

**Cascadia Initiative**  
**Cruise OC1407A R/V Oceanus**  
**(Cascadia 2014 Leg 4)**  
**July 10, 2013 - July 18, 2014**  
**Newport, Oregon to Newport, Oregon**



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## Background

As part of the 2009 American Recovery and Reinvestment Act (ARRA) spending, NSF's Earth Sciences (EAR) and Ocean Sciences (OCE) divisions each received \$5M in facility-related investment. The funds are targeted toward Facilities that support EarthScope and GeoPRISMS science objectives, with an initial emphasis on onshore/offshore studies of the Cascadia margin. The ARRA funds have been used by UNAVCO (University NAVSTAR Consortium), IRIS (Incorporated Research Institutions for Seismology), and OBSIP (Ocean Bottom Seismograph Instrument Pool) to improve seismic and geodetic datasets in the Cascadia region, including improvements to real-time GPS capabilities, densification of the onshore seismic networks, and the construction and deployment of an array of 60 ocean-bottom seismographs (OBSs) for offshore community experiments.

The Cascadia Initiative (CI) is an onshore/offshore seismic and geodetic experiment that addresses questions ranging from the structure of the megathrust and its potential for large earthquakes to volcanic arc structure, and to the formation, deformation and hydration of the Juan de Fuca plate. Articles in the GeoPRISMS Newsletter<sup>1</sup> and subsequently Oceanography Magazine<sup>2</sup> describe CI scientific objectives, the outcome of an open community workshop held in October 2010 to develop deployment plans for the offshore component of the experiment, the formation and activities of the Cascadia Initiative Expedition Team (CIET) and the potential of the data. Over its planned 4-year data acquisition period, the offshore portion of the Cascadia Initiative will involve the deployment and recovery of ~280 OBSs at ~160 different sites and a total of about 25 cruises.

## Cruise Objectives and Assessment

The objective of OC1407A was to deploy 24 OBSs built by the Woods Hole Oceanographic Institution (WHOI). Fourteen of these are ARRA instruments and 10 were built with funds from the Keck Foundation. All 24 instruments were to be deployed in the Year 4 configuration. Both the science party and OBS personnel worked close to a 24-hour schedule to get all of the instruments deployed while the weather permitted.

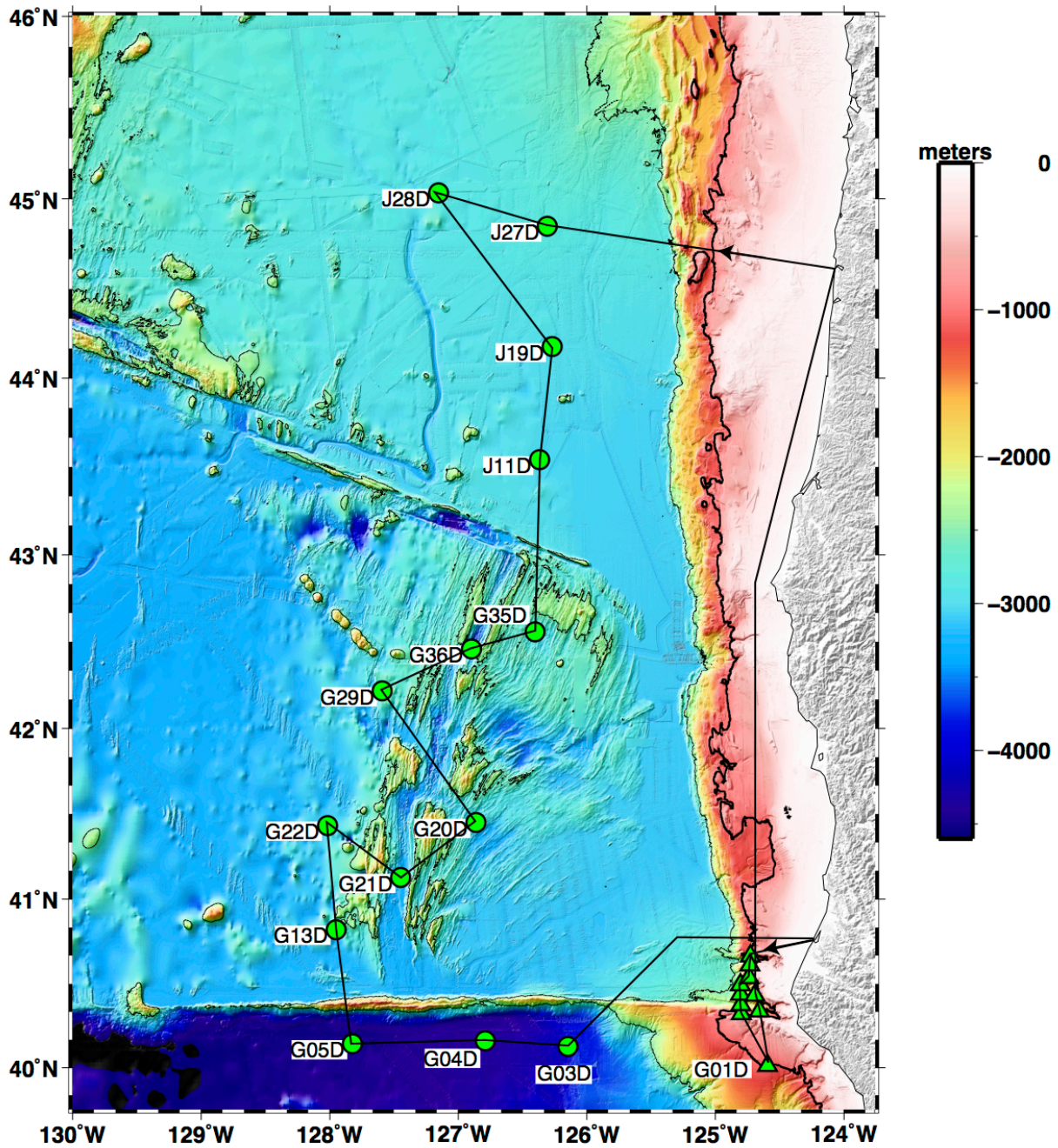
We successfully deployed all 24 OBSs (Figure 1 and 2 and Table 3). Two of the ARRA OBSs were only recovered and returned to land a week before the cruise and the availability confirmed the day before we sailed. One was deployed at a new site south of the Mendocino Triple Junction and the other at a site initially planned for a Lamont Doherty Earth Observatory instrument so as to free up an additional instrument to be deployed

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<sup>1</sup> McGuire et al., 2011, Cascadia Initiative Workshop Update, GeoPRISMS Newsletter, 26, <http://www.geoprisms.org/newsletters/42-newsletter-articles/scd/cascadia/258-cascadia-update-s2011.html>

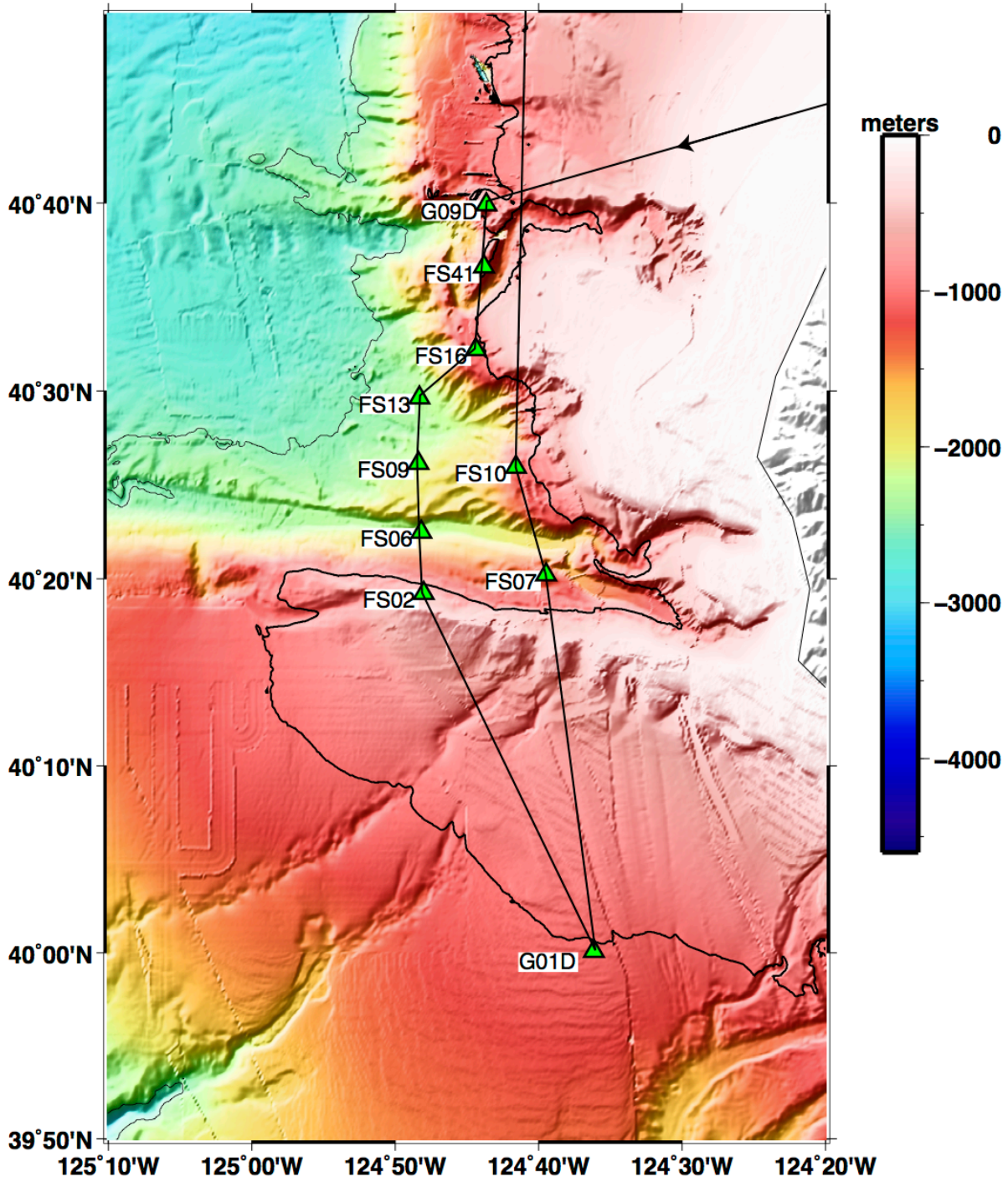
<sup>2</sup> Toomey et al., 2014, The Cascadia Initiative: A Sea Change In Seismological Studies of Subduction Zones, *Oceanography* 27(2):138–150, <http://dx.doi.org/10.5670/oceanog.2014.49>

around the Blanco Transform Fault. The OBSs will record continuously until their recovery in summer 2015.



**Figure 1.** OC1407A cruise track with deployment sites indicated (green circles for WHOI ARRA OBSs and green triangles for WHOI Keck OBSs).





**Figure 2.** OC1407A cruise track in the vicinity of Cape Mendocino with deployment sites indicated (green triangles for WHOI Keck OBSs).

## OC1407A Science Party

William Wilcock	Chief Scientist in Charge	University of Washington
Matt Fowler	Co-Chief Scientist	NOAA/PMEL - CIMRS
Alan Gardner	OBS Technician	Woods Hole Oceanography Institution
Tim Kane	OBS Technician	Woods Hole Oceanography Institution
Daniel Kot.	OBS Technician	Woods Hole Oceanography Institution
Dara Tebo, WHOI	OBS Technician	Woods Hole Oceanography Institution
Aubrey Adams	Postdoctoral Researcher	Washington University in St. Louis
Jacob Walter	Research Scientist	University of Texas at Austin
Chen Chen	Graduate Student	Purdue University
Michelle Weirathumueller	Graduate Student	University of Washington
Ryley Hill	Undergraduate Student	University of Nevada, Reno
Johna Winters	Marine Technician	Oregon State University
Nikiforos Delatolas	Mate Intern	

## OC1407A Oceanus Crew

Jeffrey Crews	Master
Ron Short	Chief Mate
Tony Monocaldilos	Second Mate
Henry Ray 'Chip' Millard	Chief Engineer
Jay Jean-Bart	Engineer
David Dean	Engineer
Doug Beck	Bos'n
Greg Sharp	AB
David Weaver	AB
Joy DeRosa	Cook
Sean Guss	Steward

## Cruise Narrative

This cruise departed on July 10, 2014 from Newport, Oregon. This is the fourth Cascadia leg of the 2014 field season and the first of 4 deployment legs. Our objective is to deploy 24 WHOI ocean bottom seismometers (OBSs), 10 of which are Keck OBSs and 14 of which are ARRA OBSs.

**Tuesday, July 8.** The WHOI OBSIP team arrived in Portland on July 5 and travelled down to Newport on July 6 where they started working to prepare the OBSs, including two ARRA OBSs that had been dropped off in Newport on July 3 after being recovered by Jason from the R/V Thompson during the third Cascadia leg. The 4 at-sea OBSIP personnel were assisted by Jimmy Elsenbeck on shore. The UW group (Wilcock, Weirathmueller and Hill) arrived late the evening of July 8.

**Wednesday, July 9.** Learned mid-morning that the two recovered ARRA OBSs have checked out properly. The transducers on these OBSs had ceramics that were clearly unseated so these were replaced by spares. Edgetech has serviced the transducers on all other ARRA OBSs. We held a short pre-cruise meeting on the bridge at 11 AM. We discussed the order of deployments and decided to stick with anti-clockwise plan. There was some discussion of reversing this order to do the Mendocino deployments during a period of forecast good weather but this would have meant deploying the two extra ARRA OBSs before the other ARRA OBSs giving us no flexibility to abandon these extra sites if we had problems with any ARRA OBSs. The Apply-to-Sail participants (Adams, Chen and Walter) arrived late in the afternoon.

**Thursday July 10.** Safety briefing a 10 AM followed by departure shortly after 11 PM. First station (J27D) was about 9 hours away with seas forecast to improve as winds died down. Instead the seas picked up and it was decided that work on preparing OBSs would not be undertaken while underway.

The first OBS deployment was at site J27D without incident

### 1) Station J27D

On Station:	7/11/2014 03:15 UTC (7/10/2014 20:15 LT)
OBS Type:	WHOI ARRA T108
Deploy Time:	7/11/2014 04:35 UTC
Deployed Position:	44° 50.842' N, 126° 18.503' W
Water Depth:	2824 m (from plan, 3.5/12 kHz were giving bad readings)
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/11/2014 05:25 UTC
OBS Fall Speed:	56.5 m/min
Start Acoustic Survey:	7/11/2014 05:45 UTC
Confirm Disable /Depart:	7/11/2014 06:45 UTC
M-Cal Survey Location	44° 50.934'N, 126° 18.498'W, 2815 m (3.3 m RMS)
Time on Station:	3 hr 30 min

**Friday, July 11.** Second deployment in early hours. Still a lot of water on the deck.

### 2) Station J28D

On Station:	7/11/2014 10:07 UTC (7/11/2014 03:07 LT)
OBS Type:	WHOI ARRA T110



Deploy Time:	7/11/2014 10:56 UTC
Deployed Position:	45° 01.997' N, 127° 09.440' W
Water Depth:	2883 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/11/2014 11:46 UTC
OBS Fall Speed:	57.7 m/min
Start Acoustic Survey:	7/11/2014 12:09 UTC
Confirm Disable /Depart:	7/11/2014 12:55 UTC
M-Cal Survey Location	45° 01.809'N, 127° 09.362, 2856 m (4.4 m RMS)
Time on Station:	2 hr 48 min

Seas improved during the night and all the science party now functional.

### 3) Station J19D

On Station:	7/11/2014 18:34 UTC (7/11/2014 11:34 LT)
OBS Type:	WHOI ARRA T105
Deploy Time:	7/11/2014 18:59 UTC
Deployed Position:	44° 10.722' N, 126° 16.263' W
Water Depth:	2986 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/11/2014 19:49 UTC
OBS Fall Speed:	59.7 m/min
Start Acoustic Survey:	7/11/2014 20:00 UTC
Confirm Disable /Depart:	7/11/2014 20:56 UTC
M-Cal Survey Location	44° 10.742'N, 126° 16.271, 2955 m (3.1 m RMS)
Time on Station:	2 hr 22 min

Quite pleasant seas as we steam towards site J11D. Plan a CTD after next deployment.

### 4) Station J11D

On Station:	7/12/2014 00:16 UTC (7/11/2014 17:16 LT)
OBS Type:	WHOI ARRA T113
Deploy Time:	7/12/2014 00:35 UTC
Deployed Position:	43° 32.422' N, 126° 22.199' W
Water Depth:	3030 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/12/2014 01:27 UTC
OBS Fall Speed:	58.3 m/min
Start Acoustic Survey:	7/12/2014 01:36 UTC
Confirm Disable /Depart:	7/12/2014 02:36 UTC
M-Cal Survey Location	43° 32.497'N, 126° 22.113, 3001 m (3.1 m RMS)
Time on Station:	2 hr 20 min

Complete a CTD to 1000 m after deployment (file name OC1407A\_J11D). WHOI team decide to take additional rest so we plan arrival on site G35D at 05:00. Several tuna are caught early in the slow transit.

**Saturday, July 12.** Seas now quite pleasant although forecast is not great for Monday-Tuesday (20-30 knot winds). First deployment of the day goes without incident. Deployed G35 on flat terrain just to south of a small seamount.

5) Station G35D

On Station:	7/12/2014 11:48 UTC (7/12/2014 4:48 LT)
OBS Type:	WHOI ARRA T104
Deploy Time:	7/12/2014 12:23 UTC
Deployed Position:	42° 33.544' N, 126° 24.192' W
Water Depth:	2830 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/12/2014 13:10 UTC
OBS Fall Speed:	60.2 m/min
Start Acoustic Survey:	7/12/2014 13:21 UTC
Confirm Disable /Depart:	7/12/2014 14:15 UTC
M-Cal Survey Location	42° 33.340'N, 126° 23.941, 2823 m (3.6 m RMS)
Time on Station:	2 hr 27 min

Next deployment goes well until there are problems disabling the acoustic release. Cycle power, change levels, change deck boxes and finally get a confirmed disable after about 30 minutes. Possibly related to challenging acoustic setting in axial valley of Gorda Ridge

6) Station G36D

On Station:	7/12/2014 16:20 UTC (7/12/2014 9:20 LT)
OBS Type:	WHOI ARRA T109
Deploy Time:	7/12/2014 16:35 UTC
Deployed Position:	42° 27.568' N, 126° 53.843' W
Water Depth:	3828 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/12/2014 17:40 UTC
OBS Fall Speed:	58.9 m/min
Start Acoustic Survey:	7/12/2014 17:48 UTC
Confirm Disable /Depart:	7/12/2014 19:17 UTC
M-Cal Survey Location	42° 27.705'N, 126° 53.788, 3780 m (2.9 m RMS)
Time on Station:	2 hr 57 min

Seas getting quite calm. Deployment of station G29D goes smoothly except there are problems disabling the acoustic release. Acoustic release appeared to disable but returned <15 chirps but and continued to respond. Two disable commands appeared to turn off the acoustics and then turn them on. Sent another disable command and confirmed no more responses to ranging.

7) Station G29D

On Station:	7/12/2014 22:28 UTC (7/12/2014 15:28 LT)
OBS Type:	WHOI ARRA T102
Deploy Time:	7/12/2014 22:34 UTC
Deployed Position:*	42° 13.034'N, 127° 36.340'W – When OBS reached seafloor
Water Depth:	2907 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/12/2014 23:20 UTC

OBS Fall Speed:	63.2 m/min
Start Acoustic Survey:	7/12/2014 23:41 UTC
Confirm Disable /Depart:	7/13/2014 00:42 UTC
M-Cal Survey Location	42° 13.045'N, 127° 36.314, 2910 m (2.2 m RMS)
Time on Station:	2 hr 14 min

8) Station G20D

On Station:	7/13/2014 06:08 UTC (7/12/2014 23:08 LT)
OBS Type:	WHOI ARRA T103
Deploy Time:	7/12/2014 06:16 UTC
Deployed Position:	41° 26.986' N, 126° 51.747' W
Water Depth:	2944 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/13/2014 07:07 UTC
OBS Fall Speed:	57.7 m/min
Start Acoustic Survey:	7/13/2014 07:23 UTC
Confirm Disable /Depart:	7/13/2014 08:21 UTC
M-Cal Survey Location	41° 27.095'N, 126° 51.825, 2931 m (2.4 m RMS)
Time on Station:	2 hr 13 min

**Sunday, July 13.** Decided prior to G20D deployment to slow transit to next site so as to arrive at 6:30 AM to conduct a 1000 m CTD followed by OBS deployment at 7:30 AM. This will give the OBSIP personnel a good nights rest.

CTD to 1000 m and deployment at site G21D was uneventful. Seas still pretty good

9) Station G21D

On Station:	7/13/2014 14:27 UTC (7/13/2014 07:27 LT)
OBS Type:	WHOI ARRA T106
Deploy Time:	7/13/2014 14:35 UTC
Deployed Position:	41° 7.632' N, 127° 26.891' W
Water Depth:	3242 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/13/2014 15:16 UTC
OBS Fall Speed:	79 m/min (deployment time mislogged?)
Start Acoustic Survey:	7/13/2014 15:32 UTC
Confirm Disable /Depart:	7/13/2014 16:39 UTC
M-Cal Survey Location	41° 7.360'N, 127° 26.881, 3293 m (3.6 m RMS)
Time on Station:	2 hr 12 min

Conduct an X-shaped 3.5 /12 kHz survey with a 3 km aperture at site G22D since it has no multibeam. Depth is pretty uniform varying by ~30 m between 3100 and 3150 m so site is good.

10) Station G22D

On Station:	7/13/2014 20:33 UTC (7/13/2014 13:33 LT) (after completing 3.5 kHz survey)
OBS Type:	WHOI ARRA T107
Deploy Time:	7/13/2014 20:33 UTC
Deployed Position:	41° 26.010' N, 128° 1.094' W
Water Depth:	3123 m

Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/13/2014 21:27 UTC
OBS Fall Speed:	55.8 m/min
Start Acoustic Survey:	7/13/2014 21:34 UTC
Confirm Disable /Depart:	7/13/2014 22:35 UTC
M-Cal Survey Location	41° 26.015'N, 128° 0.997, 3092 m (2.5 m RMS)
Time on Station:	2 hr 2 min

Winds picking up a little (just below 20 knots) but conditions still reasonable. G13D deployment uneventful

11) Station G13D

On Station:	7/14/2014 02:02 UTC (7/13/2014 19:02 LT)
OBS Type:	WHOI ARRA T114
Deploy Time:	7/14/2014 02:13 UTC
Deployed Position:	40° 45.001' N, 127° 56.091' W
Water Depth:	3235 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/14/2014 03:07 UTC
OBS Fall Speed:	59.9 m/min
Start Acoustic Survey:	7/14/2014 03:13 UTC
Confirm Disable /Depart:	7/14/2014 04:13 UTC
M-Cal Survey Location	40° 44.894'N, 127° 56.225, 3187 m (2.9 m RMS)
Time on Station:	2 hr 11 min

Decide to deploy an ARRA at site G04D and then deploy the Mendocino instruments from north to south so that G01D is the final Keck deployed. This will ensure the Mendocino array will be deployed even if one Keck has problems.

**Monday, July 14.** Winds continue to pick up reaching 25 knots soon after midnight. Deployments continue to progress smoothly.

12) Station G05D

On Station:	7/14/2014 07:17 UTC (7/14/2014 00:17 LT)
OBS Type:	WHOI ARRA T112
Deploy Time:	7/14/2014 07:34 UTC
Deployed Position:	40° 08.519' N, 127° 49.393' W
Water Depth:	4509 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/14/2014 08:57 UTC
OBS Fall Speed:	54.3 m/min
Start Acoustic Survey:	7/14/2014 09:01 UTC
Confirm Disable /Depart:	7/14/2014 10:29 UTC
M-Cal Survey Location	40° 8.582'N, 127° 49.544, 4463 m (3.5 m RMS)
Time on Station:	3 hr 12 min

Seas getting quite rough with winds approaching 30 knots during the day. Deploying ARRA at site G04D with final Keck going to G01D.

### 13) Station G04D

On Station:	7/14/2014 15:07 UTC (7/14/2014 08:07 LT)
OBS Type:	WHOI ARRA T101
Deploy Time:	7/14/2014 15:34 UTC
Deployed Position:	40° 09.438' N, 126° 47.291' W
Water Depth:	4361 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/14/2014 16:50 UTC
OBS Fall Speed:	57.4 m/min
Start Acoustic Survey:	7/14/2014 17:07 UTC
Confirm Disable /Depart:	7/14/2014 18:27 UTC
M-Cal Survey Location	40° 9.464'N, 126° 47.080, 4350 m (2.3 m RMS)
Time on Station:	3 hr 20 min

### 14) Station G03D

On Station:	7/14/2014 21:12 UTC (7/14/2014 14:12 LT)
OBS Type:	WHOI ARRA T111
Deploy Time:	7/14/2014 21:26 UTC
Deployed Position:	40° 03.554' N, 126° 9.756' W
Water Depth:	4151 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/14/2014 22:41 UTC
OBS Fall Speed:	55.3 m/min
Start Acoustic Survey:	7/14/2014 22:44 UTC
Confirm Disable /Depart:	7/14/2014 23:59 UTC
M-Cal Survey Location	40° 3.525'N, 126° 9.671, 4057 m (2.9 m RMS)
Time on Station:	2 hr 47 min

Follow Station G03D deployment and survey with a CTD to 1000 m. During the recovery with the CTD at ~500 m (~18:00 local time) the ship went dark. Power was restored in about 5 minutes by switching to the 2<sup>nd</sup> generator and the CTD recovered. The chief scientist was informed by the Captain at about 7:30 PM that because one of the main generators now has a undiagnosed fault that also manifested itself on a previous cruise that the ship needs to go into Eureka to diagnose and fix the problem. We expect to arrive there between 9 and 10 AM tomorrow.

**Tuesday, July 15.** Dock in Eureka at ~10:30. Port Engineer is traveling down from Newport to help install and test electrical breaker – this is viewed as the most likely reason for the generator problems. Science party spends day off ship. Ship goes dark at 17:30 to conduct repairs. Informed at 20:30 that things look good (some wires need to be swapped) and at 21:15 that we will sail at 22:30.

Leave the dock at approximately 22:45. Plan is to work south until WHOI OBSIP group needs a rest then head to southernmost station and work back to the north. Seas very good (winds ~ 5 knots with a gentle swell).

### 15) Station G09D

On Station:	7/16/2014 08:25 UTC (7/16/2014 01:25 LT)
OBS Type:	WHOI Keck S87
Deploy Time:	7/16/2014 09:15 UTC



Deployed Position: 40° 39.904' N, 124° 43.625' W  
Water Depth: 714 m  
Range to which tracked: Tracked to bottom  
OBS on Seafloor: 7/16/2014 09:33 UTC  
OBS Fall Speed: 44.4 m/min  
Start Acoustic Survey: 7/16/2014 09:39 UTC  
Confirm Disable /Depart: 7/16/2014 10:10 UTC  
M-Cal Survey Location 40° 39.991'N, 124° 43.615, 716 m (3.7 m RMS)  
Time on Station: 1 hr 45 min

16) Station FS41

On Station: 7/16/2014 10:38 UTC (7/16/2014 03:38 LT)  
OBS Type: WHOI Keck S88  
Deploy Time: 7/16/2014 11:13 UTC  
Deployed Position: 40° 36.602' N, 124° 43.816' W  
Water Depth: 1078  
Range to which tracked: Tracked to bottom  
OBS on Seafloor: 7/16/2014 11:41 UTC  
OBS Fall Speed: 38.5 m/min  
Start Acoustic Survey: 7/16/2014 11:48 UTC  
Confirm Disable /Depart: 7/16/2014 12:15 UTC  
M-Cal Survey Location 40° 36.743'N, 124° 43.861, 1079 m (3.8 m RMS)  
Time on Station: 1 hr 37 min

17) Station FS16

On Station: 7/16/2014 12:53 UTC (7/16/2014 05:53 LT)  
OBS Type: WHOI Keck S82  
Deploy Time: 7/16/2014 12:57 UTC  
Deployed Position: 40° 32.249' N, 124° 44.800' W  
Water Depth: 1086 m  
Range to which tracked: Tracked to bottom  
OBS on Seafloor: 7/16/2014 13:25 UTC  
OBS Fall Speed: 38.8 m/min  
Start Acoustic Survey: 7/16/2014 13:35 UTC  
Confirm Disable /Depart: 7/16/2014 13:59 UTC  
M-Cal Survey Location 40° 32.270'N, 124° 44.805, 1080 m (3.7 m RMS)  
Time on Station: 1 hr 06 min

18) Station FS13

On Station: 7/16/2014 Not logged (7/16/2014 Not Logged)  
OBS Type: WHOI Keck S80  
Deploy Time: 7/16/2014 14:49 UTC  
Deployed Position: 40° 29.642' N, 124° 48.341' W  
Water Depth: 2321 m  
Range to which tracked: Tracked to bottom  
OBS on Seafloor: 7/16/2014 15:50 UTC  
OBS Fall Speed: 38.0 m/min  
Start Acoustic Survey: 7/16/2014 15:56 UTC  
Confirm Disable /Depart: 7/16/2014 16:37 UTC  
M-Cal Survey Location 40° 29.623'N, 124° 48.205, 2291 m (3.2 m RMS)

Time on Station: Not Logged

19) Station FS09

On Station: 7/16/2014 17:05 UTC (7/16/2014 10:05 LT)  
OBS Type: WHOI Keck S83  
Deploy Time: 7/16/2014 17:18 UTC  
Deployed Position: 40° 26.162' N, 124° 48.370' W  
Water Depth: 2130 m  
Range to which tracked: Tracked to bottom  
OBS on Seafloor: 7/16/2014 18:18 UTC  
OBS Fall Speed: 35.5 m/min  
Start Acoustic Survey: 7/16/2014 18:23 UTC  
Confirm Disable /Depart: 7/16/2014 19:02 UTC  
M-Cal Survey Location: 40° 26.260'N, 124° 48.220, 2122 m (2.7 m RMS)  
Time on Station: 1 hr 58 min

20) Station FS06

On Station: 7/16/2014 19:37 UTC (7/16/2014 12:37 LT)  
OBS Type: WHOI Keck S89  
Deploy Time: 7/16/2014 19:58 UTC  
Deployed Position: 40° 22.008' N, 124° 48.123' W  
Water Depth: 1825  
Range to which tracked: Tracked to bottom  
OBS on Seafloor: 7/16/2014 20:48 UTC  
OBS Fall Speed: 36.5 m/min  
Start Acoustic Survey: 7/16/2014 21:00 UTC  
Confirm Disable /Depart: 7/16/2014 21:38 UTC  
M-Cal Survey Location: 40° 22.200'N, 124° 48.405, 1947 m (3.6 m RMS)  
Time on Station: 2 hr 1 min

21) Station FS02

On Station: 7/16/2014 21:59 UTC (7/16/2014 14:59 LT)  
OBS Type: WHOI Keck S86  
Deploy Time: 7/16/2014 22:23 UTC  
Deployed Position: 40° 19.509' N, 124° 48.015' W  
Water Depth: 920 m  
Range to which tracked: Tracked to bottom  
OBS on Seafloor: 7/16/2014 22:47 UTC  
OBS Fall Speed: 38.3 m/min  
Start Acoustic Survey: 7/16/2014 22:52 UTC  
Confirm Disable /Depart: 7/16/2014 23:13 UTC  
M-Cal Survey Location: 40° 19.562'N, 124° 48.012, 948 m (2.7 m RMS)  
Time on Station: 2 hr 14 min

After 7 OBSs in a row, WHOI OBSIP group needs a break. Plan is to collect a CTD at FS02 down to 800 m and then go to G01D before picking up final two sites on the way home. Some problems with CTD logging GPS feed so acquire CTD without GPS.

Seas still very good with winds ~5 knots. After short transit deploy G01D. Some problems with ship's heading feed to M-Cal computer delay start of survey briefly (loose connection in panel on 02 deck)

22) Station G01D

On Station:	7/17/2014 02:09 UTC (7/16/2014 17:09 LT)
OBS Type:	WHOI Keck S85
Deploy Time:	7/17/2014 02:25 UTC
Deployed Position:	40° 00.005' N, 124° 36.003' W
Water Depth:	1023 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/17/2014 02:51 UTC
OBS Fall Speed:	39.3 m/min
Start Acoustic Survey:	7/17/2014 02:57 UTC
Confirm Disable /Depart:	7/17/2014 03:23 UTC
M-Cal Survey Location	39° 59.996'N, 124° 36.049, 1007 m (3.0 m RMS)
Time on Station:	1 hr 14 min

Next site is FS07. Deployment goes smoothly but during descent we notice that there are problems again getting the ship's heading string into the M-Cal computer. Problem is related to a connection in the marine techs main panel on the 02 deck – It is fixed it by hardwiring bypass of several connectors.

23) Station FS07

On Station:	7/17/2014 05:20 UTC (7/16/2014 22:20 LT)
OBS Type:	WHOI Keck S84
Deploy Time:	7/17/2014 05:57 UTC
Deployed Position:	40° 20.221' N, 124° 39.484' W
Water Depth:	1282 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/17/2014 06:31 UTC
OBS Fall Speed:	37.7 m/min
Start Acoustic Survey:	7/17/2014 07:03 UTC
Confirm Disable /Depart:	7/17/2014 07:37 UTC
M-Cal Survey Location	40° 20.274'N, 124° 39.464, 1274 m (2.3 m RMS)
Time on Station:	2 hr 17 min

**Thursday, July 17**

24) Station FS10

On Station:	7/17/2014 08:15 UTC (7/17/2014 01:15 LT)
OBS Type:	WHOI Keck S81
Deploy Time:	7/17/2014 08:28 UTC
Deployed Position:	40° 25.961' N, 124° 41.594' W
Water Depth:	1135 m
Range to which tracked	Tracked to bottom
OBS on Seafloor:	7/17/2014 08:58 UTC
OBS Fall Speed:	37.8 m/min
Start Acoustic Survey:	7/17/2014 09:02 UTC
Confirm Disable /Depart:	7/17/2014 09:29 UTC

M-Cal Survey Location            40° 25.970'N, 124° 41.641, 1154 m (2.1 m RMS)  
Time on Station:                    1 hr 14 min

All OBS's deployed successfully so set sail for Newport.

**Friday, July 18**

Dock at Newport at 7 AM

### **OBS Operations**

OC1407A deployed 24 WHOI OBSs at 24 sites as part of the Year 4 oceanographic component of the Cascadia Initiative. The 24 sites are located on the Juan de Fuca, Gorda and Pacific plates (Figures 1 and 2).

Of the 24 OBS deployed, 14 were of a new WHOI design, the construction of which was funded through the American Recovery and Reinvestment Act (ARRA). The WHOI-designed ARRA OBS (Table 2) carry a Trillium Compact intermediate-period seismometer and a Cox-Deaton-Webb Differential Pressure Gauge (DPG). The Quanterra Q330 datalogger and Quanterra Baler-44 storage device are housed in a short aluminum (7075) pressure housing, while a smaller diameter but longer aluminum cylinder holds the lithium battery pack. The ARRA OBSs carry a new chip-scale atomic clock (CSAC) manufactured by Symmetricom that provides significantly more accurate timing than the Seascan timebase used in the other WHOI OBSs. Floatation is provided by a syntactic foam pack. The remaining 10 OBSs were funded by the W.M. Keck Foundation (Table 1), and carry a Guralp CMG-3T broadband seismometer, a Kinemetrics Episensor strong-motion accelerometer, and a DPG. Timing on the Keck OBS is provided by a Seascan timebase. All the OBSs sampled at 50 Hz; the low pass anti-alias filters passband edge is set to a 20 Hz and stopband edge to 24 Hz.

All of the OBS were deployed off the starboard side using the Oceanus' Morgan knuckle-boom crane. For most of the ARRA deployments the weather was not good enough to work on the deck during transits so the majority of the OBS preparation and electronics check-out were done on site. For the closely spaced Keck deployments the weather was good and a lot of preparation was done on the short transits between sites. We tracked all of the OBSs acoustically as they fell to the seafloor. We then surveyed them acoustically with the M-Cal commercial software by steaming out to a range of one half the water depth, following a circular path at one half water depth for about 270° and returning back over the OBS collecting ranges at 150 m intervals for the WHOI ARRA OBSs and 75 m for the WHOI Keck OBSs (in shallower water). The deployed (drop) and surveyed OBS locations are listed in Table 3.



**Table 1. Keck OBS Configurations**

Site Number	OBS ID	Guralp CMG-3T S/N	DPG S/N	DPG Version	Kinematics Episensor S/N	WHOI Episensor Board	Q330 Tag ID	Q330 Firm ware Version	Baler14 Tag ID	QEP-1 Tag	EP-ADC-1 Tag	Seascan Timebase	Edgetech Release Board #1	Edgetech Release Board #2	Novatech VHF Radio S/N	Radio Frequency
FS13D	S80	T3G38	6010	6.3	2867	11	2006	1.146	06392	117267	116633	0110	31653	31642	C04-103	154.585
FS10D	S81	T33996	6014	6.3	2864	08	2007	1.146	06393	117246	116635	0133	31654	31665	U03-093	160.785
FS16D	S82	T3L04	6009	6.3	2797	01	0002	1.146	06394	117244	116637	1040	31644	31630	C04-104	154.585
FS09D	S83	T3G37	002	6.0	2836	03	2009	1.146	06395	117245	116636	0318	31645	31656	V10-082	154.585
FS07D	S84	T3L02	6022	6.3	2865	02	2010	1.146	06396	117274	116625	1043	31657	31646	V10-085	159.480
G01D	S85	T3G30	6005	6.3	2862	09	2011	1.146	06397	117268	116638	1044	31647	31658	V10-094	160.785
FS02D	S86	T3J97	6019	6.3	2870	05	2012	1.146	06398	117269	116631	1050	48435	31659	V10-088	159.480
G09D	S87	T3L46	048	6.0	2866	07	2015	1.146	06399	117273	116652	1213	31666	31663	C04-100	154.585
FS41D	S88	T3G33	6011	6.3	2863	04	2016	1.146	06514	117271	116639	1217	31650	31661	C04-105	154.585
FS06D	S89	T3G41	6003	6.3	2868	10	2188	1.146	06401	117272	116634	1221	31628	31662	U03-071	154.585

**All Keck Edgetechs receive at 11 kHz; all release #1 boards transmit at 11.5kHz, except S86 at 12kHz; all release #2 boards transmit at 13kHz**

**Table 2. ARRA OBS Configurations**

Site	OBS ID	Nanometrics S/N	DPG S/N	DPG Version	Q330 Tag ID	Q330 Firmware Version	Baler44 Tag	CSAC Element S/N	Edgetech BART S/N	Novatech Radio S/N	Radio Frequency
G04D	T101	3023	43	old	4512	1.146	16503	1104CS00303	35744	V10-084	159.480
G29D	T102	3008	60	old	4513	1.146	16500	1103CS00255	35731	Y05-016	160.785
G20D	T103	3102	005	6.2	4514	1.146	16496	1104CS00354	35743	U03-086	160.725
G35D	T104	3027	6004	6.3	4515	1.146	17062	1106CS00447	35738	B07-029	154.585
J19D	T105	3101	004	6.2	4516	1.146	16501	1104CS00379	35747	C04-102	154.585
G21D	T106	3020	9028	6.3	4517	1.146	16502	1102CS00239	35745	Y05-014	160.725
G22D	T107	3001	42	6.0	4518	1.146	16499	1104CS00304	35740	U03-082	160.725
J27D	T108	3018	6023	6.3	4519	1.146	71951	1101CS00193	35748	U03-085	160.725
G36D	T109	3021	44	old	4520	1.146	16504	1104CS00362	35733	C04-101	154.585
J28D	T110	3022	54	old	4521	1.146	16512	1104CS00353	35741	U03-073	154.585
G03D	T111	3006	005	6.0	4522	1.146	16286	1106CS00594	35735	V10-093	160.785
G05D	T112	3106	35	6	4523	1.146	16497	1104CS00372	35739	U03-091	160.785
J11D	T113	3029	45	old	4524	1.146	16511	1103CS00281	35732	U03-079	159.480
G13D	T114	3004	49	old	4525	1.146	17061	1102CS00227	35734	U03-072	154.585

**All ARRA Edgetechs receive at 11 kHz and transmit at 13kHz**

**Table 3. Drop and Survey positions of WHOI OBSs**

Site	Drop Position (Planned)			Survey Position			Date Deployed (UTC)
	Latitude (Dec.)	Longitude (Dec.)	Depth (m)	Latitude (Dec.)	Longitude (Dec.)	Depth (m)	
J27D	44.84737	-126.30838	2824	44.84890	-126.3083	2814.8	7/11/2014
J28D	45.03329	-127.15733	2883	45.03015	-127.15604	2855.8	7/11/2014
J19D	44.17870	-126.27105	2986	44.17903	-126.27119	2955.4	7/11/2014
J11D	43.54037	-126.36998	3030	43.54162	-126.36855	3000.8	7/12/2014
G35D	42.55907	-126.40320	2830	42.55567	-126.39902	2822.6	7/12/2014
G36D	42.45946	-126.89739	3828	42.46176	-126.89647	3779.6	7/12/2014
G29D	42.21723	-127.60567	2907	42.21742	-127.60523	2910.9	7/12/2014
G20D	41.44977	-126.86244	2944	41.45158	-126.86375	2931.3	7/13/2014
G21D	41.12721	-127.44818	3242	41.12267	-127.44802	3293.4	7/13/2014
G22D	41.43349	-128.01823	3118	41.43359	-128.01661	3092.4	7/13/2014
G13D	40.75001	-127.93485	3235	40.74824	-127.93708	3186.5	7/14/2014
G05D	40.14199	-127.82322	4509	40.14304	-127.82573	4463.8	7/14/2014
G04D	40.15730	-126.78818	4361	40.15773	-126.78467	4350.3	7/14/2014
G03D	40.05924	-126.16261	4151	40.05875	-126.16118	4056.5	7/14/2014
G09D	40.66507	-124.72708	714	40.66652	-124.72692	716.3	7/16/2014
FS41	40.61003	-124.73027	1078	40.61239	-124.73102	1079.3	7/16/2014
FS16	40.53748	-124.74667	1086	40.53784	-124.74675	1080.4	7/16/2014
FS13	40.49403	-124.80568	2321	40.49371	-124.80342	2291.2	7/16/2014
FS09	40.43603	-124.80617	2130	40.43767	-124.80367	2122.1	7/16/2014
FS06	40.36681	-124.80204	1825	40.37000	-124.80675	1946.8	7/16/2014
FS02	40.32514	-124.80025	920	40.32603	-124.80020	947.9	7/16/2014
G01D	40.00008	-124.60005	1023	39.99993	-124.60082	1006.7	7/17/2014
FS07	40.33701	-124.65806	1282	40.33790	-124.65773	1273.7	7/17/2014
FS10	40.43269	-124.69324	1135	40.43284	-124.69402	1153.8	7/17/2014

**Table 4. CTD Locations and Depths**

CTD Number	Station Name	Deployment Date, UTC	Deployment Time, UTC	Latitude	Longitude	Cast Depth	File	Notes
1	J11D	7/12/14	02:45	43° 32.422' N	126° 22.199' W	1000 m	OC1407A_J11D.hex	
2	G21D	7/13/14	13:34	41° 7.570' N	127° 26.847' W	1000 m	OC1407A_G21D.hex	
3	G03D	7/14/14	00:21	40° 3.594' N	126° 9.766' W	1000 m	OC1407A_G03D.hex	
4	FS02	7/16/14	23:34	40° 19.508' N	124° 48.013' W	800 m	OC1407A_FS02.hex	CTD data collection halted 500 m from surface on recovery due to loss of ship's power

## **Acknowledgements**

This cruise was supported by the U.S. National Science Foundation. We thank Captain Jeff Crews, Chief Engineer Chip Millard, and the officers and crew of the *R/V Oceanus* for helping to make this cruise a success. Shipboard technician Johna Winters provided considerable help with shipboard data systems and ensured OBS deck operations and CTD deployments went smoothly.