Monacondilos
Engineer: Jay Jean-Bart
Engineer: Chip Millard
AB: Eugene Otto
AB: Doug Beck
AB: Duane Zatterstrom
Steward: Joy DeRosa
Cook: Kris Alberty

Science Party:

Chief Scientist*:*
Emilie Hooft (University of Oregon)

Marine Tech
Erik Arnesen (Oregon State University)

Scripps Institute of Oceanography OBS Team
Martin Rapa (Senior Engineer)
Paul Georgief (Asst. Engineer)
Mark Gibaud (Asst. Engineer)

UO Science Party
Brandon van der Beek (Graduate Student, University of Oregon)

Apply to Sail Participants
Tim Melbourne (Professor, Central Washington University)
Kasey Aderhold (Graduate Student, Boston University*)*
Robert Anthony (Graduate Student, New Mexico Institute of Mining and Technology)
Shannon Phillips (Undergraduate, University of Oregon)
Brooklyn Gose (Undergraduate, University of Oregon)

Introduction

Cruise OC1308A aboard the R/V Oceanus was the fifth cruise of Spring-Summer 2013 to deploy 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://cascadia.uoregon.edu.

The objectives for the cruise were to deploy 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 deployed as efficiently as possible. All fifteen OBS were successfully deployed. 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).

Siting of the OBSs was designed to duplicate the deployment site used for the 2011-2012 deployments. Those deployment sites were determined by a process that has been described in detail in the deployment report from October 2011 SIO cruise aboard the R/V Wecoma. http://cascadia.uoregon.edu/CIET/sites/default/files/Cruise%20Report_W1110B.pdf and includes key considerations and advising personnel.

During this process some sites were moved slightly into nearby no-trawl zones, specifically Essential Fish Habitats (EFHs) in Grays Canyon region and Nehalem Bank/Shale Pile, and others were moved near known "hangs". Liam Antrim was our contact with the Olympic Coast Sanctuary and extended our permit for one location within the sanctuary. We also informed our contacts with the Quileute and Quinault tribes (Joe Schumaker and Jennifer Hagen) of this year's deployment to ensure we do not impact their fishery rights. Kaety Hildebrand, as our main interface with the shrimp fishing and trawling community, will be notified of the deployment sites.

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

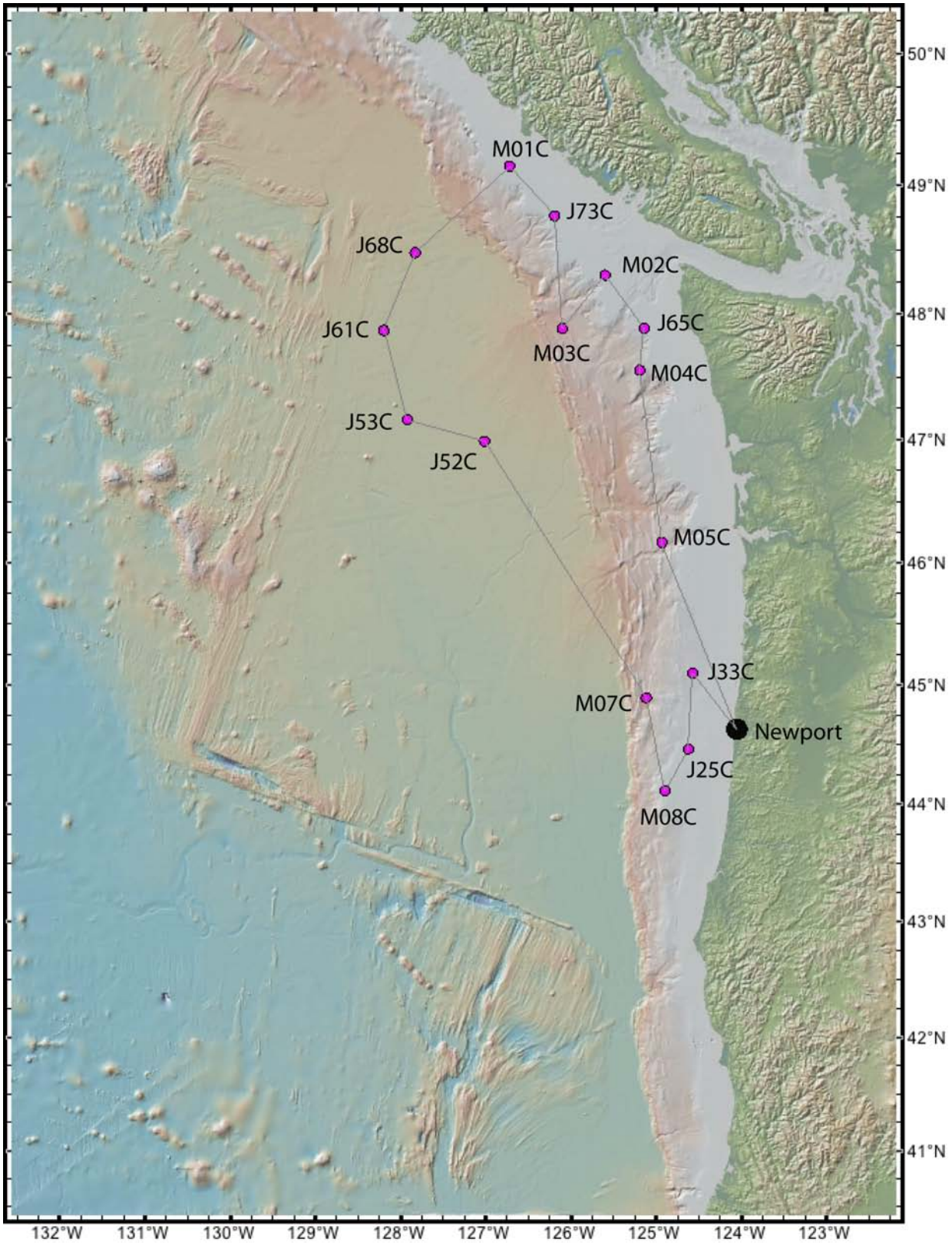


Fig 1: Map of OBS locations. All instruments deployed during this cruise were the Scripps Institute of Oceanography Abalones (picture of Abalones below). The deployment order is shown by the gray line starting with M05C and ending with J33C.

OBS description and Deployment 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. 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 deployed. All of the instruments are designed to operate autonomously; they are battery powered, with ~ 1-year longevity.

All fifteen instruments fit on the fantail of the *R/V Oceanus* without stacking. They were drop-deployed and have an acoustically triggered release. Each has a radio beacon, flasher and flag to aid in locating them on the sea surface. After each Abalone reached the seafloor, it's position on the seafloor was determined using the ship's hull-mounted transducer to range to the transducer release while the ship made a ¾ circle (pacman) around the drop site at a radius of 0.5 times the local water depth; or with a radius of 300 m in shallow water where a smaller radius was not feasible. Final locations were derived from the recorded acoustic ranges using obslocate (*locate_fileprint.py*) written by Paul Georgief. This performs a grid search (over x and y) for the best seafloor OBS position assuming a fixed depth and seawater velocity of 1500 m/s.

Fig 2: Picture of SIO Abalone Ocean Bottom Seismometer.

CRUISE NARRATIVE:

Day 1: Sunday August 18, 2013, JD 230 (Deployed M05C)

We departed Newport at 11:00 AM PDT (JD: 230) after 1 hour lifeboat and fire drills. The first deployment was ~9 hours from Newport at 10.5 kns. Wind is out of northwest at 5 knts, swells are ~ 4 ft.

M05C is the first deployment location**.** Water depth at site is 837 m. Instrument was deployed at 21:09 PDT. The survey was completed and the instrument disabled at 21:47 PDT.

Began transit to site M04C at 21:50 PDT and the SIO team was able to rest during most of the night.

Day 2: Monday August 19, 2013, JD 231(Deployed M04C, J65C, M02C, M03C, and J73C)

Wind 13 knts @ 165°, ~4 ft swell, foggy morning.

M04C deployed at 05:40 PDT, water depth 570 m. Survey started at 05:50 PDT and completed at 06:11. The instrument was successfully disabled.

J65C deployed at 08:12 in 169 m water depth. Surveyed from 08:16 to 08:35 PDT with a 300 m radius – this radius is ~2 x water depth (instead of ½ x water depth) due to the shallow water at this site. Instrument successfully disabled at 08:35 PDT. Completed deck work and proceeding to next site at 08:42 PDT.

A large pod of orcas was seen apparently attaching two humpback whales at 10:30 PDT. We observed them for a while. One large male orca had a large dorsal fin that was bent to for a stub at the top. Several females accompanied by young that swam with them in synchronicity and occasionally breached. Winds 9 knts 330° weather clearing and sunny.

M02C deployed at 12:28 PDT in 141 m water. Again the survey was done with a 300 m water depth because of the shallow waters at this site. Instrument successfully disabled at 12:55 PDT and proceeding to next site.

M03C deployed at 16:04 PDT in 1839 m water. A regular survey was done here: radius = ½ x water depth. Instrument disabled at 17:15 PDT.

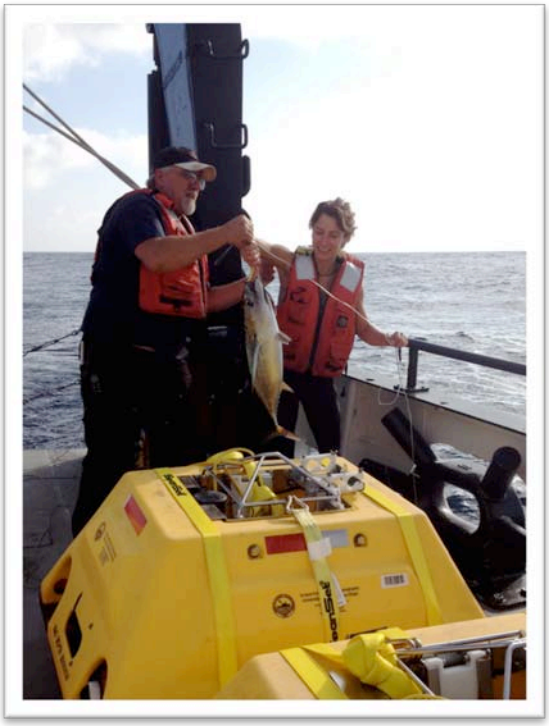
Wind picking up slightly: 11 knts @ 300° and sunny.

J73C deployed at 10:44 PDT. Water depth was 133 to 150 m; water depth is uncertain since the 12 kHz echo sounder was pegged on the echo and thus reading a water depth of 300 m when we dropped the instrument. Slant ranges from the transducer to the station on the bottom was 127 and 133 m. The acoustic survey was done with a radius of 300m due to shallow water depths. After the acoustic survey we disabled the station at 11:19 PDT and measured a water depth adjacent to the site of 150 m using the 12 kHz echo sounder.

Day 3: Tuesday August 20, 2013; JD 232 (deployed M01C, J68C, J61C, J53C)

M01C deployed at 02:40 PDT in a water depth of 138 m. The acoustic survey was done with a radius of 300m due to shallow water depths. Instrument disabled at 03:03 PDT.

Transiting to the next site at slower speed so that the OBS team can rest. Plan to arrive at noon PDT. A night with a full moon and calm seas. Winds 11 knts, 330°.



The students fished for albacore tuna with Doug Beck and caught 4.

J68C deployed at 12:03 PDT in a water depth of 2554 m. The OBS hit seafloor at 12:48 PDT and was disabled at 13:41 PDT. Regular survey radius (0.5 water depth).

J61C deployed at 17:33:40 PDT in a water depth of 2673. The OBS hit seafloor at 18:19 PDT and disabled at 19:12 PDT. Regular survey radius (0.5 water depth).

Apparently the 300 kHz ADCP has ceased working.

Sunny, winds 1 knts beautiful seas. Played corn hole on the back deck after dinner.

J53C deployed at 23:28 PDT in 2717 m water. Some issues tracking it to the bottom as the SABER deck box was picking up lots of extraneous pings. This was resolved when switching to the older Edgetech deck box. OBS hits seafloor at 00:20 PDT and was disabled at 01:12 PDT.

Day 4: Wednesday August 21, 2013; JD 233 (deployed J52C and M07C)

Winds coming up slightly to 10 knts with a full blue moon.

J52C deployed at 04:51 PDT in water depth 2640 m. OBS landed on seafloor at 05:37 PDT, and was disabled at 06:30 PDT. Survey radius was half the water depth.

M07C deployed at 19:39 PDT in water depth of 1365 m. OBS hit seafloor at 20:03 PDT and disabled at 20:37 PDT. Survey radius was half the water depth.

Winds predicted to pick up to 20+ knts this evening.

Day 5: Thursday August 22, 2013 (deployed M08C, J25C, and J33C)

M08C deployed at 01:03 PDT in 131 m water depth. Survey done with 300 m radius. OBS on bottom at 01:07 PDT and disabled at 01:29 PDT.

J25C deployed at 04:05 PDT in 144 m water depth. Survey done with 300 m radius. OBS on bottom at 04:08 PDT and disabled at 04:33 PDT.

J33C deployed at 08:31 in 354 m water depth. Survey done with 300 m radius. OBS on bottom at 08:38 PDT and disabled at 08:52 PDT.

This is the final OBS deployment. Begin transit to Newport at PDT.

Arrive Newport at OSU dock at 13:00 PDT.

Table 1: SIO OBS Abalone Dropped and Surveyed Locations

Site	Drop Lat	Drop Lon	Drop Depth (m)		Surveyed Lat	Surveyed Lon	Depth (m)	Offset (m)	Angle	Residual (msec)
M05C	46.1735	-124.9345	837		46.1747	-124.9357	837	165	124	13
M04C	47.5584	-125.1923	570		47.5581	-124.8082	570	47	-38	19
J65C	47.8913	-125.1398	169		47.8914	-125.1394	169	36	12	17
M02C	48.3069	-125.6012	141		48.3066	-125.5999	141	79	-7	14
M03C	47.8884	-126.1046	1839		47.8881	-126.1033	1839	103	-22	24
J73C	48.7679	-126.1926	133*		48.7675	-126.1920	133*	60	-43	8
M01C	49.1504	-126.7222	138		49.1498	-126.7219	138	73	-70	15
J68C	48.4811	-127.8293	2587		48.4811	-127.8294	2587	8	-146	36
J61C	47.8728	-128.1972	2673		47.8699	-128.1964	2673	324	80	17
J53C	47.1643	-127.9223	2717		47.1661	-127.9209	2717	225	62	12
J52C	46.9920	-127.0158	2640		46.9907	-127.0152	2640	151	-73	12
M07C	44.8988	-125.1168	1365		44.8989	-125.1162	1365	52	7	12
M08C	44.1185	-124.8954	131		44.1182	-124.8950	131	60	-67	14
J25C	44.4730	-124.6217	144		44.4722	-124.6214	144	78	-75	14
J33C	45.1068	-124.5708	354		45.1065	-124.5709	354	18	-118	11

Table 2: SIO OBS Abalone Instrument Setup and Clock & CPU Synchronism Information

Site	Data Logger	CF Card	Acoustic	Frame	Trillium	DPG	Light Strobe	Radio	CPU Sync
M05C	1	1	152	1	1	-	2008-122	2002-042	2013:231:00:52:00
M04C*	12	12	162	16	12	-	2007-007	2002-017	2013:231:00:31:00
J65C	11	11	157	11	4	-	2008-118	2002-0068	2013:231:01:32:00
M02C	8	8	153	8	11	-	NS0045	NR0012	2013:231:15:48:00
M03C	6	6	156	6	7	-	2000-0075	2009-024	2013:231:16:13:00
J73C	10	10	163	10	8	-	2009-009	2009-017	2013:231:16:50:00
M01C	7	7	161	7	14	-	2000-0055	2002-0022	2013:231:20:08:00
J68C	13	13	155	13	2	-	2000-0063	NR0072	2013:232:10:02:00
J61C	4	4	154	4	9	-	2000-0016	2002-0001	2013:232:10:21:00
J53C	2	2	151	2	5	-	2000-0037	2000-0074	2013:232:19:25:00
J52C	5	5	160	5	10	-	2008-121	2002-0057	2013:232:19:38:00
M07C	15	15	158	15	6	-	2000-0083	2002-0014	2013:233:21:25:00
M08C	14	14	159	14	15	-	2000-0046	2002-0051	2013:233:21:39:00
J25C	9	9	164	9	3	-	2000-0059	2008-132	2013:234:03:28:00
J33C	3	3	165	8	13	-	2008-098	2008-129	2013:234:03:44:00

* Programmed this one first - before #1 (M05C)

All Abalone packages were set up and programmed in the following way:

Num Channels	SPS	Gain 1 (X)	Gain 2 (Y)	Gain 3 (Z)	Gain 4 (DPG)
4	50	1	1	1	64

Table 3: SIO Abalone Drop Log

Sta-tion	Lat	Lon	Depth	Drop Lat (° N)	Drop Lon (° W)	Drop Depth (m)	Drop Time (DDD:HH:MM:00)	Time on Bottom (DDD:HH:MM:00)	Time Disabled (DDD:HH:MM:00)
M05C	46.1735	-124.9346	828	46.1735	124.9345	837	231:04:09:27	231:04:23:15	231:04:47:57
M04C	47.5581	-125.1922	563	47.5584	125.1923	570	231:12:40:00	231:12:50:43	231:13:11:33
J65C	47.8913	-125.1396	165	47.8913	125.1398	169	231:15:12:00	231:15:16:20	231:15:35:00
M02C	48.3070	-125.6004	139	48.3069	125.6012	141	231:19:28:16	231:19:33:26	231:19:55:26
M03C	47.8883	-126.1040	1817	47.8884	126.1046	1839	231:23:04:29	231:23:36:24	232:00:16:22
J73C	48.7677	-126.1925	143	48.7679	126.1926	133*	231:05:44:00	232:05:53:40	232:06:19:33
M01C	49.1504	-126.7221	133	49.1504	126.7222	138	232:09:40:09	232:09:42:33	232:10:03:34
J68C	48.4810	-127.8292	2554	48.4811	127.8293	2587	232:19:03:51	232:19:48:21	232:20:41:19
J61C	47.8725	-128.1972	2646	47.8728	128.1972	2673	233:00:33:40	233:01:19:43	233:02:12:00
J53C	47.1642	-127.9221	2689	47.1643	127.9223	2718	233:06:28:45	233:07:20:53	233:08:12:54
J52C	46.9920	-127.0159	2613	46.9920	127.0158	2640	233:11:51:23	233:12:37:42	233:13:30:00
M07C	44.8988	-125.1168	1356	44.8988	125.1168	1365	234:02:39:53	234:03:03:18	234:03:37:25
M08C	44.1187	-124.8953	126	44.1185	124.8954	131	234:08:03:30	234:08:07:00	234:08:29:18
J25C	44.4729	-124.6216	143	44.4730	124.6217	144	234:11:05:29	234:11:08:55	234:11:33:33
J33C	45.1066	-124.5708	349	45.1068	124.5708	354	234:15:31:51	234:15:38:14	234:15:52:36

*Both bridge and Sci. Lab read 300m at time of drop - issue with 12kHz echosounder. Expected ~150m. Both bridge and Sci. Lab read ~150 after survey at location. The 133 value is from slant range