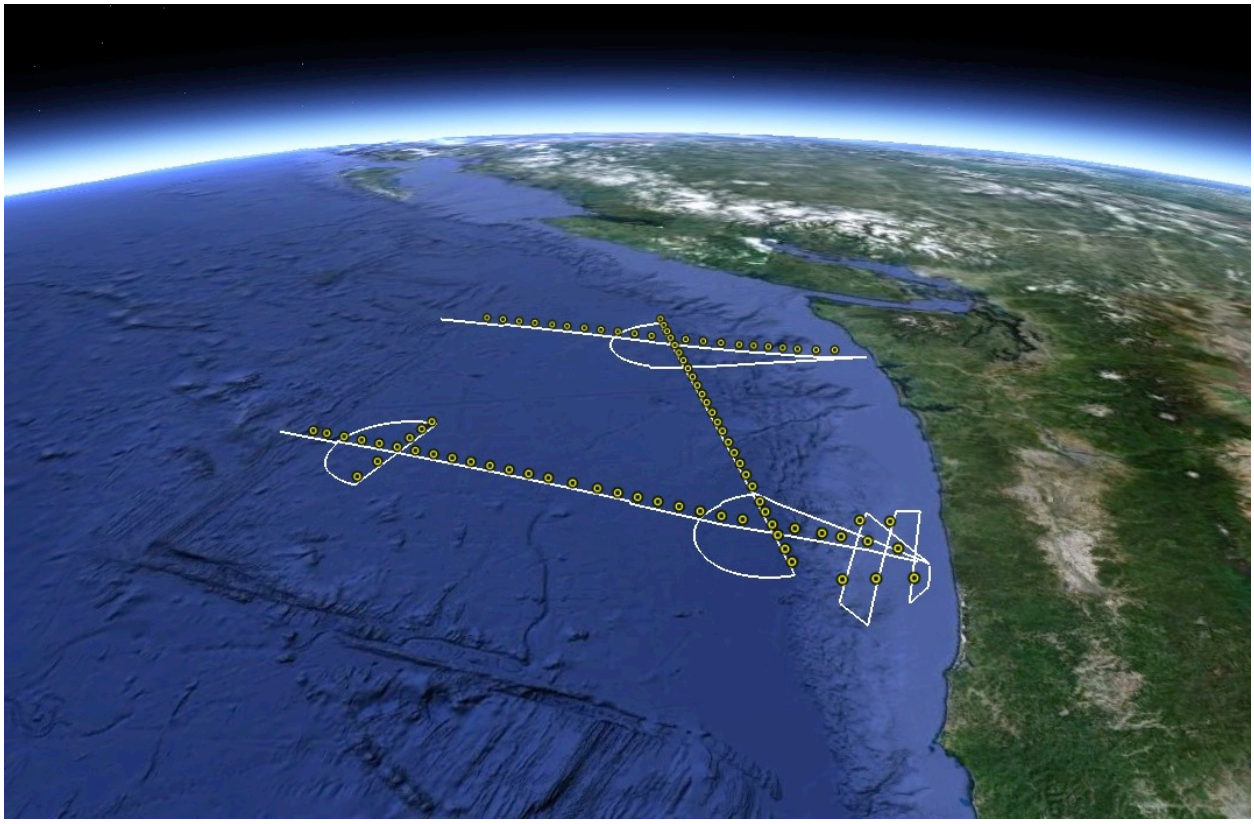
Evolution and Hydration of the Juan de Fuca Crust and Uppermost Mantle: A Plate-Scale Seismic Investigation from Ridge to Trench

Cruise Report

R/V Oceanus OC1206A

June 7 – July 13, 2012



Chief Scientist: J. Pablo Canales (*Woods Hole Oceanographic Institution*)

Co-chief Scientist: Helene Carton (*Lamont-Doherty Earth Observatory*)

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1. SCIENTIFIC MOTIVATION AND PROJECT OBJECTIVES

Evolution of oceanic lithosphere from formation at the ridge crest to subduction at the trench involves incorporation of water into the physical and chemical structure of the crust and shallow mantle. At subduction zones, water stored and transported with the down-going plate is released at depth through mechanical and metamorphic dehydration [e.g., *Meade and Jeanloz*, 1991]. A number of subduction zone processes are affected by de-watering, including partial melting associated with arc magmatism [e.g., *Tatsumi and Egginns*, 1995], the mechanical characteristics of the megathrust [e.g., *Shipley et al.*, 1994], and the generation of intraslab earthquakes at intermediate depths [e.g., *Kirby et al.*, 1996]. Despite the importance of water bound in oceanic plates for subduction processes, little is known about the extent, evolution, and distribution of plate hydration within the plate interior.

At the Cascadia subduction zone, where volcanic eruptions and megathrust and intraslab earthquakes pose significant hazards in the heavily populated northwestern US, the state of the down-going Juan de Fuca (JdF) plate is of particular interest as relatively little hydration of this young oceanic lithosphere (~6-9 Ma at the subduction zone [*Wilson*, 2002]) is expected. With the presumed warm state of the plate, hydration of the oceanic lithosphere may be confined to the crust, limiting the potential volume of water bound chemically into the plate [e.g., *Hyndman and Wang*, 1995]. However, numerous observations support the abundant presence of water within the subduction zone including reduced velocities within the mantle wedge [e.g., *Bostock et al.*, 2002], episodic tremor and slip events possibly linked to fluid overpressures along the megathrust [e.g., *Audet et al.*, 2009; *Kao et al.*, 2005; *Rogers and Dragert*, 2003], the intermediate-depth intraslab seismicity beneath Puget Sound [*Hacker et al.*, 2003a; *Hacker et al.*, 2003b; *Parsons et al.*, 1998], and reflection banding above the deep megathrust [e.g., *Hyndman*, 1988; *Nedimović et al.*, 2003]. Some of the water entering the Cascadia subduction zone is transported within the sediment section and the highly porous upper crust, but this seismicity located below the oceanic crust [*Parsons et al.*, 1998; *Preston et al.*, 2003] suggests the presence of water reaching into at least the shallowest mantle of the down-going plate. Regional variations in subduction zone structure and seismicity are observed at Cascadia and variations in incoming plate hydration are inferred. To understand the contribution of water to subduction zone processes at Cascadia, better constraints on the state of hydration of the incoming JdF plate are needed.

The overarching questions we aim to address in this NSF-funded project are:

(1) How does the JdF plate evolve from ridge to trench and does significant hydration of the lower crust and upper mantle accompany the now well documented evolution of the uppermost crust as the plate ages?

(2) What is the state of hydration of the JdF plate at the Cascadia trench, which represents a young and presumed warm end member for subducting plates?

(3) Do along-trench variations in structure and extent of alteration of the down-going JdF plate contribute to the regional scale variations in structure and seismicity of the Cascadia subduction zone?

An earlier multichannel seismic (MCS) survey (*RV Ewing Cruise* EW0207) acquired profiles across the Juan de Fuca ridge extending 150 km into the plate interior. This survey documented the progressing increase in velocities within seismic layer 2A associated with the infilling of porosity by alteration minerals during ridge flank circulation, and also imaged intra-plate faulting starting at 75-120 km from the ridge axis (these faults provide potential conduits for water to reach through the crust and into the shallow mantle). Building on these earlier results, our new NSF-funded survey was designed to test the hypothesis that the JdF plate is significantly hydrated prior to subduction, transporting chemically bound water into the subduction zone, and potentially contributing to along-strike variations in structure and seismic characteristics of the Cascadia margin. To test this hypothesis we are characterizing the evolution of the crust and shallow mantle across complete transects of the JdF plate, from formation at the ridge, through alteration and hydration within the plate interior, to subduction at the Cascadia trench. These would be the first continuous ridge-to-trench transects of any oceanic plate, feasible at the JdF plate due to the small size of the plate.

Fracturing and alteration of crustal and mantle rocks give rise to detectable changes in seismic velocities, and seismic methods provide an important remote sensing tool for assessing plate hydration. We use both MCS and wide-angle seismic reflection/refraction methods to obtain a complete seismic characterization of the oceanic crust and uppermost mantle. Specifically, reflection data are needed to provide crustal (sediments, igneous basement) and sub-Moho structure, in particular to detect and characterize faulting within the plate interior and to image variations in structure of the incoming plate near the trench. Seismic velocity information from refraction data is needed to map changes caused by fracturing and alteration: velocities within the upper 1-2 km of the crust to be determined using tomographic methods applied to long-offset streamer data (at lateral resolutions of ~2 km), and velocities within the lower crust and uppermost mantle to be determined from OBS data (at lateral resolutions of 10-20 km). Furthermore, the presence (or lack) of seismic anisotropy in the uppermost oceanic mantle can be a proxy for the state of hydration of the plate.

Cascadia thrust zone imaging

An “add-on” to the above project was developed (co-PI’s Anne Trehu, Geof Abers, and Helene Carton), proposing to extend the planned experiment landward into the subduction zone by deploying additional OBS and land seismometers out to ~80-100 km inland to record the offshore shots. The objective was to sample the Cascadia thrust zone at locations where the structure and state of hydration of the oceanic plate will be known prior to subduction, allowing to investigate further the hypothesis that subduction zone thrust properties vary along strike due to variable hydration of the incoming plate. In particular, the extended seismic velocity models will aim to track the subducting JdF plate as it begins to dewater beneath the megathrust. Of high interest will be wide-angle reflections from the megathrust and the Moho of the diving plate: the spatial overlap between active source data and existing data from receiver function transects provides an opportunity to conduct an integrated analysis of the short-period and broadband seismic responses of a subduction thrust zone structure. In addition to this, several airgun lines were proposed to be acquired offshore Oregon, shooting into an array of land stations, to enhance and extend the 3D coverage of raypaths in a region of the forearc which coincides with a major transition in the recurrence interval of plate boundary earthquakes and in contemporary

patterns of strain accumulation. This part of the study aims to investigate complex buried structures that appear to affect the frictional behavior of the megathrust.

2. CRUISE PLAN AND SUMMARY OF ACCOMPLISHMENTS

Expedition OC1206A was part of a two-ship active source seismic experiment aiming to characterize crustal and shallow mantle velocities and distribution of faulting along two ridge-perpendicular transects spanning the full width of the JdF plate, and a trench-parallel line to characterize along-trench variations in the architecture and velocity structure of the down-going plate across distinct structural regimes of the Cascadia subduction zone (Figure 1). *RV Oceanus* OC1206A was devoted to the deployment and recovery of ocean bottom seismometers (OBSs). *RV Marcus G. Langseth* (cruise MGL1211, chief scientist Suzanne Carbotte) conducted long-streamer multichannel seismic (MCS) reflection profiling, and used its air-gun array as a seismic source for the OBSs deployed along wide-angle seismic profiles.

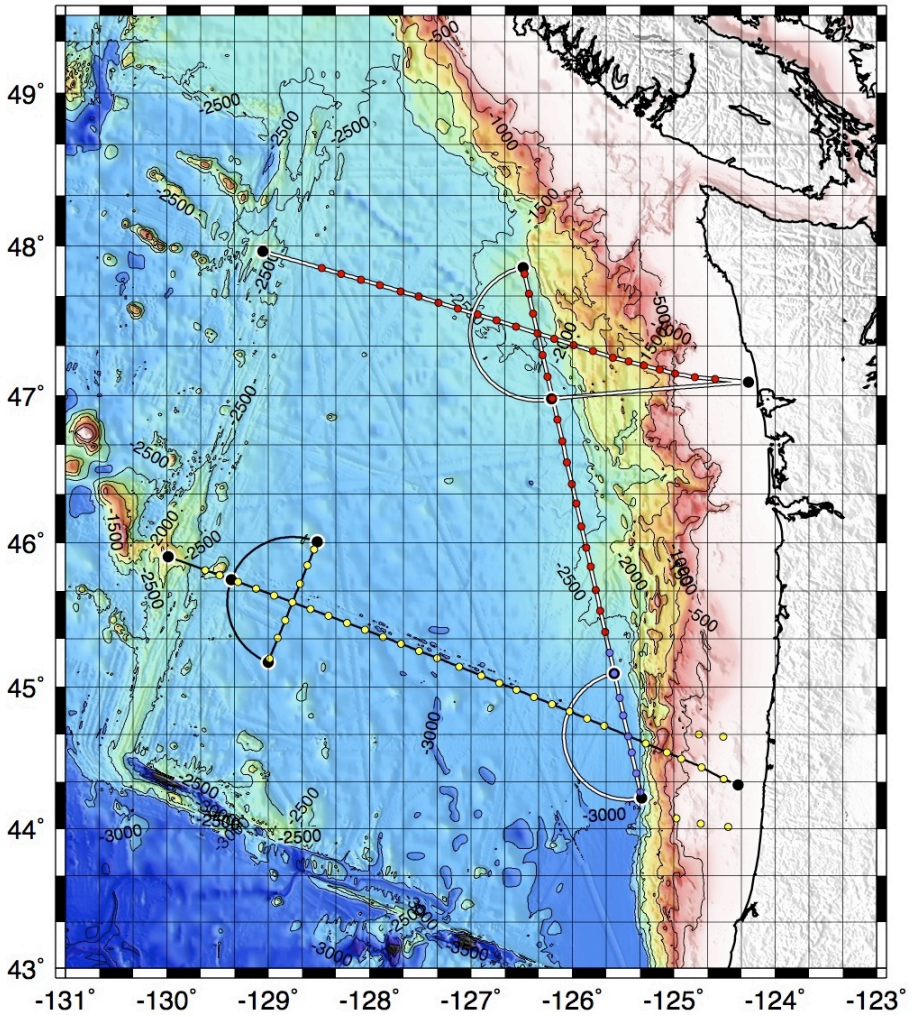

Figure 1. Bathymetry of the Juan de Fuca Plate. Colored circles are proposed OBS locations, and lines are MCS and OBS shooting profiles.

The southern plate transect was proposed to run from Axial Seamount to Hydrate Ridge, and the northern one from Endeavour ridge to 47°N offshore Grays Harbor. Southern and northern transects cross two distinctly different segments of the Cascadia forearc. They span the maximum age range of the JdF plate (8-9 Ma), close to the age of 10 Ma at which mature crustal and upper mantle seismic properties are reached. The southern transect spans the Axial and Hydrate Ridge Regional Scale Nodes (RSN) of the NSF Ocean Observatories Initiative, constraining crustal structure at and between these nodes, which will be sites of focused investigation for the next 30 years. The transect locations were also chosen to optimize leverage of existing seismic data at the ridge axis, for constraining zero age structure, and at the trench and onshore, for constraining velocities and structure of the down-going plate within the forearc. They are complemented by a short ridge-parallel reference line located ridgeward to the onset of faulting in the plate interior. The trench-parallel line was chosen to run a couple of km to ~15 km seaward from the trench, in order to sample similar-age crust on the incoming plate prior to subduction for >400 km. This line is designed to characterize along-trench variations in the architecture and velocity structure of the down-going plate, and hence, in variation its state of hydration. The cruise also included an add-on survey to deploy/recover 6 additional OBSs off shore WA and OR states as part of an onshore-offshore complementary project intended to extend our study onshore.

The US OBSIP provided the OBSs and the personnel for their operations. Sixteen (16) instruments were from the WHOI OBSIP group, and 31 instruments from the SIO OBSIP group. The planned OBS drop locations were defined as sites and numbered 1-47 for the first deployment (including 1-8 which stayed through both phases of OBS shooting), and 48-86 for the second deployment.

The cruise plan, in coordination with operations at *RV Langseth*, was to deploy 47 OBSs along the margin-parallel Line 3 and along Line 2 extending from Endeavour segment at the JdF Ridge to just north of Grays Harbor, WA. *RV Oceanus* would then wait for *RV Langseth* to perform air-gun operations along these lines, before proceeding to recover 39 of the 47 OBSs and redeploy them along Line 2, which extends from Axial Seamount to offshore OR, Line 4, and offshore Oregon. Again, *RV Oceanus* would then wait for *RV Langseth* to perform air-gun operations along these lines, before eventually proceed to recover all the deployed OBSs.

During the downtime waiting for *RV Langseth* operations we conducted hydrographic casts (conductivity-temperature-depth, CTD) at most of the OBS locations. The purpose of these CTD measurements was two-fold: (1) to obtain the detailed sound velocity structure of the water column to aid us in instrument relocation and post-cruise seismic modeling; and (2) to use the CTD measurements in conjunction with the *RV Langseth* MCS data for a seismic oceanography study of the water masses in Cascadia Basin. We also had time to conduct 8 CTD tow-yo's at Axial Seamount to explore the extent of hydrothermal activity within the 2011 eruption area, and one short acoustic hydrographic survey to detect methane bubble plumes across Hydrate Ridge.

In summary, Cruise OC1206A accomplished the following:

- Deployment of 85 OBSs;
- Recovery of 84 OBSs;

- 80 vertical CTD casts;
- 8 CTD tow-yo's;
- 1 hydrographic acoustic transect.

3. CRUISE NARRATIVE

All times is local Pacific DST. Local time is UTC + 7 hours. JD=Julian Day.

JD 157 Tuesday June 5, 2012 – The science party arrived to Newport OR at night.

JD 158 Wednesday June 6, 2012 – The science party moved to *RV Oceanus* during the morning. All OBS equipment was already there and onboard.

JD 159 Thursday June 7, 2012 – On the morning we still didn't have permits to operate in Canadian waters. A series of e-mails from State Department indicated that permits have been secured for RV Langseth and that it included RV Oceanus, but we have no written letter explicitly stating this. After consultation with the Captain, we decided to sail as planned and hope that permits would arrive within the next couple of days before entering Canadian waters. Safety drill and orientation meeting at 10:00. Lines out at 11:38. At 13:00 we had some trouble with the engine (a dirty screen in the turbo) that prevented us from making more than 9 knots. At 14:40 we stopped to clean the screen; on the way at 16:44. Arrived at Site 1 at 20:45. Start doing the SIO acoustic release tests in the rosette.

JD 160 Friday June 8, 2012 – Started OBS deployments at 01:10. We were able to do 21 deployments this day (Sites 1-21). Canadian clearance arrived at 08:00.

JD 161 Saturday June 9, 2012 – Continued with OBS deployments. Sixteen (16) deployments done: Sites 22-37. WHOI OBSIP found a damaged penetrator cable in one of their OBSs. They were able to fix it and passed all the standard tests. The penetrator cable brings power to the burn wires. If the fix fails, the instruments won't release anchors.

JD 162 Sunday June 10, 2012 – Continued with OBS deployments. We completed the 10 remaining sites (38-47) by 09:47. Proceeded to conduct CTD casts at the OBS sites. We started by Site 47 and worked our way east and then south. CTD casts 01-05 (Sites 47-43) done. Received not-so-good news from *Langseth*: (1) The IHA has not been issued because on Friday there were report of southern resident orcas leaving Pudget Sound and entering open waters. The IHA will have to be ammended for this and include additional mitigation procedures for orca sightings. (2) Two out of the 4 gunner have not arrived. The chief gunner due to a medical emergency (he won't be available for the *Langseth* cruise); and a scond gunner due to weather-related flight delays and cencelations. We discussed the possibility of having *Oceanus* pick up the gunner in Astoria and bring it to *Langseth* to avoid delays in *Langseth* departure form Astoria.

JD 163 Monday June 11, 2012 – Continued with CTD casts: 9 casts accomplished (Sites 42-37, 23, 36-35). Communications with *Langseth* proceeded during the morning. *Langseth* departure has been postponed until the new IHA is issued. Thus, they will wait for the gunner.

JD 164 Tuesday June 12, 2012 – Continued with CTD casts: 7 casts accomplished (Sites 34-30, 26-25). Casts at Sites 27-29 were not attemped because of the shallow water (all sites are in less than 300 m water depth).

JD 165 Wednesday June 13, 2012 – Continued with CTD casts: 9 casts accomplished (Sites 24-16). *Langseth* left Astoria at 18:50.

JD 166 Thursday June 14, 2012 – Continued with CTD casts: 9 casts accomplished (Sites 15-7). We are having troubles seeing *Langseths'* elog. We are monitoring their movements at the website www.sailwx.info. *Langseth*'s first shots was at 13:18.

JD 167 Friday June 15, 2012 – Continued with CTD casts: 6 casts accomplished (Sites 6-1). We are finished with CTDs. We have casts at all of the OBS positions for this first deployment (except Sites 27-29). *Langseth* is still shooting Line 3 so we cannot start recoveries yet. We decided to conduct acoustic surveays of the OBSs to relocate them. We proceed for surveys at Site 1 and make our way north, then west to east. Acoustic surveys at Sites 1-4 accomplished.

JD 168 Saturday June 16, 2012 – Continued with acoustic surveys: 16 surveys accomplished (Sites 5-20).

JD 169 Sunday June 17, 2012 – Continued with acoustic surveys: 10 surveys accomplished (Sites 21-25, 47-43). Survey at Site 26 (WHOI OBS D62) could not be done because the instrument was not responding. This was something expected. Tests in the lab indicated that the OBS could receive well the signals but was having trouble transmitting back. It is not expected that this will cause any problems at recovery; the instrument should respond to the release commands.

JD 170 Monday June 18, 2012 – Continued with acoustic surveys: 6 surveys accomplished (Sites 42-37). As we were finishing the survey at Site 37 we were informed that the Chief Engineer had a family medical emergency back at home at that we should go back to port to drop him off and get a replacement. We interrupted the acoustic surveys and headed towards Newport at 09:15

JD 171 Tuesday June 19, 2012 – Arrived at Newport at 09:15.

JD 172 Wednesday June 20, 2012 – Leave Newport at 09:45. On the way to Site 27. We got information from Langseth that they finished shooting for the OBSs along Line 2 at 07:00.

JD 173 Thursday June 21, 2012 – Started recoveries at Site 27 at 00:38 at Line 2, working east to west. Twelve (12) OBSs recovered this day (Sites 27-38). At Site 31 we had to wait because Langseth was reshooting between Sites 40-41.

JD 174 Friday June 22, 2012 – Nine (9) OBSs recovered this day (Sites 39-47). Transiting to Site 26 at the northern end of Line 3.

JD 175 Saturday June 23, 2012 – Recovery of Site 26 (WHOI OBS D62) started at 08:30. This unit has some problems with the transducer. We think it hears us but cannot respond. We send the release command and hope for the best. We tried for 4 h to release this instrument. Eight (8) burn commands were sent at intervals of 15 minutes. In neither of the expected time windows for surfacing we received radio signals or visual contact. After 8 tries, we decide to abandon the site. We think that most likely is an acoustic problem, with the instrument unable to hear any of our acoustic commands. Right after deployment we couldn't range to it as it sank even when it was just 100 m below the surface, and we never got confirmation that it received the disable

command. Six (6) OBSs recovered this day (Sites 25-20), working along Line 3 from north to south.

JD 176 Sunday June 24, 2012 – Eleven (11) OBSs recovered this day (Sites 19-9). Recovery of 38 OBSs from deployment# 1 completed. Transiting to start the second deployment at Site 48.

JD 177 Monday June 25, 2012 – Started the deployment of Site 48 at 02:39. We will deploy first the near-shore Oregon array, and then proceed along Line 1 from east to west. Nineteen (19) OBSs deployed: Sites 48-66.

JD 178 Tuesday June 26, 2012 – Continued with deployments. All the remaining 19 deployments completed by 22:16: Sites 67-85. Since we have one less instrument, only 85 Sites were eventually occupied. Started to do CTD casts along the short Line 4. CTD at Site 85 completed.

JD 179 Wednesday June 27, 2012 – Five (5) CTD casts completed along Line 4: Sites 84, 75, 83-81. Since the deployments have gone very well and fast, we have ~2 days of unused contingency time. We contacted Bill Chadwik (OSU) and Ed Baker (NOAA) about suggestions for us to do CTD work at Axial Seamount. They were very helpful and sent us bathymetry data of Axial, information on where past vertical casts and tow-yos have been conducted, and guidelines to do the tow-yos. We decided to focus on tow-yos along the eastern caldera wall and southern rift zone where the 2011 eruption occurred. During these days of CTD tow-yo work *Langseth* was in the area shooting a couple of MCS lines, so we had several interruptions to avoid being on the way of *Langseth*. First CTD tow-to 01 started at 22:16.

JD 180 Thursday June 28, 2012 – Continue with CTD tow-yos. Lines 05, 07, and 02 completed. Tow-yo 03 started at 15:42, although it had to be interrupted because of conflict with *Langseth*.

JD 181 Friday June 29, 2012 – Tow-yos 03, 04, 08, and 08b completed. We finished the Axial CTD tow-yos at 14:00 and proceeded to start the vertical CTD casts along Line 1 working form west to east. Four (4) CTDs completed: Sites 80-77.

JD 182 Saturday June 30, 2012 – Eight (8) CTDs completed: Sites 76-69.

JD 183 Sunday July 1, 2012 – Nine (9) CTDs completed: Sites 68-62, CC1, and CC2. Mladen Medimovic (Dalhousie Univ.) asked us if we could do a CTD cast at the Cascadia Channel. Suzanne Carbotte at the Langseth sent us a multibeam bathymetry map of their crossing of the Cascadia Channel. At this latitude it is actually formed by two branches, so we decided to do CTDs at both channel branches (sites CC1 and CC2), which are located in between our OBS sites 67 and 68.

JD 184 Monday July 2, 2012 – Six (6) CTDs completed: Sites 61-58, 04, and 57. Given our good timing, we did a short lines across Souhtern Hydrate Ridge with the 12.0 kHz echosunder tuned for imaging methane bubbles in the water column, as it has been done in this area previously by Anne Trehu and colleagues. The survey worked well, with clear bubble plume imaged on the summit of SHR.

JD 185 Tuesday July 3, 2012 – The remaining 2 CTDs (Sites 56, 55) were completed 02:55. No CTDs were attemped at the other Sites (48-54) because of their shallow water. We returned to Newport for a exchange of OBSIP ISO techs. This port call was planned for July 4th, but we made it a 2-day port call. Arrived at the OSU dock at 09:30.

JD 187 Thrusday July 5, 2012 – We left Newport at 10:30, and started transiting to Site 85 to start the OBS recoveries.

JD 188 Friday July 6, 2012 – Arrived at the first site at 07:00. We recovered 5 OBS during this day (Sites 85-81). For the WHOI recoveries we did acoustic surveys prior to recovery for instrument relocation.

JD 189 Saturday July 7, 2012 – Twelve (12) OBS recoveries completed (Sites 80-69).

JD 190 Sunday July 8, 2012 – Ten (10) OBS recoveries completed (Sites 68-59).

JD 191 Monday July 9, 2012 – Eleven (11) OBS recoveries completed (Sites 58-48).

JD 192 Tuesday July 10, 2012 – The remaining 8 OBS recoveries completed (Sites 1-8).

JD 193 Wednesday July 11, 2012 –We decided to do a last attempt at recovery OBS D62 at Site 26. We tried unsuccessfully for several hours sending release commands every 20 minutes, and moving the ship around the Site (~500 m distance) to try different azimuths. The OBS never responded to any commands. We abandon the site with the hope that the OBSIP group from Lamont, who is in thre area aboard RV Thompson with ROV Jason recovering their CI TRMs, will use the ROV to try find the OBS and retrieve it. Correpondance with RV Thompson chief scientist Maya Tolstoy said that they will be glad to help if they have time at the end of their cruise (July 10-24).

JD 194 Thursday July 12, 2012 – Transit back to Newport.

JD 195 Friday July 13, 2012 – Arrived to OSU dock in Newport at 10:30.

4. PRELIMINARY CRUISE ASSESSMENT

4.1. OBS Deployments

Eighty five (85) OBS deployments were accomplished during this cruise. (Appendix 5). Of these, 28 consisted of deployment of short-period D2 instruments from the Woods Hole Oceanographic Institution, while the remaining 57 where short-period instruments from Scripps Institute of Oceanography. Deployments from *RV Oceanus* were done from the starboard side. Teams consisted of two people at tag lines, one person at the release line, and an AB at the starboard crane. Deployments were done very efficiently, with only a few minutes between arrival to station and deployment. Instrument preparation for deployment was done during the transits form station to station, which with a nominal distance of 8 naut. miles between sites took about 45 minutes.

The deployment positions were very close to those provided to the bridge. Only 9 OBSs were deployed more than 100 m form the planned site, with the vast majority being deployed within just 20-40 m from the planned site (Figure 2).

4.2. OBS Recoveries

Of the 85 OBS deployments we successfully recovered 84 (99% recovery rate) (WHOI OBS D62 was recovered after our cruise during *RV Thompson* Cruise TN283.) For recoveries the instruments were enabled at a distance of ~1km from the site as the ship approached the drop location, and the release command sent. Expected time on the surface was calculated based on

the depth at the drop location, wire burning time of 8 minutes, and ascent rates of 44 and 70 m/minute for the SIO and WHOI instruments, respectively. A radio direction finder (RDF, Table 1) on the bridge was the primary method of confirming instrument on the surface, and visual contact was established soon after in most of the cases.

Table 1 WHOI D2 Radio Frequencies

	MHz		MHz
D03	160.785	D39	154.585
D06	151.505	D40	159.480
D09	151.505	D44	151.625
D15	160.725	D49	151.505
D16	151.625	D50	151.625
D21	154.585	D51	151.505
D34	159.480	D55	151.505
D35	160.725	D62	158.400
	All SIO OBSs	160.725 MHz	

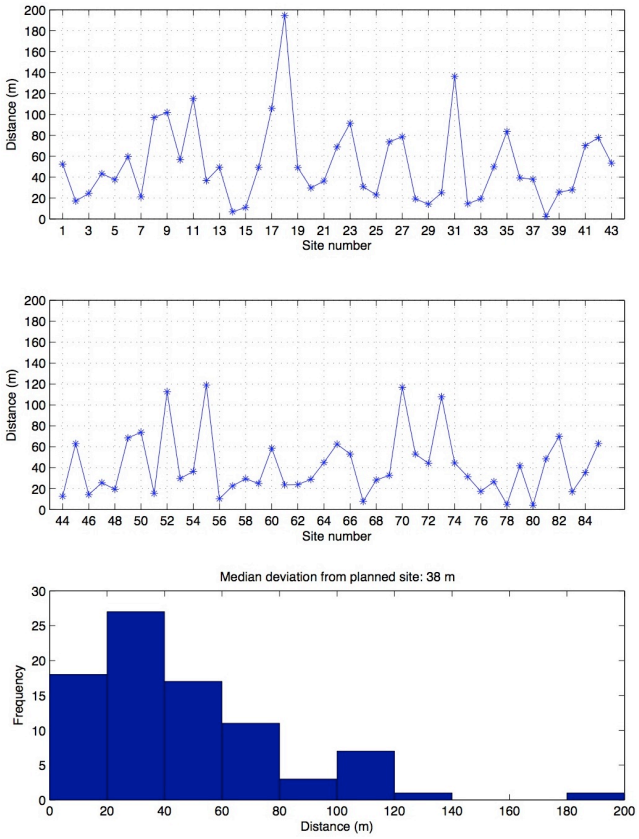

Figure 2. Distance between the OBS drop locations and the planned site locations.

4.3. OBS Acoustic Surveys and Instrument Relocation

At 48 of the 85 Sites we conducted acoustic surveys to relocate the instruments. This was completed for all the sites of deployment 1 except Sites 27-36 (surveys completed at sites 1-26, 37-47), and for the sites of deployment 2 corresponding to WHOI instruments. We did not attempt acoustic surveys at SIO sites where OBSs were redeploy (deployment 2) to avoid risking draining the batteries of the acoustic package, which also provide power to the release system.

For the SIO instruments, the instrument was enabled when the ship was at a distance of ~1.5 km. At that point, the ship started to circle around the instrument with a radius of 1.5 km (~1/2 the water depth) at a speed of 7 knots. Faster speeds up to 9 knots were tested, and the acoustics worked well without being interfered by the ship's engine. Acoustic interrogation was done as the ship circled until 360 degrees were completed (Figure 3). The acoustic pings were then processed by the SIO techs., who produced a final file for each site named site*_Corrected.txt.

Contents of these files are such as File site12_Corrected.txt:

```
 1:: Boat Location:  Lat: 45 49.2585 (45.8210),  Lon: -125 48.8441 (-125.8141), range: 2810.6960Residual: 79.438003
 2:: Boat Location:  Lat: 45 49.3852 (45.8231),  Lon: -125 48.6302 (-125.8105), range: 2729.0760Residual: 49.352095
 3:: Boat Location:  Lat: 45 49.6070 (45.8268),  Lon: -125 48.3228 (-125.8054), range: 2678.6200Residual: 7.904677
 4:: Boat Location:  Lat: 45 49.8942 (45.8316),  Lon: -125 48.1813 (-125.8030), range: 2623.7120Residual: -40.285907
 5:: Boat Location:  Lat: 45 50.1846 (45.8364),  Lon: -125 48.2232 (-125.8037), range: 2577.7080Residual: -81.633406
 6:: Boat Location:  Lat: 45 50.4348 (45.8406),  Lon: -125 48.4400 (-125.8073), range: 2536.1560Residual: -116.001289
 7:: Boat Location:  Lat: 45 50.6184 (45.8436),  Lon: -125 48.7571 (-125.8126), range: 2533.1880Residual: -136.558207
 8:: Boat Location:  Lat: 45 50.6874 (45.8448),  Lon: -125 49.1617 (-125.8194), range: 2546.5440Residual: -132.766768
 9:: Boat Location:  Lat: 45 50.6380 (45.8440),  Lon: -125 49.5558 (-125.8259), range: 2570.2880Residual: -115.788188
10:: Boat Location:  Lat: 45 50.4826 (45.8414),  Lon: -125 49.9081 (-125.8318), range: 2619.2600Residual: -78.407788
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 11:: Boat Location:  Lat: 45 50.2539 (45.8376),  Lon: -125 50.1444 (-125.8357), range: 2680.1040Residual: -33.027548
 12:: Boat Location:  Lat: 45 49.9820 (45.8330),  Lon: -125 50.2062 (-125.8368), range: 2717.2040Residual: 11.161172
 13:: Boat Location:  Lat: 45 49.7019 (45.8284),  Lon: -125 50.1366 (-125.8356), range: 2761.7240Residual: 48.362814
 14:: Boat Location:  Lat: 45 49.6393 (45.8273),  Lon: -125 50.0920 (-125.8349), range: 2767.6600Residual: 55.649237
Sum (Residual^2): 93032.809953
Sqrt(Sum(Residuals^2)/N): 81.518101

============================================================

Running calculation on 100x100 grid (with 100.0000 meter spacing) Lat: 45 49.9850 (45.8331),  Lon: -125 49.1562 (-125.8193),
depth: 2341.0000
New drop point location:
 Lat: 45 50.0928 (45.8349),  Lon: -125 49.0788 (-125.8180), depth: 2341.0000
sum(Residual^2) = 19904.2704

sqrt(sum(Residual^2)/14) = 37.7059


Running calculation on 100x100 grid (with 10.0000 meter spacing) Lat: 45 50.0928 (45.8349),  Lon: -125 49.0788 (-125.8180),
depth: 2341.0000
New drop point location:
 Lat: 45 50.1036 (45.8351),  Lon: -125 49.1098 (-125.8185), depth: 2341.0000
sum(Residual^2) = 15376.7188

sqrt(sum(Residual^2)/14) = 33.1412


Running calculation on 20x20 grid (with 1.0000 meter spacing) Lat: 45 50.1036 (45.8351),  Lon: -125 49.1098 (-125.8185), depth:
2341.0000
New drop point location:
 Lat: 45 50.1014 (45.8350),  Lon: -125 49.1129 (-125.8185), depth: 2341.0000
sum(Residual^2) = 15321.3961

sqrt(sum(Residual^2)/14) = 33.0815


Running calculation on 20x20 grid (with 0.1000 meter spacing) Lat: 45 50.1014 (45.8350),  Lon: -125 49.1129 (-125.8185), depth:
2341.0000
New drop point location:
 Lat: 45 50.1015 (45.8350),  Lon: -125 49.1130 (-125.8185), depth: 2341.0000
sum(Residual^2) = 15321.3619

sqrt(sum(Residual^2)/14) = 33.0815


Individual residuals (based at final drop point):
  1)  Lat: 45 49.2585 (45.8210),  Lon: -125 48.8441 (-125.8141), range: 2810.6960Individual residual: -26.033071
  2)  Lat: 45 49.3852 (45.8231),  Lon: -125 48.6302 (-125.8105), range: 2729.0760Individual residual: -34.195803
  3)  Lat: 45 49.6070 (45.8268),  Lon: -125 48.3228 (-125.8054), range: 2678.6200Individual residual: -35.268269
  4)  Lat: 45 49.8942 (45.8316),  Lon: -125 48.1813 (-125.8030), range: 2623.7120Individual residual: -36.853073
  5)  Lat: 45 50.1846 (45.8364),  Lon: -125 48.2232 (-125.8037), range: 2577.7080Individual residual: -35.146858
  6)  Lat: 45 50.4348 (45.8406),  Lon: -125 48.4400 (-125.8073), range: 2536.1560Individual residual: -36.693908
  7)  Lat: 45 50.6184 (45.8436),  Lon: -125 48.7571 (-125.8126), range: 2533.1880Individual residual: -38.147860
  8)  Lat: 45 50.6874 (45.8448),  Lon: -125 49.1617 (-125.8194), range: 2546.5440Individual residual: -35.330259
  9)  Lat: 45 50.6380 (45.8440),  Lon: -125 49.5558 (-125.8259), range: 2570.2880Individual residual: -37.190293
 10)  Lat: 45 50.4826 (45.8414),  Lon: -125 49.9081 (-125.8318), range: 2619.2600Individual residual: -33.451023
 11)  Lat: 45 50.2539 (45.8376),  Lon: -125 50.1444 (-125.8357), range: 2680.1040Individual residual: -28.786179
 12)  Lat: 45 49.9820 (45.8330),  Lon: -125 50.2062 (-125.8368), range: 2717.2040Individual residual: -26.266677
 13)  Lat: 45 49.7019 (45.8284),  Lon: -125 50.1366 (-125.8356), range: 2761.7240Individual residual: -27.691310
 14)  Lat: 45 49.6393 (45.8273),  Lon: -125 50.0920 (-125.8349), range: 2767.6600Individual residual: -28.276803

Initial Drop:     Lat: 45 49.9850 (45.8331),  Lon: -125 49.1562 (-125.8193), depth: 2341.0000
Final Drop:     Lat: 45 50.1015 (45.8350),  Lon: -125 49.1130 (-125.8185), depth: 2341.0000
                Number of points (N):14.000000
                sum(Residual^2) = 15321.3619

                sqrt(sum(Residual^2/N)  : 33.081460

Offset Distance: Lat=216.1000 meters, Lon=55.9000 meters, (r=223.2129 meters, angle=75.50)

============================================================
```

The ranges in these files correspond to slant ranges from the ship to the instrument, in meters. Although the initial output from the transducer were one-way milliseconds, these final files have the one-way times converted to distances in meters using the sound velocity supplied by the user. The procedure seems to use a nested grid search. It does not update the depth of the instrument. Thus we performed an alternative relocation using a simple `matlab`-based least-squares inversion in which both the position and depth of the instruments were inverted for. The sound velocity used for relocations is the average mean of the sound profile obtained with the CTD casts. Where no casts were done, we used information from the nearest available CTD cast. The inversion relocation worked as well as the SIO grid search, with minimal differences (Figure 3). Since the inversion produced also a best estimate for the OBS depth, we will use this least-

squares method to relocate all of the instruments (WHOI and SIO), using either acoustic pings or direct water arrival picks from the air-gun shots.

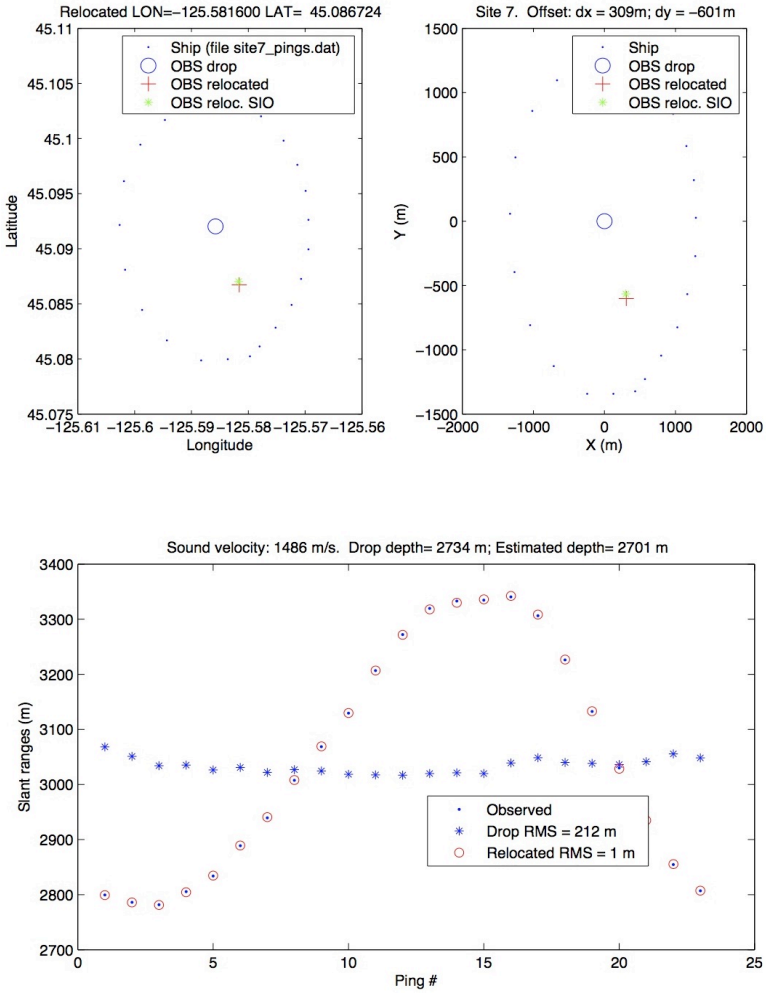

Figure 3. Diagram illustrating the relocation of SIO instruments based on an acoustic survey.

For the WHOI instruments the survey procedure was slightly different. The ship arrived to the site location above the OBS, where it was enabled. Then the ship moved to a distance of ~1.5 km from the site and started a 270° circle centered in the instrument at 5 knots while it was interrogated. When the 270° were completed, the ship returned to the site so the OBS could be disabled (during deployment 1), or released and recovered (during deployment 2). This kind of survey was referred to as a "Pac-Man" survey (Figure 4).

The files provided by the WHOI techs. are named D??_S*-edit.txt, where ?? is the OBS ID and * is the site number. Data in these files are one-way milliseconds; the contents of the files are such as:

File D03_S43-edit.txt:

```
UTC Date and Time: 2012-06-18 06:33:14
Cruise: OC1206A
Site: S43
Instrument: D03
Drop Point Latitude: 47 41.887 n
Drop Point Longitude: 127 41.643 w
Drop Point Depth: 2680
TAT: 12.5
Comment:
================================================

 1783 msec.  Lat: 47 41.8709 N  Lon: 127 41.5582 W  Time (UTC): 06:34:47  UTC Date/Time (system clock): 2012-06-18 06:34:48
 1803 msec.  Lat: 47 41.8650 N  Lon: 127 41.1936 W  Time (UTC): 06:38:17  UTC Date/Time (system clock): 2012-06-18 06:38:18
 1825 msec.  Lat: 47 41.8662 N  Lon: 127 41.0507 W  Time (UTC): 06:39:17  UTC Date/Time (system clock): 2012-06-18 06:39:18
 1856 msec.  Lat: 47 41.8651 N  Lon: 127 40.9042 W  Time (UTC): 06:40:17  UTC Date/Time (system clock): 2012-06-18 06:40:18
 1910 msec.  Lat: 47 41.9088 N  Lon: 127 40.7403 W  Time (UTC): 06:42:17  UTC Date/Time (system clock): 2012-06-18 06:42:18
 1905 msec.  Lat: 47 41.9542 N  Lon: 127 40.7470 W  Time (UTC): 06:43:17  UTC Date/Time (system clock): 2012-06-18 06:43:18
 1825 msec.  Lat: 47 42.1291 N  Lon: 127 40.8586 W  Time (UTC): 06:45:47  UTC Date/Time (system clock): 2012-06-18 06:45:48
 1878 msec.  Lat: 47 42.3962 N  Lon: 127 41.3644 W  Time (UTC): 06:50:47  UTC Date/Time (system clock): 2012-06-18 06:50:48
 1882 msec.  Lat: 47 42.3951 N  Lon: 127 41.8089 W  Time (UTC): 06:53:41  UTC Date/Time (system clock): 2012-06-18 06:53:42
 1892 msec.  Lat: 47 42.3305 N  Lon: 127 42.0320 W  Time (UTC): 06:55:11  UTC Date/Time (system clock): 2012-06-18 06:55:12
 1894 msec.  Lat: 47 42.3002 N  Lon: 127 42.1068 W  Time (UTC): 06:55:41  UTC Date/Time (system clock): 2012-06-18 06:55:42
 1902 msec.  Lat: 47 42.1756 N  Lon: 127 42.2777 W  Time (UTC): 06:57:11  UTC Date/Time (system clock): 2012-06-18 06:57:12
 1920 msec.  Lat: 47 41.9572 N  Lon: 127 42.4094 W  Time (UTC): 06:59:11  UTC Date/Time (system clock): 2012-06-18 06:59:12
 1923 msec.  Lat: 47 41.9042 N  Lon: 127 42.4158 W  Time (UTC): 06:59:41  UTC Date/Time (system clock): 2012-06-18 06:59:42
 1924 msec.  Lat: 47 41.7510 N  Lon: 127 42.3822 W  Time (UTC): 07:01:11  UTC Date/Time (system clock): 2012-06-18 07:01:12
 1936 msec.  Lat: 47 41.3679 N  Lon: 127 41.8671 W  Time (UTC): 07:06:11  UTC Date/Time (system clock): 2012-06-18 07:06:12
 1920 msec.  Lat: 47 41.3598 N  Lon: 127 41.7928 W  Time (UTC): 07:06:41  UTC Date/Time (system clock): 2012-06-18 07:06:42
 1914 msec.  Lat: 47 41.3881 N  Lon: 127 41.6651 W  Time (UTC): 07:07:41  UTC Date/Time (system clock): 2012-06-18 07:07:42
 1901 msec.  Lat: 47 41.4164 N  Lon: 127 41.6200 W  Time (UTC): 07:08:11  UTC Date/Time (system clock): 2012-06-18 07:08:12
 1701 msec.  Lat: 47 41.5959 N  Lon: 127 41.5784 W  Time (UTC): 07:10:41  UTC Date/Time (system clock): 2012-06-18 07:10:41
 1663 msec.  Lat: 47 41.6343 N  Lon: 127 41.5768 W  Time (UTC): 07:11:11  UTC Date/Time (system clock): 2012-06-18 07:11:11
```

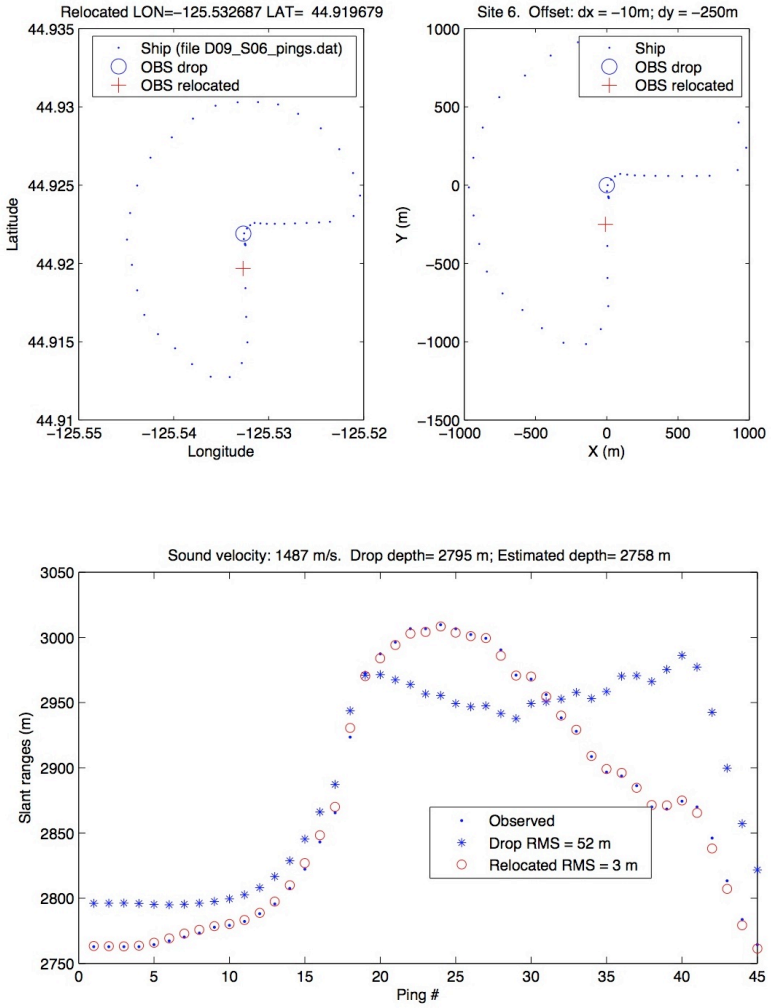

Figure 4. Diagram illustrating the relocation of WHOI instruments based on an acoustic survey.

4.4. Shipboard OBS Data Processing and Data Quality

4.4.1. Shipboard data processing and visualization

Shipboard processing and data quality control were done soon after instrument recovery. The procedures varied to some extent between SIO and WHOI data.

SIO Data. Data were downloaded from the SIO memory cards and processed into miniseed format files by the SIO engineers. SEGY files were not produced until near the end of the cruise. To access the miniseed files we used a free `matlab` routine (`rdmseed.m`, by F. Beauducel, IPG Paris). Accessing the miniseed file in `matlab` allowed us to build preliminary record sections for each channel and evaluate the data.

WHOI Data. Data were processed by the WHOI techs. and provided to the scientific party in SEGY format. Only data from the first deployment was processed onboard. Data from the second deployment was processed onshore after the cruise. The SEGY files were visualized and evaluated using `matlab` routines (e.g., `upicker`, by W. Wilcock) and `Seismic Unix`.

4.4.2. Leap second

A positive leap second was added to UTC time at 23:59:59 GMT on June 30, 2012, to synchronize atomic clocks with the speed of the rotation of the Earth (e.g., http://www.timeanddate.com/time/leapseconds.html). The OBS instrumentation and clocks DID NOT include the leap second. Thus, the OBS data time series were initially off by 1 second with respect to the shot times provided by *RV Langseth* (which included the added leap second). To correct for this mismatch when constructing the SEGY files, the SIO OBSIP group followed the approach of manually adding 1 second to the shot times provided by *RV Langseth*, for all shots occurring after 23:59:59 GMT on June 20 (shot numbers 53,143 and above, Appendix 7). While correct, this approach results in SEGY trace headers with incorrect shot time by one extra second for those shots. The WHOI OBSIP group followed a different approach. They corrected for the leap second onshore by adjusting the time in the minissed data files prior to cutting the SEGY files. Thus the WHOI SEGY files, cut from the leap-second-adjusted miniseed files, used the shot times as provided by *RV Langseth* and have the correct shot time in the trace headers.

4.4.3. Clock drift correction for OBS D62 (Site 62).

OBS D62 was recovered after our cruise during *RV Thompon* Cruise TN283. Thus the clock drift could not be measured immediately after recovery. This is the information regarding the clock correction that P. Lemmond provided after processing the data for this instrument:

From the records of past performance of the internal clock in D62, we estimated:
Drift rate 20 parts per billion, or 1.73 ms/day.
From notes recorded during pre-deployment checkout.
Jump of 1101 uSec at 2012/06/09 09:57:00
Based on past drift rate, we estimate the following offset when the instrument was returned to WHOI and data recovered:
Jump of 77833 uSec at 2012/07/23 19:40:01

4.4.4. Data quality

A preliminary table with the quality of the data for each deployment and channel is presented in Appendix 6. Overall data quality was very good. Of the 84 recovered instruments, only two returned no data due possibly to bad flash cards (see SIO report in Appendix A3). Most of the

instruments had good quality data in all channels, although some bad hydrophones or geophone channels were found. For those instruments recovered after deployment 1 with possibly bad sensors, the sensors were swapped with spare ones before redeployment.

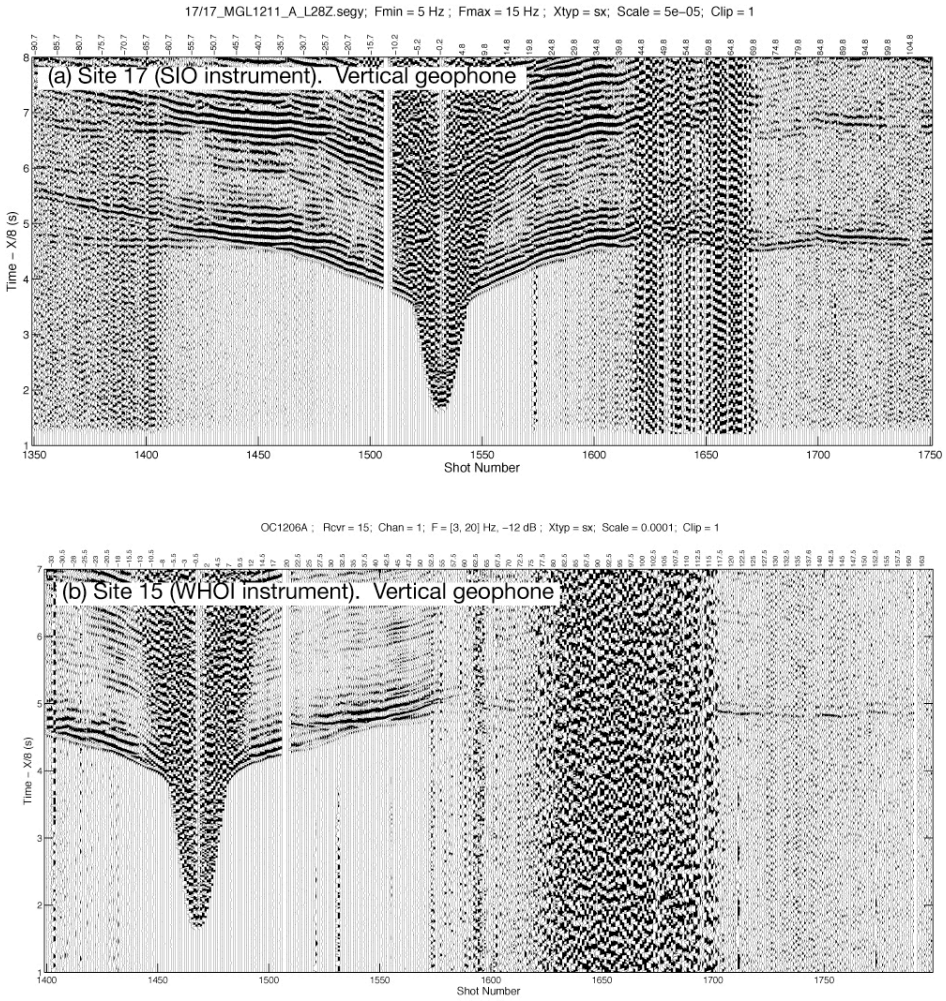

Figure 5. Example of record sections showing bursts of monochromatic noise (a) SIO instrument deployed at Site 17. (b) WHOI instrument deployed at Site 15.

One aspect that was observed while doing the onboard data quality control is the presence of monochromatic noise in some of the instruments for some periods of time. Figure 5a illustrates this: a record section from the vertical channel of the instrument deployed at Site 17 shows this monochromatic noise for shots ~1620-1670. A spectral analysis of the time series containing this noise is shown in Figure 6. The noise recorded at Site 17 shown in Figure 5a is centered at 6.0-6.5 Hz (although the frequency may vary from site to site and/or with time). This kind of noise seems to be more prevalent on the geophone channels. Figure 7 shows the spectra for all of the four channels of Site 17: the noise signal is present in the 3 components of the geophone (with the largest amplitude observed in one of the horizontal components, channel 1), but is not observed in the hydrophone channel (channel 3). However we found instances in which this monochromatic noise was also present in the hydrophone channel (Figure 8). Our qualitative

assessment of the data quality suggests that this noise is more prevalent in the SIO instruments than in the WHOI ones, but not exclusively in the former ones (Figure 5b shows an example of a noisy record section from a WHOI instrument). At this stage we do not know if this perception is real or an artifact due to (1) having more SIO than WHOI instruments, and/or bias produced by the geographical distribution of each kind of instrument: we tended we deploy SIO instruments near the shelf in shallower water because of their slower rising time, while the WHOI instrument were generally deployed in deeper waters. We cannot say if this monochromatic noise has an instrumental (mechanical or electronic) origin, or a natural origin.

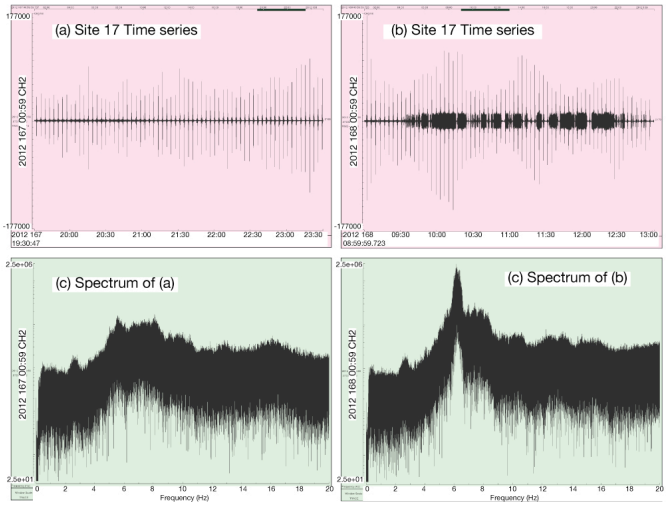

Figure 6. Time series records for OBS at Site 17 (channel 2=vertical geophone) for a time period (a) when no monochromatic noise is observed; and (b) with signal contaminated by noise. Spikes are airgun arrivals. (c-d) Spectra of the time series in (a-b). Note the high-amplitude noise peak at ~6.0-6.5 Hz.

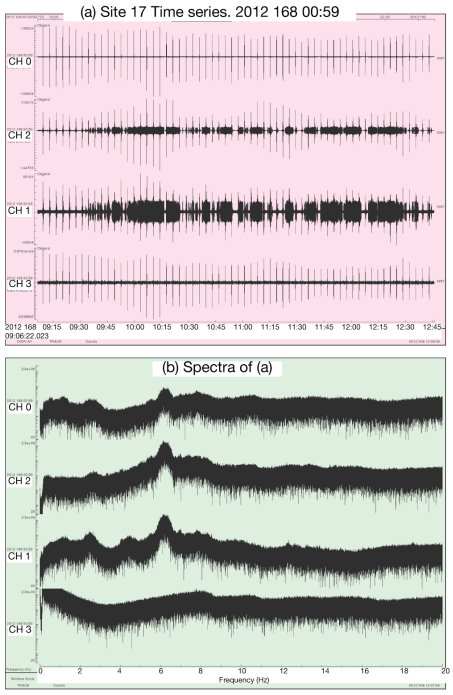

Figure 7. (a) Time series records for OBS at Site 17 (channels 0, 1=horizontal, 2=vertical, 3=hydrophone) for a time period with signal contaminated by noise. Spikes are airgun arrivals. (b) Spectra of the time series in (a). Note the high-amplitude noise peak at ~6.0-6.5 Hz in the geophone channels that is absent in the hydrophone channel.

However we tentatively favor a natural origin based on that it appears in bursts, that is more prevalent in geophones but occasionally present in hydrophone channels, and that is present in both SIO and WHOI instruments. A more in-depth analysis of these signals in the future will be required to determine their origin.

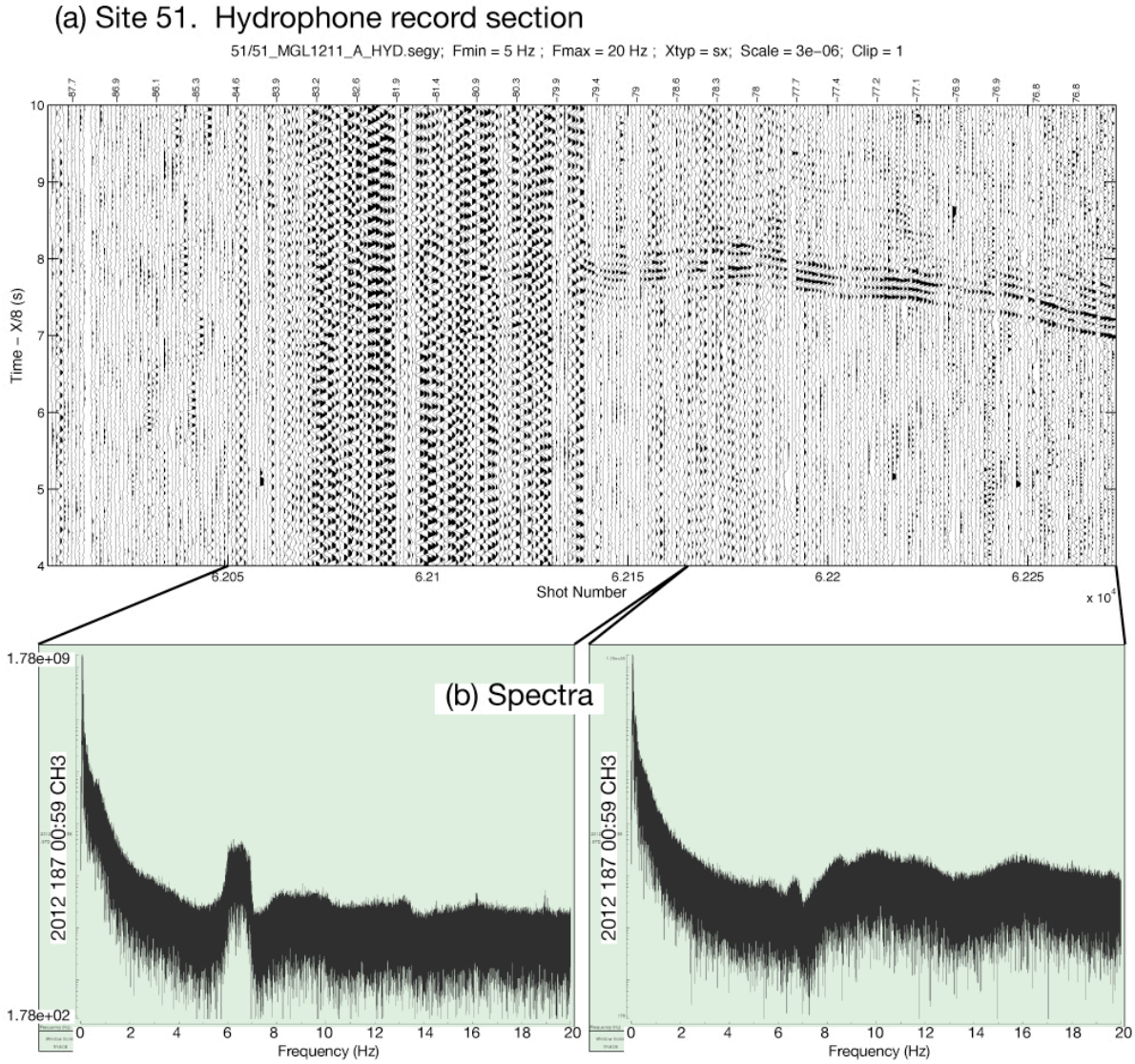

Figure 8. (a) Record section for OBS at Site 51 (hydrophone channel) showing a burst of monochromatic noise for shots ~62,070-62,130. (b) Spectra of two time series in (a) corresponding to a noisy record (shots 62,050-62,169, left) and a noise-free time period (shots 62,050-62,320). Note the high-amplitude noise peak at ~6.0-6.5 Hz in the spectrum on the left panel. This example illustrates that the monochromatic noise can also be present in the hydrophone channels.

4.4.5. Preliminary observations

The dataset is very rich and will require close inspection to unravel of its information. During our quality control procedures we observed a few features that caught our attention. One is the difference in *Pg-PmP-Pn* triplication and *Pn* strength observed between instruments recording along a flow line (i.e., energy propagating along the spreading direction) and those OBSs recording along the Cascadia margin (Figure 9). Along the spreading direction, the triplication is very well marked, but *Pn* tends to become weak soon after the triplication, disappearing at offsets of 60-80 km. In contrast, some the along-margin instruments show very strong *Pn* clearly observed up to ranges of 100-160 km, and with less marked triplication.

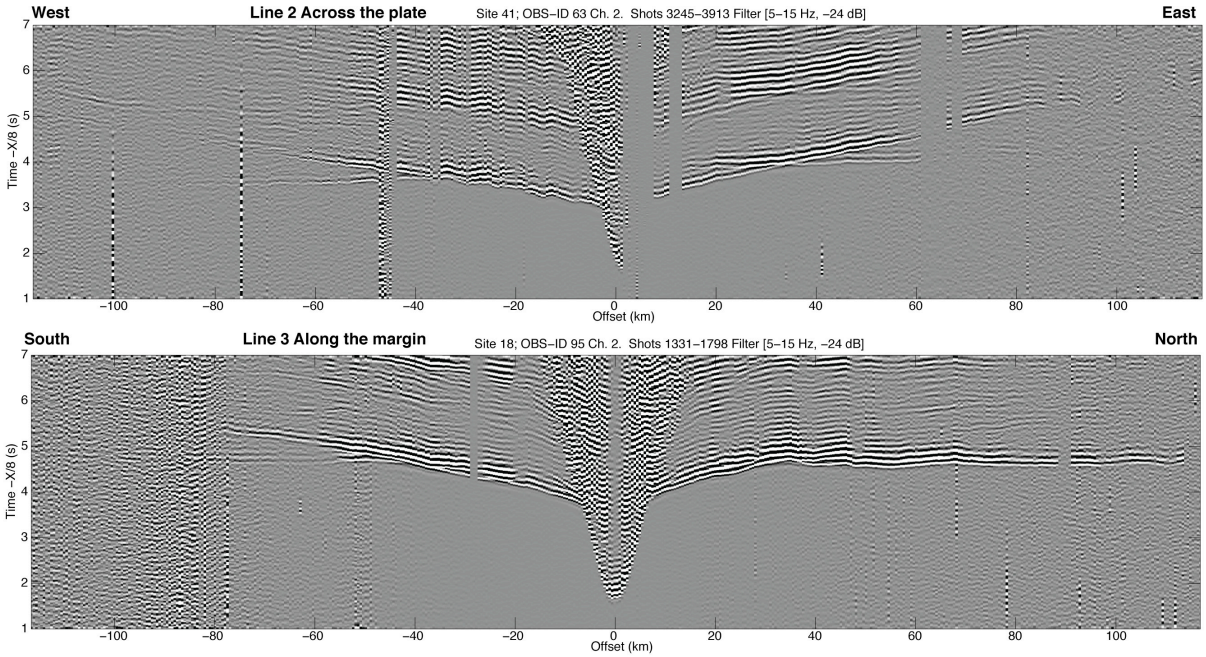

Figure 9. Example of record sections showing *Pg-PmP-Pn* triplications of difference characteristics.

In some the along-margin recordings we also observe sub-crustal mantle reflections that tend to be more prominent in the southern area of the experiment (Figure 10).

In addition to record the widely spaced *RV Langseth* shots, many of the OBSs also recorded closely spaced shots for the MCS component of the Langseth cruise. These recordings have the advantage of providing very densely spaced traces that allows recognition of many seismic phases in the near offsets (<20 km) (Figure 11). At larger offsets the background noise introduced by the fast-repeating shots and previous-shot noise results in recordings with a very low signal-to-noise ratio (Figure 12). However in some instances it is possible to observe in the small-shot-interval recordings wide-angle arrivals up to ~50 km offset (Figure 13).

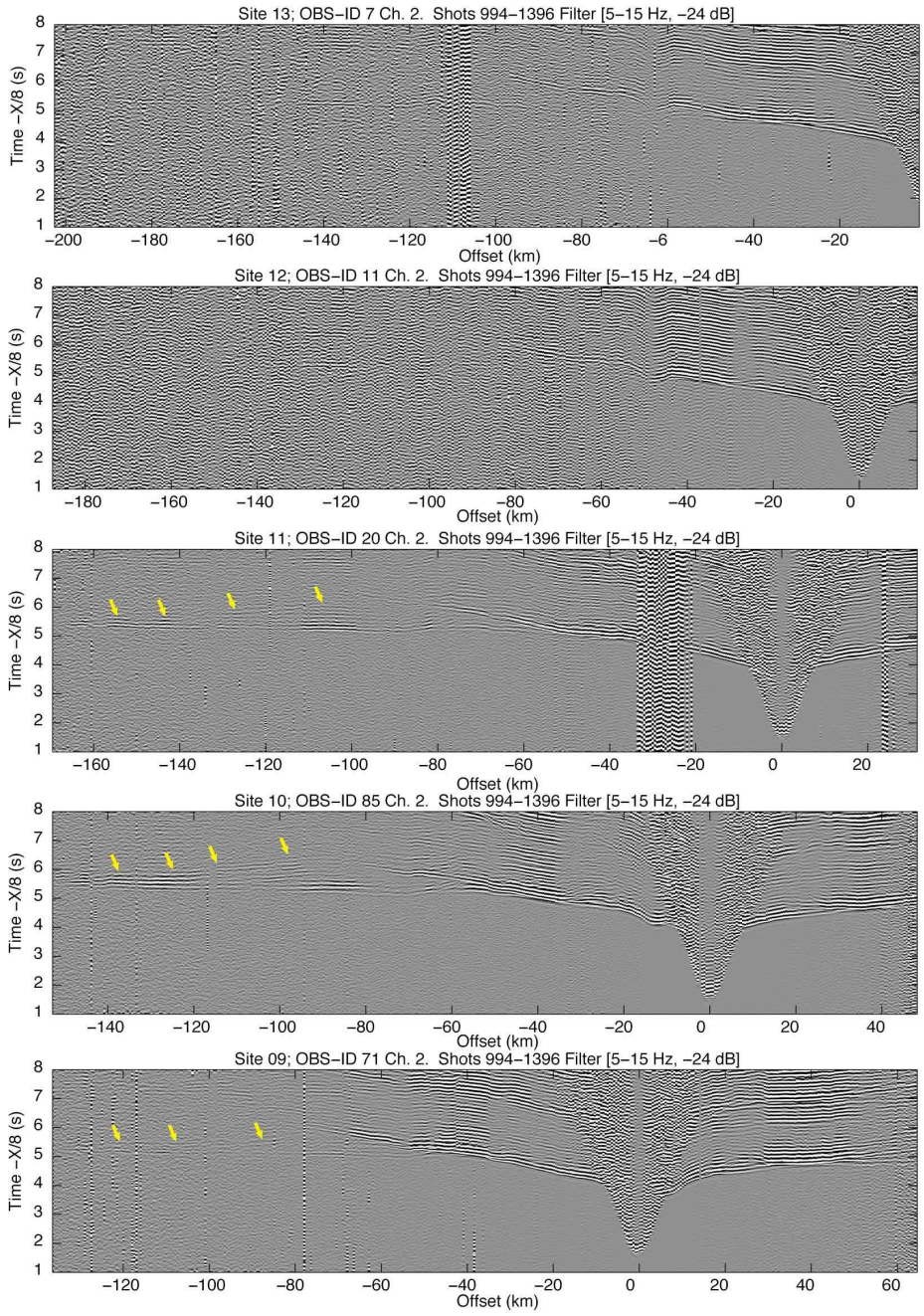

Figure 10. Record sections along the margin-parallel Line 3 showing sub-Moho mantle reflections (yellow arrows).

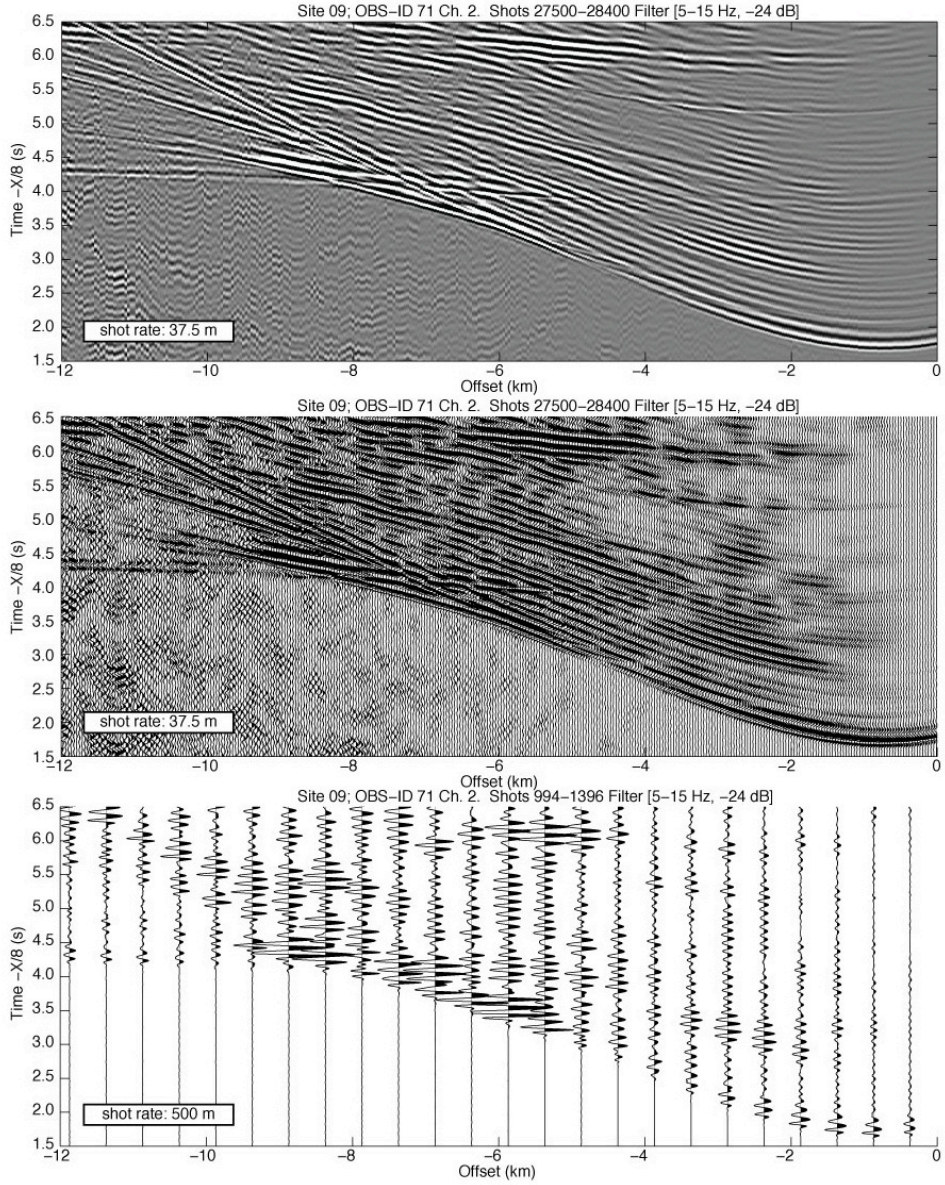

Figure 11. Example of coincident OBS record sections for MCS (37.5 m shot interval) and wide-angle (500 m shot interval) shots.

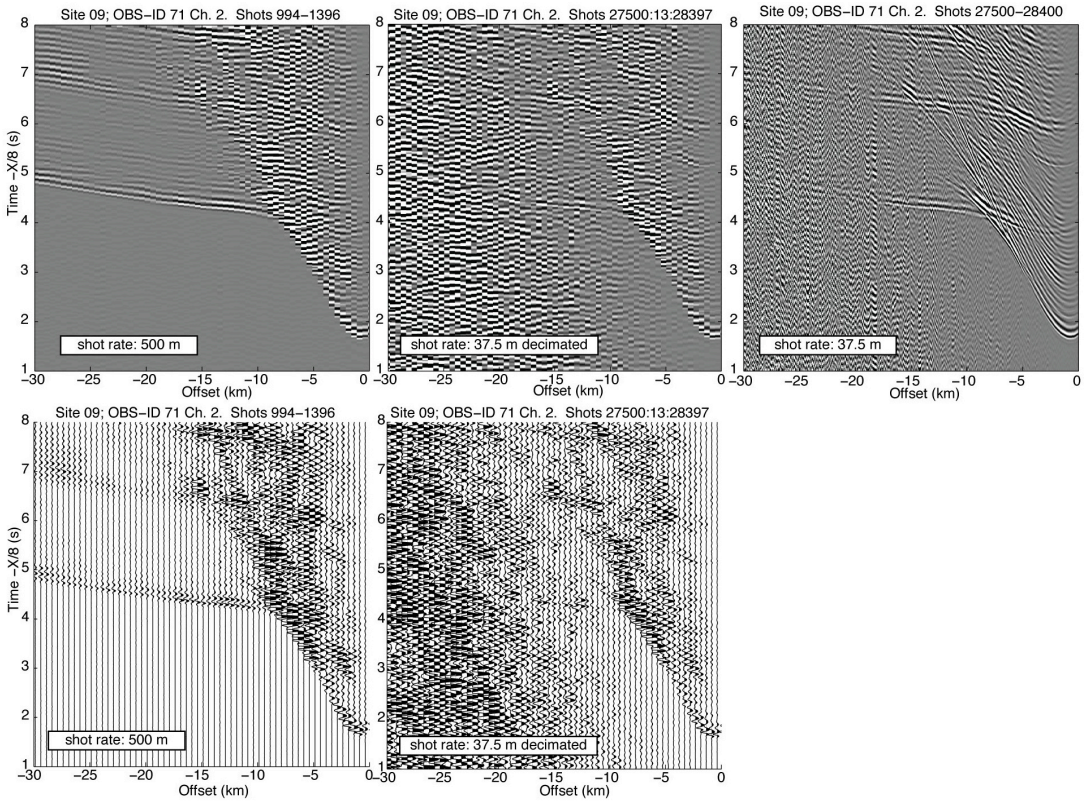

Figure 12. Record sections from OBs at Site 09 illustrating the data quality and noise levels for two different shooting rates.

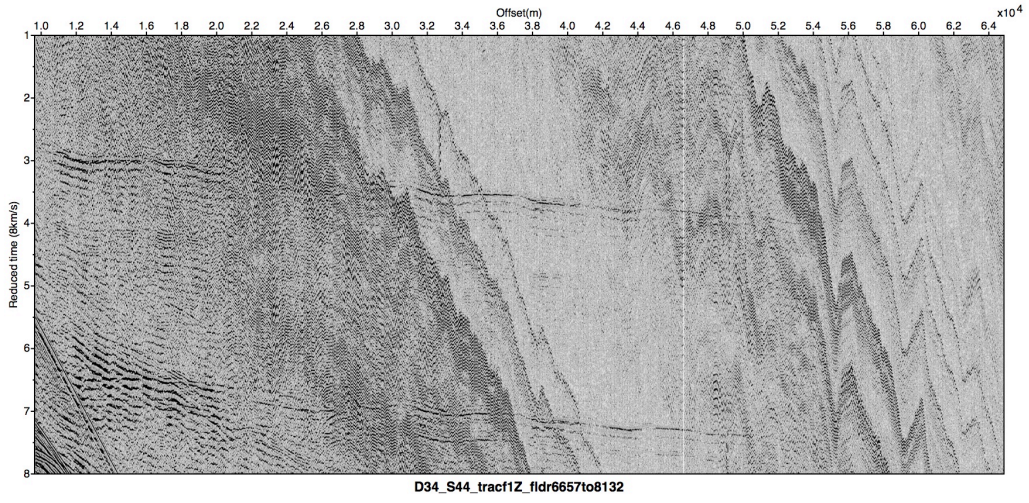

Figure 13. Example of OBS record section for MCS shots for 10-65 km offsets.

4.5. Hydrograhpic Surveys

4.5.1. Vertical CTD Casts.

Eighty (80) vertical CTDs were accomplished at most of the OBS deployment sites (Appendix 8) and two additional locations at the Cascadia Channel (Figure 14). All profiles were gathered from the sea surface to 20 m above the bottom (casts at Sites CC1 and CC2 at the Cascadia Channel were done down to 10 m off the bottom).

A Seabird 911plus CTD system was used to collect the hydrographic measurements; additionally, oxygen data were gathered with an oxygen SBE43 sensor mounted in the CTD frame (Figure 15).

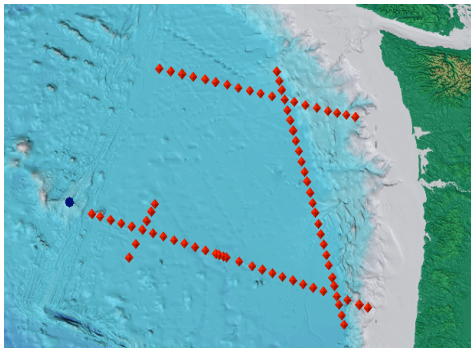

Figure 14. Map of the CTD stations (red dots) performed during the OC1206A cruise, and the area surveyed using the tow-yo method (blue dot).

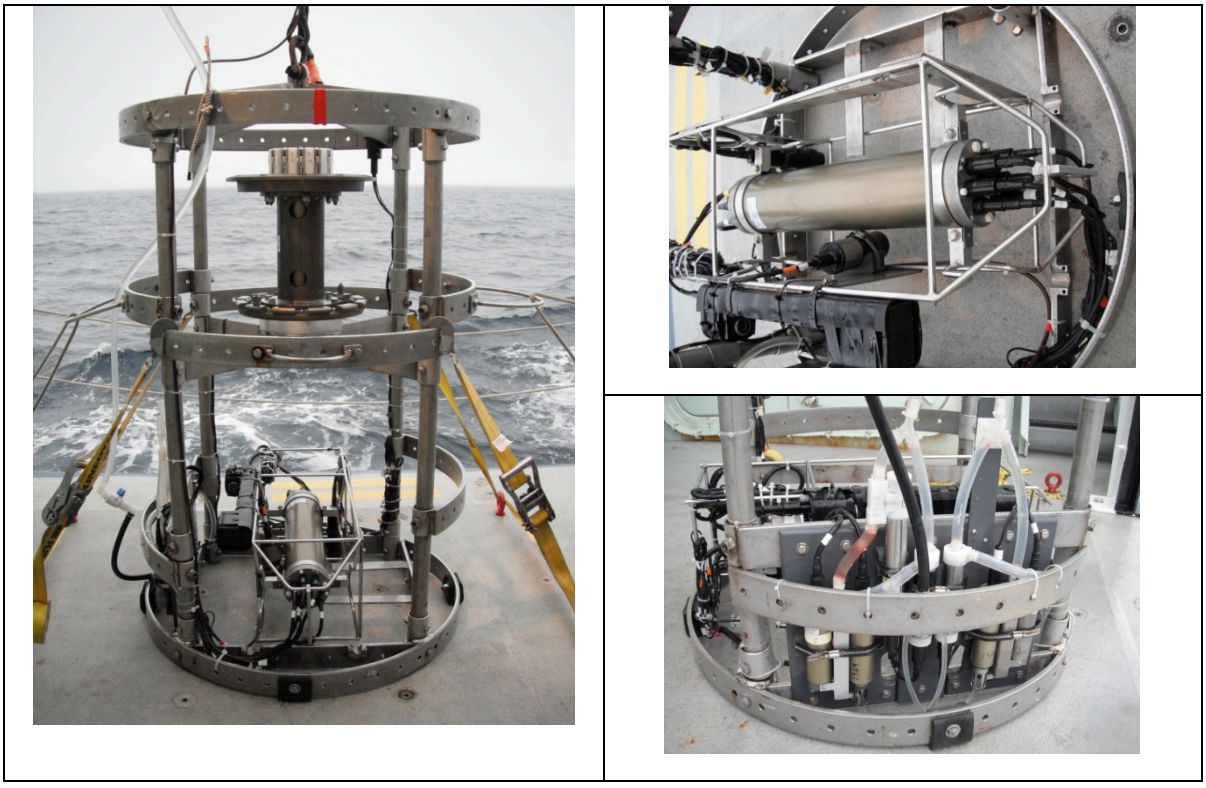

Figure 15. CTD probe used during Cruise OC1206A.

Table 2 indicates the name and units of the variables configured. The sampling frequency of the CTD probe was 20 Hz. Data was processed using the SBEData Processing software®. A summary of the main steps of the data processing procedures are given below:

- Conversion of raw data to geophysical variables.
- Detection and removal of spikes on temperature and conductivity variables.
- Thermal lag correction.
- Loops in the profiles are detected and removed.
- Derived variables are computed (depth, salinity, sound velocity).
- Data are interpolated at 1 db resolution from surface to the maximum depth of the cast.

The procedure was as follows:

Table 2. CTD variables and units

Variable	Units
Pressure	Db
Temperature	deg C
Conductivity	mS/cm
Oxygen	ml/l

- Deploy CTD down to 10 m below surface;
- Initiate CTD and software;
- Rise CTD to just below the surface;
- Determine target depth (nominally 100 m above bottom) and turn on water pumps;
- Lower CTD to target depth at 60 m/minute, with the first 100 m at 30 m/minute;
- At target depth, continue lowering CTD at 20 m/minute until pinger indicated 20 m above bottom;
- Close downcast data file, and open upcast datafile;
- Rise CTD to surface at 60 m/minute;
- Turn off CTD and retrieve.

4.5.2. CTD tow-yo's at Axial Seamount.

Tow-yo operations involve using the CTD to search the water column for indicators of hydrothermal activity. The CTD is lowered and raised through the water column repeatedly while the ship moves slowly forward over the search area. We conducted 8 CTD tow-yo's within the caldera and southern rift zone of Axial Seamount (Figure 16, Appendix 6). Each tow-yo's started as a vertical cast, and once the CTD was at the bottom the ship started the transit at 1.5 knots. As the ship moved, the CTD was brought to a depth of ~200-300 m above bottom, and then lowered again. At the start and end of each cycle the setback distance was calculated using Pythagoras: $\sqrt{(wire\_out^2 - CTD\_depth^2)}$.

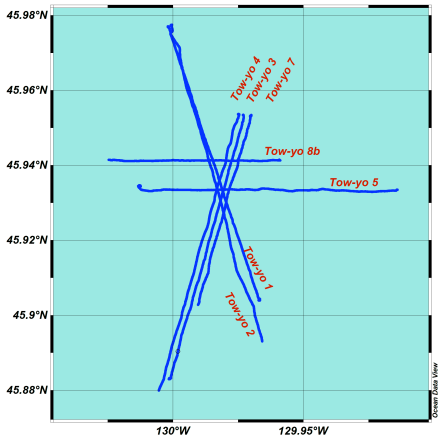

Figure 16. Map of all tow-yo lines.

4.5.3. 12.0 kHz acoustic survey at Hydrate Ridge.

We conducted a short water-column acoustic survey across Hydrate Ridge to try detect plumes of methane bubble. Based on previous similar surveys we configures the Knudsen Chirp 3260 Echosounder with the parameters shown in Figure 17. The survey was conducted between the following two waypoints:

SHR1	**44° 34.2'N**	**125° 11.0'W**

SHR2	**44° 34.2'N**	**125° 07.0'W**

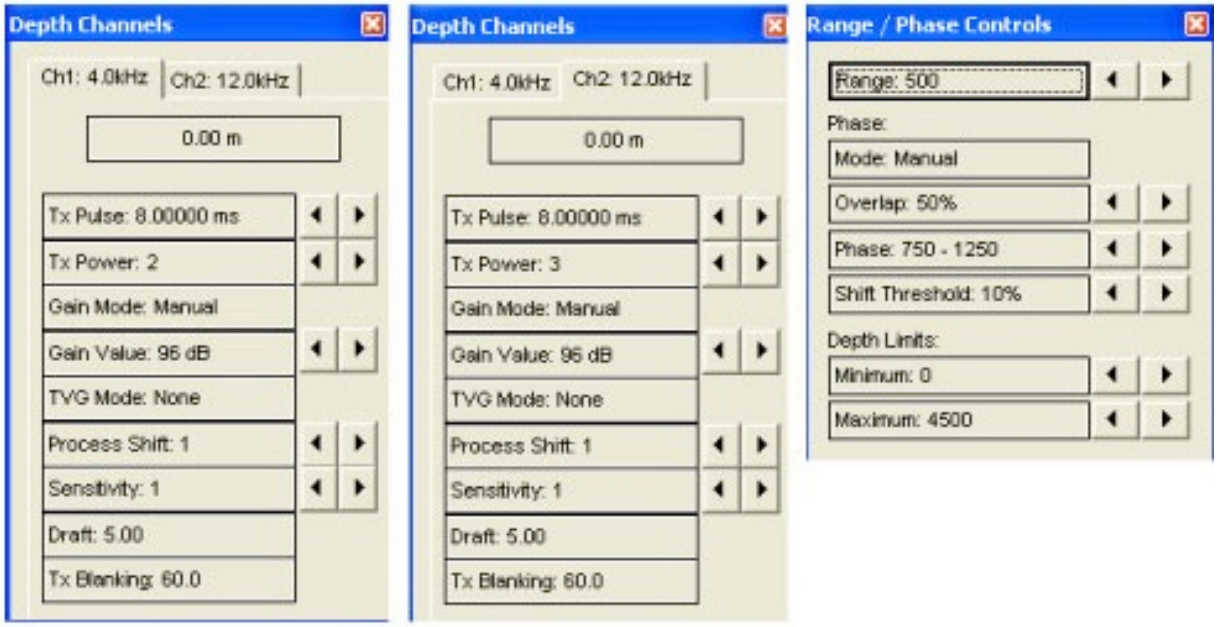

Figure 17. Knudsen 4-12 kHz echsounder parameters for water-column acoustic imaging.

4.6. Coordination of OBS and MCS Operations

Close coordination of *Langseth* and *Oceanus* operations was required throughout our survey. We planned on using R2R eLog netbooks (Appendix 9), which were set up on both ships and accessible to via internet, as the primary means communicating ships' position and operations between the two scientific teams in near real-time. Unfortunately updates from the ships' servers to R2R shore servers were not as frequent as needed, and many times communications between the tow ships were accomplished via regular email and VOIP chat between the PIs.

5. ACKNOWLEDGEMENTS AND RECOMMENDATIONS

We want to express our gratitude to NSF managers, personnel from the Office of Ships Operations at the OSU, personnel from the LDEO Office of Marine Operation (particularly Jeff Rupert for his efforts and assistance in procuring permits to operate in foreign waters), personnel from OBSIP, and *RV Oceanus* crew for their support and hard work that made this experiment possible and highly successful.

We want to thank Bill Chadwick and Ed Baker at NOAA for sending us materials and instructions to run the CTD tow-yo survey over Axial Volcano.

We thank *RV Thompson* Cruise TN283 Chief Scientists M. Tolstoy and R. Allen for recovering OBS D62 (Site 26).

Recommendations:

A unified policy for all UNOLS ships/operators regarding permitting procedures for operations in foreign waters will help prevent some of problems we encounter when preparing for this cruise.

WHOI OBSs: It is desirable that miniseed files are generated immediately after OBS recoveries for QC on the go. This would help identify bad sensors before the next deployment and make decisions regarding where/which D2 OBSs to deploy.

SIO data cards: they should be tested in the lab prior to deployments. Also, it would be nice to explore the possibility of having the data logger with a second data card to duplicate the data and have a backup in case one of the cards is defective. Currently the cards are "zeroed" in the lab (written zeros all over, then delete them, then reformatting), but it is possible that if the card has bad sectors, computers will skip the sectors without warning. It will be useful to establish a procedure to detect bad sectors in the data cards before deployments.

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A.1. Scientific Complement and Ship's Crew for OC1206A

Ship's Crew and Technician List

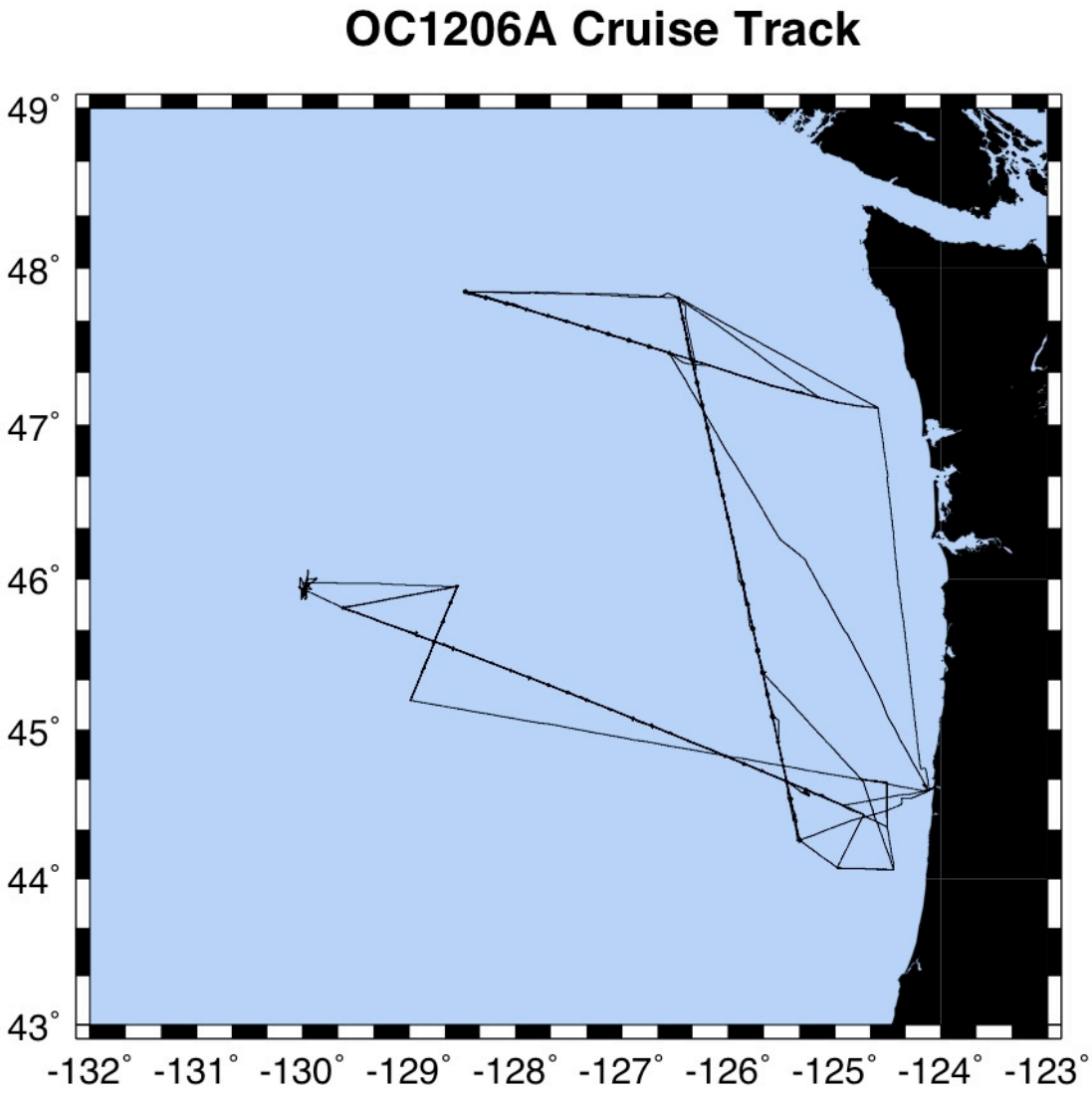
Name	Position		Name	Position
Jeff Crews	Captain		Tony Jackson (06/07-07/04)	A/B
John Forgione	First Mate		Bob Ashley (06/07-06/19)	Chief Engr.
Tony Monocandilos	2nd Mate		John Hubner (06/20-07/14)	Chief Engr.
Daryl Swensen	Martech		Jay JeanBart	Engr.
Doug Beck (07/05-07/14)	Bosun		Chip Millard	Engr.
Patrick Breshears	A/B		Kris Alberty	Cook
Mark Simpson	A/B		Taylor Williams	Steward

Scientific Party

Name	Position	Institution	E-mail
J. Pablo Canales	Chief Scientist	Woods Hole Oceanographic Institution	jpcanales@whoi.edu
Helene Carton	Co-chief Scientist	Lamont-Doherty Earth Observatory	hcarton@ldeo.columbia.edu
Peter Lemmond	OBSIP Res. Assoc.	Woods Hole Oceanographic Institution	plemmond@whoi.edu
Dave DuBois	OBSIP Senior Res. Assist.	Woods Hole Oceanographic Institution	ddubois@whoi.edu
Chris Judge	OBSIP Engr. Assist.	Woods Hole Oceanographic Institution	cjudge@whoi.edu
Ernest Aaron	OBSIP Senior Development Engr.	Scripps Institution of Oceanography	eaaron@ucsd.edu
Mark Gibaud (06/06-07/04)	OBSIP Senior Development Engr.	Scripps Institution of Oceanography	mgibaud@ucsd.edu
Scott Carey (06/06-07/04)	OBSIP Development Engr.	Scripps Institution of Oceanography	scarey@ucsd.edu
Phil Thai (07/05-07/14)	OBSIP Jr. Development Engr.	Scripps Institution of Oceanography	pthai@ucsd.edu
David Anderson (07/05-07/14)	OBSIP Jr. Development Engr.	Scripps Institution of Oceanography	dwanderson@ucsd.edu
Brendan Murphy	Undergrad Res. Assistant	Woods Hole Oceanographic Institution & Boston College	murpaad@bc.edu
Jhon Mojica-Moncada	Grad Res. Assistant	CSIC, Spain	jhonmojica888@gmail.com
Adam Bartlett	Undergrad Res. Assistant	Dalhousie University, Canada	ad994839@dal.ca


E. Aaron
T. Williams
P. Thai
B. Murphy
D. Anderson
J. Mojica
J.P. Canales
H. Carton
P. Lemmond
D. DuBois
"the fish"

A.2. OC1206A Cruise Track

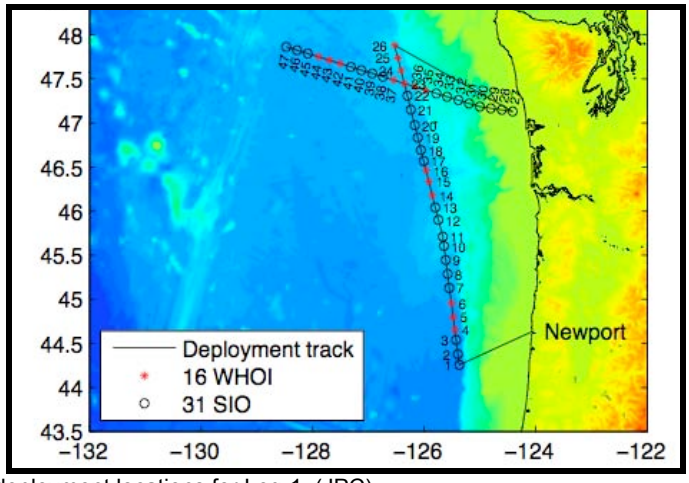


A.3. OBSIP SIO Senior Engineer Report.

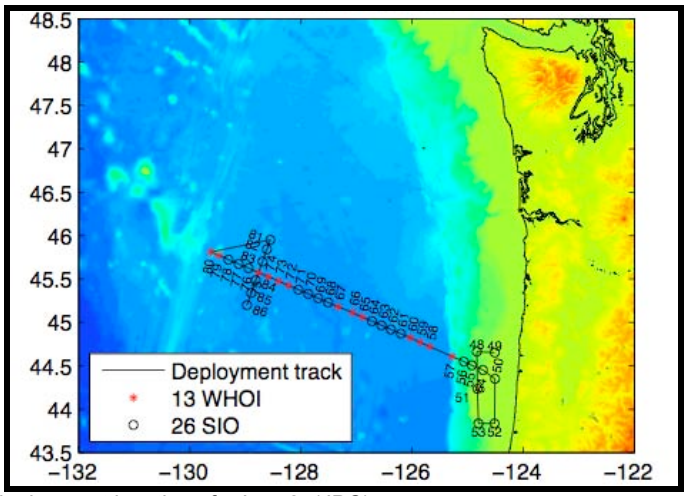
Cruise: Susanne Carbotte (OC1206A)
IRIS Network Code: NA
SIO Purpose: Deploy 31, Recover 26, Deploy 26, Recover 31 SPOBS
Vessel: R/V Oceanus
Ports: Newport, Oregon
Master/Captain: Jeff Crews
Chief Scientist: Juan Pablo Canales
Co-Chief Scientist: Helene Carton
SIO Personnel (OBSIP): Ernest Aaron, Mark Gibaud, Phil Thai, Dave Anderson
SIO Personnel (AOG): Scott Carey
WHOI Personnel (OBSIP): Dave DuBois, Peter Lemmond, Chris Judge
Marine Technician (OSU): Daryl Swensen
Student Assistants: Adam Bartlett, Jhon Mojica, Brendan Murphy
Cruise Dates (OBS work): Leg-1 (06/07-07/04), Leg-2 (07/05-07/14)

R/V OCEANUS

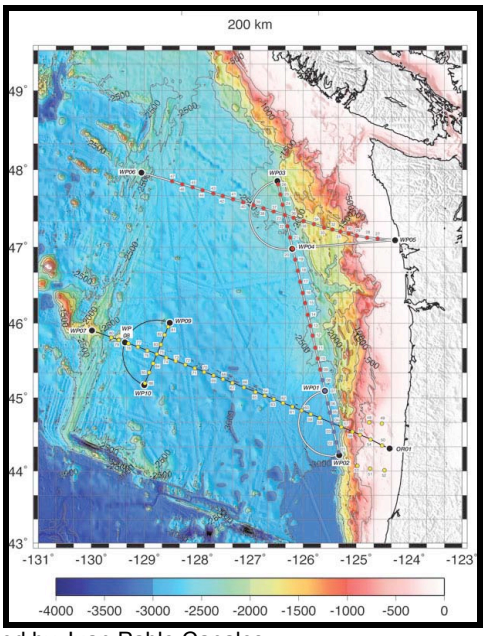
I. Summary of SIO OBS Activities



OBS deployment locations for Leg-1. (JPC)



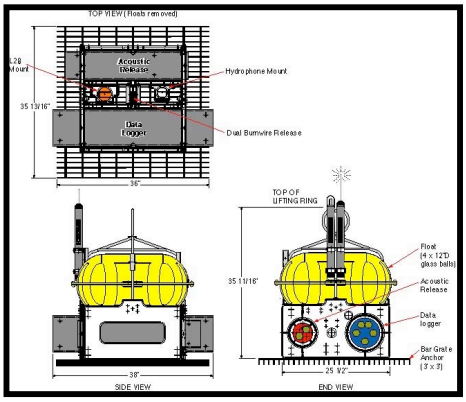
OBS deployment locations for Leg-2. (JPC)



Locations provided by Juan Pablo Canales.

II. Instrumentation

The SP-OBS float and frame components are typically stored separately in a custom rack system, and are assembled and tested prior to deployment. The complete instrument weighs approximately 400 pounds in air. This is inclusive of the 100-pound iron anchor grate held to the base of the poly frame, by a single 2" oval quick-link. When the anchor is released for recovery, the four 12" glass spherical floats, as well as the syntactic foam blocks provide sufficient buoyancy to lift the instrument at about 43 m/min to the sea surface. To increase visibility at the surface, an orange flag on a 48" fiberglass-resin staff is attached to the side of the lift bale along with a Novatech low-pressure activated strobe-beacon and radio. The radio provides one-second pulses every two-seconds at 160.725 MHz.



The acoustic release transponder developed in conjunction with ORE/EdgeTech is comprised of a main circuit board, an alkaline battery pack, and an ITC-3013 transducer manufactured by International Transducer Corp. All SIO transponders are interrogated at 11kHz and respond at 13kHz. The alkaline battery pack provides ~18 volts power for the burn, ~12 volts power for the transponder, and ~9 volts power for the circuit board logic. The release mechanism includes two burn-wire elements, and when activated, it takes an average of 7-minutes to trigger anchor release.

III. Areas of Concern

Whales. This is a two-ship operation and the Langseth will be shooting air guns. Their ability to finish "shooting" the line governs our recovery schedules. We have seen quite a few marine mammals since leaving port.

IV. Ships Equipment and Condition

Excellent. There was just enough space on the main deck to accommodate our 33 OBS, equipment, plus the WHOI 20' lab van.

V. Journal of Events in Chronological Order

All times and dates in this report are UTC/GMT unless otherwise noted.

1. Loading & Setup

06/05/12

Our gear was delivered to the Oceanus at 10:00 sharp. All gear was loaded and secured before days end.

06/07/12

We moved onto the ship this afternoon and finished the dry-lab setup and verified that all gear had been properly secured.

2. Transit
06/07/12 11:45
We just pulled away from the dock, and we are expecting to be at the first station in approximately 6-hours. This is where we will perform two rosette tests, and then deploy our first SP OBS.

3. Rosette Testing
06/07/12 21:00
The first of two rosette tests has been deployed. They will both be lowered to ~2500 meters for this checkout.

06/08/12 00:10
The acoustic communications are crystal clear. Both rosette tests were completed flawlessly. The second rosette is currently being retrieved.

4. OBS Deployments (Leg-1)
Duration- Leg 1&2

site	cruise leg	acoustic	logger	tag time	LAT	LON	depth	comments
1	1&2	58	86	2012:192:08:00:00.1009871	44.25957	-125.32977	2990	
2	1&2	38	90	2012:192:10:31:00.2040620	44.39162	-125.37053	2972	
3	1&2	29	23	2012:192:12:38:00.0378673	44.53959	-125.41545	2932	
7	1&2	90	61	2012:192:20:25:59.8306294	45.09202	-125.58576	2734	
8	1&2	31	55	2012:192:22:32:59.9844963	45.23802	-125.63225	2678	

Duration- Leg 1

site	cruise leg	acoustic	logger	tag time	LAT	LON	depth (m)	comment
9	1	39	71	2012:177:03:55:59.9072816	45.38362	-125.67787	2621	
10	1	69	85	2012:177:02:02:58.9424784	45.52782	-125.72308	2489	
11	1	74	20	2012:177:00:09:00.0024603	45.67468	-125.77001	2424	
12	1	71	11	2012:176:21:37:00.0532164	45.83308	-125.81327	2341	
13	1	60	2	2012:176:19:48:59.9793620	45.96457	-125.86176	2454	
17	1	97	57	2012:176:12:34:59.7732398	46.54511	-126.05126	2673	
18	1	27	95	2012:176:10:37:59.9386444	46.68966	-126.09884	2641	
19	1	62	67	2012:176:08:30:26.0651007	46.83708	-126.14768	2617	Massive drift
20	1	109	92	2012:176:06:23:59.3909977	46.98217	-126.19611	2596	Clock off by 1-sec
21	1	83	78	2012:176:04:25:59.9786392	47.12724	-126.24532	2549	
22	1	148	93	2012:176:02:27:59.9471083	47.27179	-126.29409	2503	
27	1	64	38	2012:173:08:05:59.9407420	47.11134	-124.59320	81	Pssible dead hyd channel
28	1	43	39	2012:173:09:20:00.0071479	47.12304	-124.78945	129	
29	1	32	68	2012:173:10:32:59.9720694	47.14740	-124.98483	300	
30	1	72	56	2012:173:12:02:00.0069685	47.17462	-125.13857	1250	
31	1	61	17	2012:173:17:39:59.9191989	47.20144	-125.29025	1504	
32	1	82	40	2012:173:19:07:59.9881878	47.22868	-125.44584	1768	
33	1	34	21	2012:173:20:28:59.9430052	47.25520	-125.60020	1257	
34	1	67	65	2012:173:22:13:00.0030931	47.29817	-125.79457	1762	
38	1	73	13	2012:174:05:30:59.9784713	47.50302	-126.74494	2475	
39	1	7	50	2012:174:07:20:00.0324303	47.54312	-126.93563	2542	
40	1	125	47	2012:174:09:21:59.9424481	47.58294	-127.12798	2564	
41	1	105	63	2012:174:11:30:59.9198663	47.62251	-127.32006	2616	
45	1	86	73	2012:174:18:49:00.0401763	47.77610	-128.08692	2673	
46	1	59	74	2012:174:20:39:59.9662363	47.81436	-128.28065	2681	No data on CF
47	1	146	94	2012:174:22:31:00.0132233	47.85183	-128.47349	2686	

06/08/12 12:00-00:00 shift
Logger #38 clock was off by 5-6 seconds and wouldn't correct after several restarts attempts.

Logger #72 would not power up. The issue could not be immediately identified.

04:00
I was able to fix logger #38 by swapping out the CPU board with the one from logger #72 and intermixing (switching) the clocks.

06/15/12
With Leg-1 deployments complete, and at the request of Pablo, we began surveying the OBS stations because we have a few days to kill before we can begin recoveries. This is partially due to the fact that we deployed much faster than anticipated. Also, the Langseth's delayed departure from Astoria because of permitting issues set them behind schedule a little. We should be done with surveys by Tuesday, 6/18.

5. OBS Recoveries (Leg-1)
2012:173:08:00:00, Recoveries begin at Site #27.

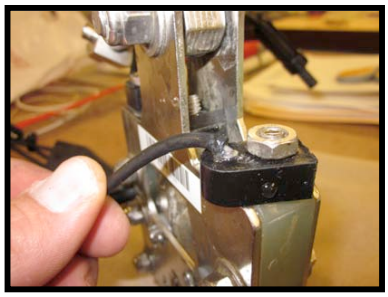
2012:174:20:30:00
Site 46 has no data written to the CF. The checkout sheet shows that the logger was setup correctly (all boxes filled and checked) and the clock gave a good tag, but when the logger was reset to check GPS time, the screen did not prompt for the "OBS password" as it should if an experiment had been started. The only difference with this logger is that it has one of the newly purchased CF cards, which I bought just before this trip.

I ran a test with one of our spare loggers and one of these new CF cards to see if the issue is repeatable. The CF worked fine, or as expected, from a good instrument. I restarted the logger and it prompted me for the OBS password. It collected a few MB's of raw data, and I was able to process it successfully. I will now pull Logger #74 and repeat this test.

Logger #74 worked flawlessly. Upon restart I was prompted for the OBS password and the setup information was valid. The only other possibilities for the data recording failure are that the new CF #2012-100 is bad, or I failed to start, or fully start the experiment for Site #46. I was the one who checked it out and deploy it. CF-100 has been marked with red tape and is in the bag with the rest of Leg-1 CF's, all of which are not to be reused for the Leg-2 deployments.

2012:176:06:00:00 Site 20, Logger #92, Acoustic #109
During its ascent and closer to the surface than the bottom, this acoustic went ape-shit. It was rapidly pinging as if it were being interrogated by an 11kHz noise. Once on deck it was silent and it checked out fine. No one on the ship could account for the mystery noise.

2012:176:08:29:00 Site 19, Logger #67, Acoustic #62
This acoustic kicked out of the 1st burn #1 attempt at about the 5-min mark, then at 3-min, 1-min, 1-min, 1-min, then it finally released from anchor (~11-min). We intentionally repeated burns to burn #1 to see how many it would take to release,



if at all. Upon inspection, post-recovery, I identified that water had intruded the cable boot for the 4-pin acoustic connection and corrosion was present. I also found that the #1 burn wire had a jacket that was separated from the base, but I could not tell if it was the reason for the delayed release. I suspect that it was not. If the wire were exposed to saltwater, even a little bit, then it would have eroded and broke long before the chromed-nickel wire, which we have demonstrated in lab tests. The release cable, and associated acoustic were both replaced by spares.

6. Data Processing and Instrument assessment (Leg-1)

Site	Logger	CH0 Horiz	CH1 Horiz	CH2 Vert	CH3 Hyd	Notes
27	38	Y	Y	Y	N	Possible dead hydrophone channel
28	39	Y	Y	Y	Y	
29	68	Y	Y	N	Y	PPS at recovery
30	56	Y	Y	Y	Y	
31	17	Y	Y	Y	Y	
32	40	N	Y	N	Y	Channels look funny
33	21	Y	Y	Y	Y	
34	65	Y	Y	Y	Y	
38	13	Y	Y	Y	Y	Swapped to different frame
39	50	Y	Y	Y	Y	
40	47	Y	Y	Y	Y	
41	63	Y	Y	Y	Y	
45	73	Y	Y	Y	Y	
46	74	N	N	N	N	No data on CF 2012-100
47	94	Y	Y	Y	Y	
22	93	Y	Y	Y	Y	
21	78	Y	Y	Y	Y	
20	92	Y	Y	Y	Y	OBS time was off by 1-sec
19	67	Y	Y	Y	Y	Drift = -33.93490
18	95	Y	Y	Y	Y	
17	57	Y	Y	Y	Y	
13	2	Y	Y	Y	Y	
12	11	Y	Y	Y	Y	
11	20	Y	Y	Y	Y	Swapped to different frame
10	85	Y	Y	Y	N	Possible dead hydrophone channel
9	71	Y	Y	Y	Y	

Thanks to the new and improved processing software, I have been able to generate miniseed for the PI's to review, shortly after recoveries. This has been very helpful for identifying any channel issues associated with our gear and allows us to repair, or replace components as necessary, to try and maximize our data collection for the 2nd deployment phase. We have been fortunate to have the luxury of two spare SP OBS with us for parts, plus our regular spare parts. We have used almost every major component for the benefit of Leg-2.

Referring to the chart posted above, here's a breakdown of what we have done:

Site 27, Logger 38 – Dead hydrophone (Ch3)
We replaced the A2D card, hydrophone, and hydrophone cable for this OBS.

Site 29, Logger 68 – Dead Z (Ch2)
We replaced the L28 and sensor cable for this OBS.

Site 32, Logger 40 – Dead X&Z (Ch0 and Ch2)
We replaced the A2D, L28, and sensor cable for this OBS.

Site 46, Logger 74 – No data collected. Logger failed to start.
The logger checks out fine and I ran a bench test, collecting a small data set, successfully. The only change we made to this logger was to install a new CF. For this OBS, Pablo has chosen a less critical location for its use in the Leg-2 deployment scheme. Keeping the PI's informed of our evolving capabilities will allow them to adjust their science plan accordingly. This is absolutely critical.

Site19, Logger 67 – This logger had a 34 second drift at recovery
We replaced the CPU/Clock with a spare for this OBS.

Site 10, Logger 85 – Dead hydrophone (Ch3)
We replaced the hydrophone and hydrophone cable for this OBS.

7. OBS Deployments (Leg-2)
2012:177:09:00:00 Site 48
We have begun the deployment phase of Leg-2.

Duration- Leg 2

site	cruise leg	acoustic	logger	tag time	LAT	LON	depth	comments
48	2	74	13	2012:191:21:01:59.9729246	44.66782	-124.74924	189	
49	2	32	68	2012:191:19:28:59.9655721	44.65127	-124.50933	135	
50	2	43	39	2012:191:17:12:00.0108820	44.35100	-124.50804	98	
52	2	73	20	2012:192:01:27:00.0432898	44.06098	-124.44542	123	
51	2	64	38	2012:192:03:02:59.9218334	44.06856	-124.72569	113	
53	2	59	74	2012:192:04:36:59.9695750	44.07205	-124.97418	457	
54	2	114	67	2012:191:15:17:00.0108787	44.43578	-124.72567	139	
55	2	82	40	2012:191:14:05:59.9863576	44.49606	-124.92388	539	
56	2	69	85	2012:191:12:59:59.1543285	44.54045	-125.06780	1269	
61	2	39	71	2012:191:00:33:59.9237832	44.87863	-126.20143	2832	
62	2	146	94	2012:190:22:18:00.0140248	44.93033	-126.37906	2828	
63	2	86	73	2012:190:20:18:00.0472105	44.97962	-126.54964	2855	
64	2	34	21	2012:190:18:21:59.9372252	45.02830	-126.72097	2872	
65	2	67	65	2012:190:16:17:00.0083043	45.07846	-126.89656	2867	
66	2	72	56	2012:190:14:10:00.0068911	45.14047	-127.11445	2890	
71	2	61	17	2012:190:01:55:59.9150644	45.39722	-128.04577	2866	
72	2	105	63	2012:189:23:52:59.9221670	45.44582	-128.22380	2834	
73	2	125	47	2012:189:21:52:59.9462461	45.49369	-128.40408	2826	
74	2	7	50	2012:189:19:58:00.0334206	45.54085	-128.58131	2804	
75	2	109	92	2012:189:17:54:59.5482246	45.58848	-128.76139	2797	
76	2	148	93	2012:189:16:04:59.9618531	45.63535	-128.94066	2800	
77	2	83	78	2012:189:14:03:59.9908234	45.68196	-129.11966	2767	
78	2	27	95	2012:189:12:10:59.9543133	45.72838	-129.29969	2733	
79	2	96	57	2012:189:10:08:59.8380326	45.77465	-129.47995	2540	
84	2	60	2	2012:188:17:47:59.9876866	45.39319	-128.87450	2820	
85	2	71	11	2012:188:15:20:00.0332873	45.19789	-128.98698	2832	

2012:177:18:00:00 Site 55, Logger #40
During setup, I had to torque the 12-pin interface cable in order to get the pins to make contact, allowing me to synch the logger to GPS and view the time tag. This is the only logger that behaved this way, so the issue is specific to the 12-pin VSK bulkhead of Logger #40 and should be replaced.

2012:178:18:00:00 Site 79

During the acoustic (#97) deck checkout of this OBS I discovered that it would not sense the ground, so I pulled the cable for inspection and found that water had intruded. This caused corrosion to the pins and sockets, so I replaced acoustic #97 and its cable with our last spares. We are seeing moisture intrusion associated with our acoustic cables more, and more frequently. It is very possible that the cable boot seals are wearing out from the frequent cycles of use.

I installed a new (never-before-used) acoustic cable on an earlier OBS that needed a cable replacement, and I really had to work to get the boot seated; this is because it was a very tight seal compared to the older cables. The difference, or feel is very noticeable.

8. OBS Recoveries (Leg-2)

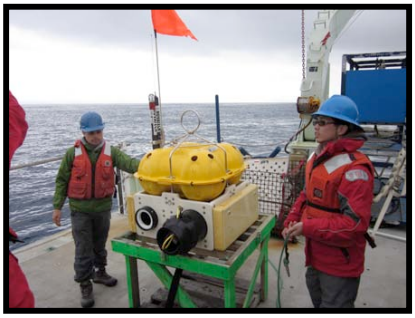
2012:187:17:50:00 (07/05/12 10:50 local time)

We just pulled away from the OSU dock and will transit to Site 85 to begin our recoveries.

Phil, Dave and I will work together for the first two recoveries, then they will stay on a 12-hour shift together, while I work the opposing 12-hour shift. The seas are very calm and this will be good for Dave and Phil to run the show, and they can always wake me if needed.

2012:185:16:30:00 Site 84, AC #60

Acoustic #60 is of the 5-min burn cycle variety, and this OBS had one of the new single wire burn-wires installed on the mechanical release, for burn-1. It burned through this single wire burn-wire in less than 5-minutes. Upon kicking out of the 5-min burn cycle it was more than 100 meters off the bottom, based on slant ranges.



2012:190:14:00:00
Site 66, Acoustic #72
This acoustic unit kicked out of the burn cycle at about 8-minutes. Upon inspection, I found a very minor amount of moisture in the cable connector boot. The OBS had successfully released from the anchor within the burn window.

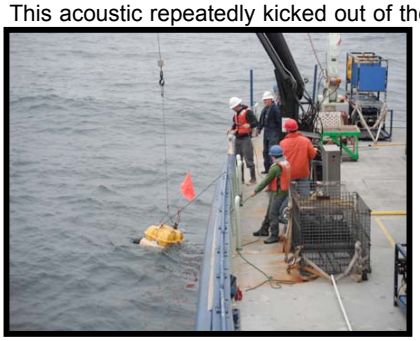
Site 65, Acoustic #67
This acoustic unit kicked out of the burn cycle at about 8-minutes. Upon inspection, I found tarnished pins on the release cable, but no signs of moisture. The OBS had successfully released from the anchor within the burn window.

2012:191:14:00:00
Site 55, SN #40
This logger failed to record data to the CF. The checkout sheet shows that the logger was setup correctly (all boxes filled and checked) and the clock gave a good tag upon recovery. The header information was successfully written to the CF, but it did not record data. This logger had one of the new CF cards (2012-107) purchased for this experiment. Also, The 12-pin bulkhead on this logger (#40) needs to be replaced because it has contact issues in the sockets.

2012:191:17:00:00
Site 50, AC# 43
This acoustic repeatedly kicked out of the burn-1 cycle at exactly 1-minute. The burn-1 command was successfully sent seven times, each time kicking out at 1-minute. Then, we sent one burn-2 command and the OBS released from the anchor. The burn-2 cycle stayed in for the full 15-minutes. Upon inspection of the OBS on deck I found a small amount of moisture in the acoustic cable boot. Also, both burn wires had broken (fully burned), which leads me to believe that the 7th burn-1 command was successful and the single burn-2 was unnecessary, but also successful.

2012:192:00:00:00
The shallow sites, those in the 100-200 meter range, are releasing from their anchors in about 1-minute. These OBS have the new single wire burn-wires on the mechanical releases.

2012:192:10:30:00
Site 02, SN #90, AC #38
This acoustic repeatedly kicked out of the burn-1 cycle at exactly 1-minute. The



burn-1 command was successfully sent twice, each time kicking out at 1-minute. Then, we sent one burn-2 command and the OBS released from the anchor. The burn-2 cycle stayed in for the full 15-minutes. Upon inspection of the OBS on deck we again found a small amount of moisture in the acoustic cable boot, which is most likely the cause of the ground short. I believe we have some fairly strong evidence to show that our original acoustic release cables are in need of replacement.

9. Data Processing and Instrument Assessment (Leg-2)

Site	Logger	CH0 Horiz	CH1 Horiz	CH2 Vert	CH3 Hyd	Notes
85	11	Y	Y	Y	Y	
84	2	Y	Y	Y	Y	
79	57	Y	Y	Y	Y	
78	95	Y	Y	Y	Y	
77	78	Y	Y	Y	Y	
76	93	Y	Y	Y	Y	
75	92	Y	Y	Y	Y	
74	50	Y	Y	Y	Y	PPS at recovery
73	47	Y	Y	Y	Y	
72	63	Y	Y	Y	Y	Time break errors fixed
71	17	Y	Y	Y	Y	
66	56	Y	Y	Y	Y	
65	65	Y	Y	Y	Y	
64	21	Y	Y	Y	Y	
63	73	Y	Y	Y	Y	
62	94	Y	Y	Y	Y	
61	71	Y	Y	Y	Y	
56	85	Y	Y	Y	Y	Fixed hydrophone issue from previous deployment
55	40	N	N	N	N	No data on CF 2012-107
54	67	Y	Y	Y	Y	
50	39	Y	Y	Y	Y	
52	20	Y	Y	Y	Y	
51	38	Y	Y	Y	Y	Fixed hydrophone issue from previous deployment
53	74	N	Y	Y	Y	Dead CH0
48	13	Y	Y	Y	Y	
49	68	Y	Y	N	Y	Dead CH2
8	55	Y	Y	Y	Y	
7	61	Y	Y	Y	Y	
3	23	Y	Y	Y	Y	
2	90	Y	Y	Y	Y	
1	86	Y	Y	Y	Y	

Logger 38 – Dead hydrophone (Ch3)
We replaced the A2D card, hydrophone, and hydrophone cable for this OBS.
*Issue solved

Logger 68 – Dead Z (Ch2)
We replaced the L28 and sensor cable for this OBS.
*Issue not solved, but a closer look both sets of data revealed that the logger was recording on all channels before deployment, up to when it touched the sea floor. Then, it went dead on Ch2, only to resume collecting Ch2 data again at the surface, during recovery.

Logger 40 – Dead X&Z (Ch0 and Ch2)
We replaced the A2D, L28, and sensor cable for this OBS.
*Issue was not solved because the logger woke up, but failed to record data to the CF.

Logger 74 – No data collected. Logger failed to start.
The logger checks out fine and I ran a bench test, collecting a small data set, successfully. The only change we made to this logger was to install a different CF.
*The no-data issue was solved, but a new issue arose with a dead Ch0.

Logger 67 – This logger had a 34 second drift at recovery
We replaced the CPU/Clock with a spare for this OBS.
*Issue solved

Logger 85 – Dead hydrophone (Ch3)
We replaced the hydrophone and hydrophone cable for this OBS.
*Issue solved

Hi Ernie,
Paul and I talked about this if you sync an instrument before June 30th and recover after the leap second occurs you want to add 1 second to the TAG. Then do everything else the same exactly as you did before.

As for the shot timing. It would be best to have them add 1 second to all the shot times after the leap second occurs.

After we cut the data with the shot times we can then go back and correct the absolute timing so that it matches external events.

-phil

On 6/12/2012 10:15 AM, Aaron, Ernest wrote:
I was informed that we have a leap second occurring before we recover all

instruments. Will we have any problems with this during processing? Will the shot records need to correct for this too?

Langseth has been delayed because of orca concerns.

-E

SEGY Data Issues
By: Phil Thai

Issue 1: Combining all shots into one massive SEG-Y file
The PI's of this cruise requested one file per channel per instrument containing all the shots. There were roughly 49000 shots, which created individual SEGY files ranging from 1.5 GB to 3.5 GB each file! Because we buffer everything in ram before writing to the drive, the lab computers were extremely over encumbered.

A possible solution to this is to start writing to the file every 10,000 shots or so and continue appending to the file instead of buffering it and writing it all at the end.

Issue 2: Leap Second
The Langseth did not do what we requested to help us deal with the leap second.

Our solution was to go into the shot logs and add a second to all the shot times after the leap second occurred. In addition to this, in order to keep the timing consistent and the drift corrections accurate, we had to subtract a second from our OBS recovery time tags. Doing these two things allowed us to treat the file as if the leap second never happened.

Our last challenge here is to go into the SEG-Y headers and add the leap second back into the processed files. Also, I'm not quite sure how to handle this correction for miniseed. Somehow we have to add one second into the day files between June 30th and July 1st.

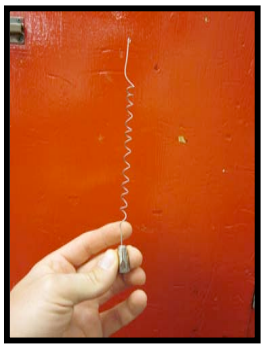
Issue 3: Ranges in SEG-Y header were incorrect
The PI's of the cruise noted that our ranges were off by roughly 25%. At first I thought I might have run the SEG-Y with an outdated script, but then I realized that this was not the case. The function we use in the SEGY script to calculate distance between source and receiver was incorrect.

I was able to figure this out due to the fact that the PI's for this particular cruise had calculated all the ranges for each instrument. They were able to give me a list of correct ranges that I can run alongside our generated ranges and with that I was able to narrow down what was causing the discrepancy. I took a function that Marc Ambros wrote and incorporated it into Paul's SEGY script in order to

get correct ranges. The PI for the cruise (Pablo) wrote a Matlab script in order to compare our ranges with his and plot them. He also did this with the WHOI group's ranges as well. The WHOI ranges fell roughly within 20-meters of the PI's calculated values, but ours seemed to vary more as the distance grew from source to receiver. Well, it turned out that the PI and the WHOI group did distance calculations based off of a sphere, while we do ours based off of the #WGS84 ellipsoid. After realizing this, the PI recalculated his ranges based off the same ellipsoid model and our ranges were in fact, accurate to within 1-meter!

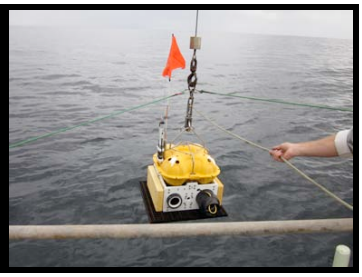
10. Room for Improvement

I'm running a little experiment on the 2nd Leg of the cruise with our NovaTech radio. We have been loosing antennas regularly, and the anodes at the bases are nearly depleted, and NovaTech wants too much money for such a simple item, so here is what I'm proposing:



For the test I used stainless steel (0.051) lock wire for our replacement antenna.

After nearly ripping off yet another flag, due to the OBS twisting upon removal of the slip lines, I decided that there must be a better solution for rigging the pelican release at deployment. Here is what I came up with:



I took away the slip lanyard and rigidly connected the pelican release to the lift bale (this is how we used to deploy). I then attached two tag lines to the pair-ring above the pelican release. With tension applied to the tag lines, the OBS cannot rotate more than a few degrees. There is plenty of control and no need to wait for the lines to be slipped before release. I've used the setup for every Leg-2 deployment with success. For a broadband OBS, I'd use one slip line at the end of the sensor ball arm in place of one of the clipped in tags.

11. Cruise Summary

Overall, this was a very successful cruise as we were able to recover all SIO OBS without damage, or loss. We did, however, experience a few faulty channel issues, which we were able to partially resolve before the Leg-2 deployments. Other issues resulting in zero-data recording to the CF will have to be investigated back at the lab.

Before the Leg-1 deployments, we replaced all seal-screw o-rings (122) with the new higher quality Mil-Spec (M83461/1-122) o-rings. We performed 57-deployments and 57-recoveries with zero leak issues.

Another issue we dealt with was the shorting of our acoustic release cables due to moisture intrusion at the connector boot. We have seen this issue on past cruises (NoMelt) where the burn-1 cycle prematurely ends, but the frequency of this issue seems to have peaked during the CY2011 cruises. For NoMelt it was very difficult to determine these issues because the acoustic communications were swamped with background noise. For this cruise, the acoustics were crystal clear, which allowed us to catch every interrogation response.

Other challenges for this cruise were related to The June 30th leap second occurrence, SEGY range offset issues, and personalized processing requests from the PI's. All of these challenges were addressed successfully due to the fact that we maintained an open and inclusive dialog with the PI's, who helped us with troubleshooting some of the processing and data issues, which has been very beneficial.

Thanks to the hard work and dedication of the ships crew and science personnel, OC1206A was a safe, productive, and enjoyable seagoing experience.

A.4. WHOI D2 OBS Description

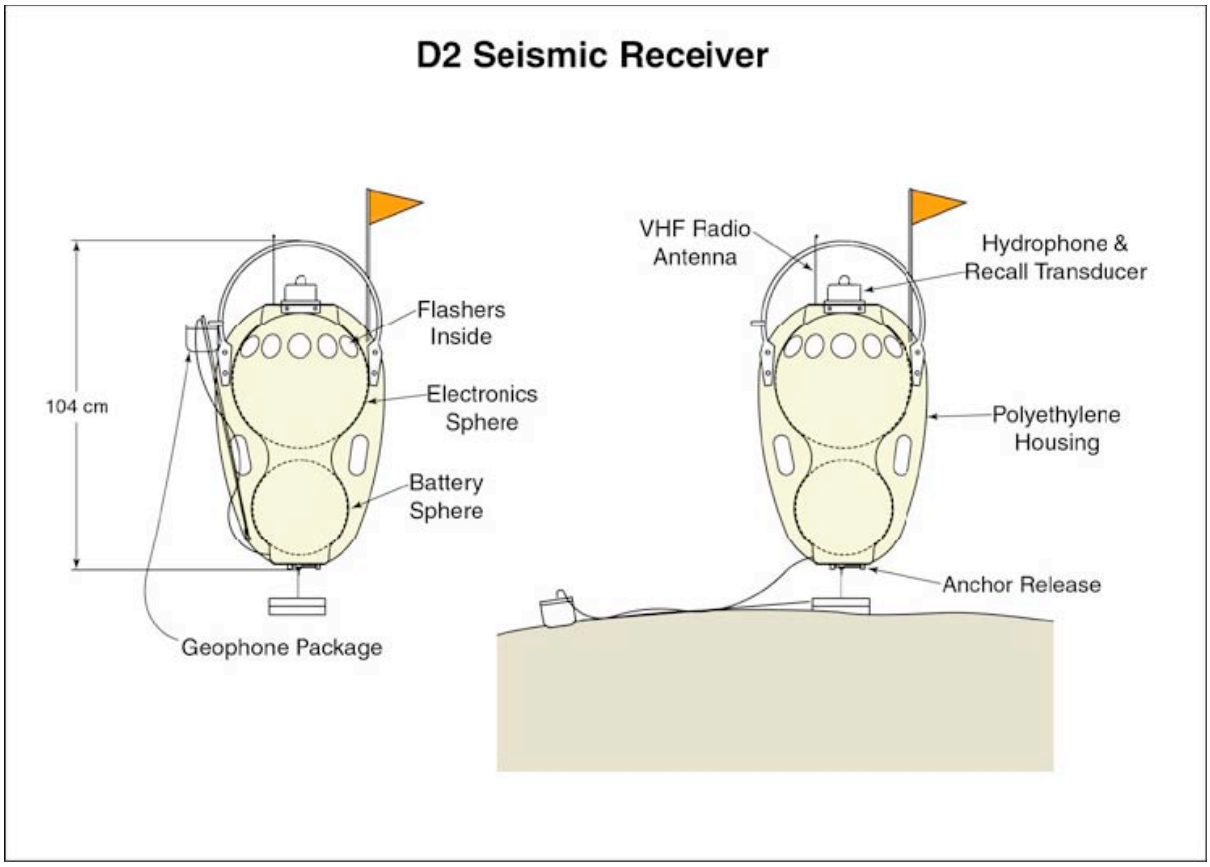
The WHOI model D2 ocean bottom seismometer (OBS) is a compact, relatively lightweight system, which allows recording of three components of ground motion and one acoustic channel at sample rates up to 250 Hz. The D2 is comprised of two glass balls containing electronics and batteries enclosed within a rigid plastic housing. The system stands 39" high and weighs approximately 115 lb in air.

The upper glass ball (17" diameter) contains a Quanterra signal-processing unit (Q330), a Quanterra 20 Gbyte hard drive containing an ethernet hub, an EdgeTech acoustic release board, GPS antennae, recovery aids, and custom electronics. A Seascan clock is located on a system control board and is accessible via a serial ASCII current loop. Recovery aids include four flashers and a programmable VHF radio with a minimum range at sealevel of ~2 nmi. The VHF antennae is attached to the inside surface of the glass ball. The Q330 includes operating software, a low-power analog-to-digital converter with 140 dB dynamic range, digital filters, clock, and 8 Mbytes of buffer memory. Engineering data and four channels of signal are continuously recorded and intermittently logged via an ethernet connection onto the disk drive in miniSEED format. For this experiment we used a sample rate on all data channels of 200Hz. In the lower glass ball (10" diameter) are battery packs comprised of both alkaline and lithium cells that supply power separately to the Q330 and hard drive, the recovery electronics board and aids, and to the EdgeTech release board used for acoustic ranging and supplying a current to the anchor release burn-wire. Ethernet connections can be used to change and program the operating software and to recover data from the hard drive.

The external plastic case provides protection for the glass balls and structural rigidity. An ITC 12 kHz acoustic transponder is attached to the upper cover of the case. Next to the transponder is a HighTech model HTI 1-90-U hydrophone. Three orthogonally mounted 4.5 Hz geophones are mounted in a 5" diameter (5.5" high) titanium case (Figure 2), which is attached by a weighted cable through the plastic case to the upper electronics ball. The case is filled with high viscosity silicone oil. Internal gimbals allow the geophones to passively orient themselves with respect to gravity through 180 degrees of motion. Prior to deployment, a bail is screwed to the seismometer case, and the bail is hooked to the tip of a 23" long fiberglass wand. The bottom of the wand is attached to the base of the plastic housing by a rotatable joint. The tip of the wand and the seismometer are raised and attached to the side of the plastic housing by a galvanic link that dissolves in seawater after ~4 hours. When the link dissolves, gravity carries the sensor can out and away from the D2. The sensor can slips from the tip of the wand, which is then pulled up and away from the can by a bungee cord.

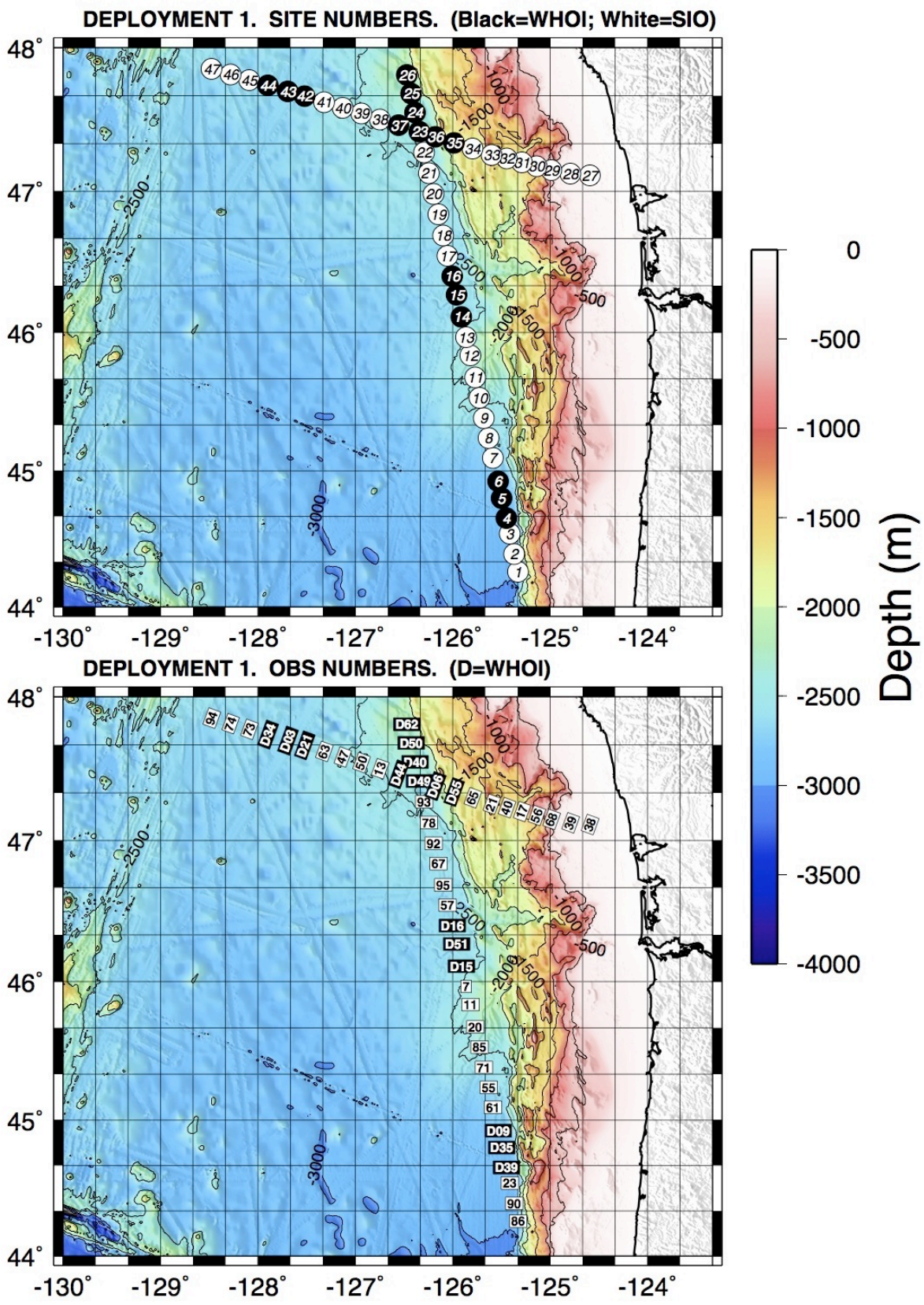
The D2 has ~25 lb of buoyancy and is weighted by a 55 lb steel plate anchor (6"x15"x2"). A 9" length of stainless steel wire rope to a 2" diameter ring connects the anchor plate. The ring is held to the D2 by a lever arm. One end of the lever arm is attached to the D2 base plate by a burn-wire that can be severed by an electric current triggered by a coded acoustic signal to the EdgeTech transponder. A battery that is separate from the battery supplying power to the Q330 and the hard drive powers the burn-wire and the release electronics.

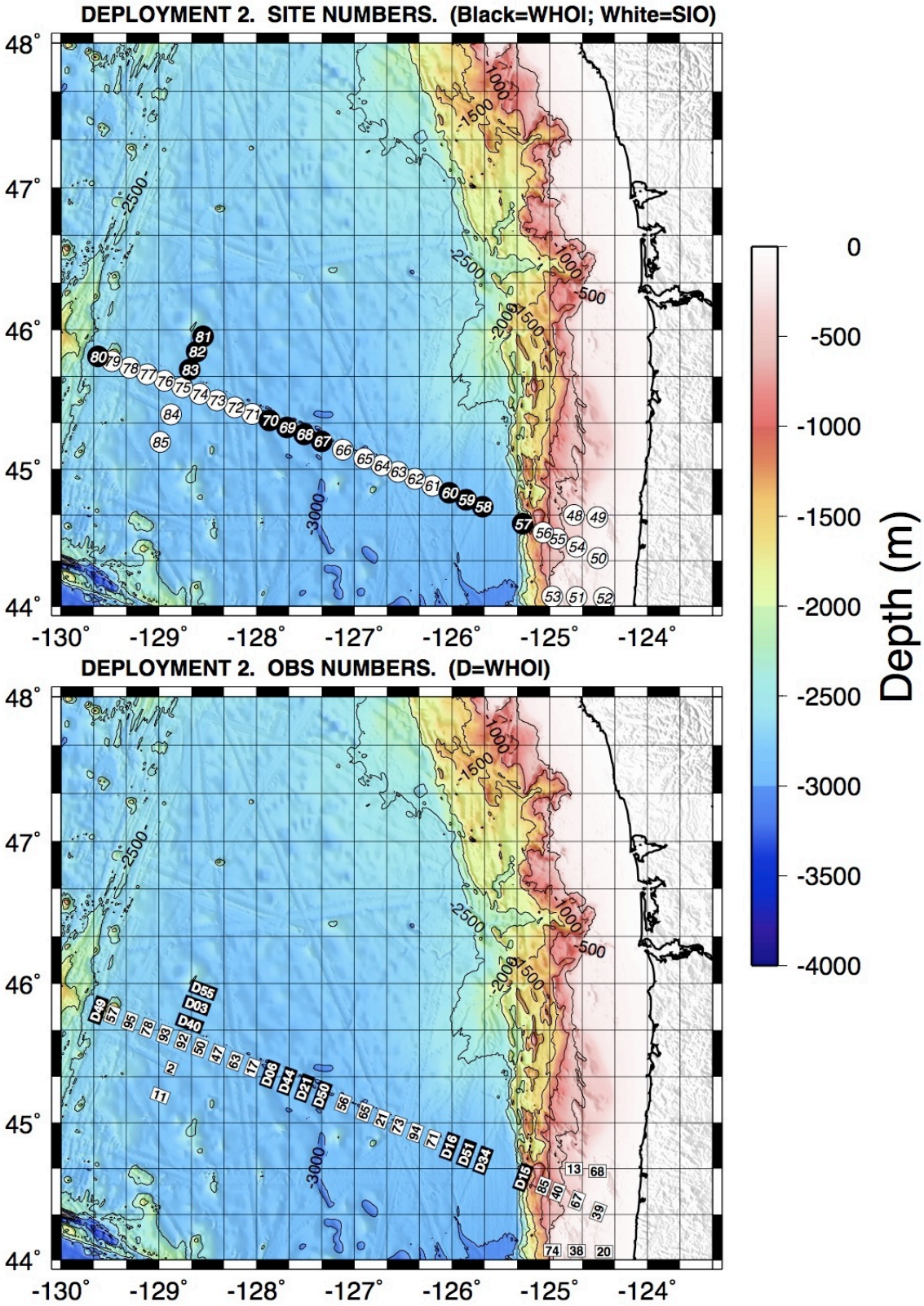
WHOI OBS



Hydrophone: High Tech® HTI-90-U
Geophone: Geospace® 4.5 Hz GS-11D
Data Logger: Quanterra QA330 24-bit A/D. Dynamic range: 135 dB. Data compression. **Sample Rate**: 200 Hz

A.5. OBS Deployments: Maps and Table




DEPLOYMENT 2. SITE NUMBERS. (Black=WHOI; White=SIO)
DEPLOYMENT 2. OBS NUMBERS. (D=WHOI)
48°
47°
46°
45°
44°
-130°
-129°
-128°
-127°
-126°
-125°
-124°
0
-500
-1000
-1500
-2000
-2500
-3000
-3500
-4000
Depth (m)

				Drop Location			Relocated Position								Deployment Date	Recovery Date	Shots Recorded	
OBSIP Instrument	OBS ID	Line	Site	Latitude	Longitude	4-12 kHz Depth (m)(e)	Latitude	Longitude	Δlon (m)	Δlat (m)	Depth (m)	Mean Water Sound Velocity from CTD (m/s)	Method	Multibeam Depth at Relocated Position (m)	Julian Day, Date UTC Time	Julian Day, Date UTC Time	First	Last
SIO	86	3	1	44.259570	-125.329770	2990	44.262331	-125.329098	62	304	2952	1488	Acous. Srvy.	2958	160, 08 Jun 2012 08:10:55	192, 10 Jul 2012 07:54:56	994	65,195
SIO	90	3	2	44.391623	-125.370525	2972	44.393251	-125.370865	-22	180	2933	1488	Acous. Srvy.	2946	160, 08 Jun 2012 09:24:13	192, 10 Jul 2012 10:26:20	994	65,195
SIO	23	3	3	44.539598	-125.415457	2932	44.539791	-125.415354	9	20	2896	1488	Acous. Srvy.	2908	160, 08 Jun 2012 10:42:19	192, 10 Jul 2012 12:33:32	994	65,195
WHOI	D39	1, 3	4	44.654888	-125.450827	2882	44.654696	-125.450571	20	-23	2848	1488	Acous. Srvy.	2859	160, 08 Jun 2012 11:44:29	192, 10 Jul 2012 14:30:30	994	65,195
WHOI	D35	3	5	44.801130	-125.495880	2838	44.799568	-125.496815	-79	-173	2804	1487	Acous. Srvy.	2816	160, 08 Jun 2012 12:45:11	192, 10 Jul 2012 16:24:54	994	65,195
WHOI	D09	3	6	44.921912	-125.532663	2795	44.919679	-125.532687	-10	-250	2758	1487	Acous. Srvy.	2772	160, 08 Jun 2012 13:36:03	192, 10 Jul 2012 18:08:06	994	65,195
SIO	61	3	7	45.092023	-125.585762	2734	45.086724	-125.581600	309	-601	2701	1486	Acous. Srvy.	2719	160, 08 Jun 2012 14:41:09	192, 10 Jul 2012 20:20:56	994	65,195
SIO	55	3	8	45.238032	-125.632253	2678	45.235602	-125.631545	47	-274	2645	1486	Acous. Srvy.	2655	160, 08 Jun 2012 15:50:17	192, 10 Jul 2012 22:30:06	994	65,195
SIO	71	3	9	45.383623	-125.677870	2621	45.381497	-125.677535	18	-239	2588	1486	Acous. Srvy.	2596	160, 08 Jun 2012 17:02:19	177, 25 Jun 2012 03:49:01	994	28,738
SIO	85	3	10	45.527817	-125.723083	2489	45.527513	-125.723108	-3	-36	2447	1485	Acous. Srvy.	2458	160, 08 Jun 2012 18:09:05	177, 25 Jun 2012 01:57:07	994	28,383
SIO	20	3	11	45.674677	-125.770007	2424	45.675083	-125.769737	22	42	2377	1485	Acous. Srvy.	2392	160, 08 Jun 2012 19:08:55	177, 25 Jun 2012 00:03:15	994	27,938
SIO	11	3	12	45.833083	-125.819270	2341	45.835096	-125.818472	70	218	2303	1484	Acous. Srvy.	2315	160, 08 Jun 2012 20:22:21	176, 24 Jun 2012 21:31:49	994	27,354
SIO	7	3	13	45.964572	-125.861758	2454	45.967380	-125.860540	105	305	2419	1485	Acous. Srvy.	2432	160, 08 Jun 2012 21:25:35	176, 24 Jun 2012 19:43:31	994	26,928
WHOI	D15	3	14	46.109972	-125.909232	2622	46.111697	-125.909477	-12	189	2584	1485	Acous. Srvy.	2597	160, 08 Jun 2012 22:37:59	176, 24 Jun 2012 17:54:19	994	26,504
WHOI	D51	3	15	46.266950	-125.959798	2579	46.267187	-125.958618	92	19	2540	1485	Acous. Srvy.	2556	160, 08 Jun 2012 23:39:55	176, 24 Jun 2012 16:00:49	994	26,100
WHOI	D16	3	16	46.401128	-126.004118	2599	46.401212	-126.003610	39	7	2556	1485	Acous. Srvy.	2573	161, 09 Jun 2012 00:32:33	176, 24 Jun 2012 14:23:05	994	25,710
SIO	57	3	17	46.545113	-126.051255	2673	46.544750	-126.051543	-20	-45	2631	1486	Acous. Srvy.	2643	161, 09 Jun 2012 01:29:37	176, 24 Jun 2012 12:29:53	994	25,262
SIO	95	3	18	46.689658	-126.098838	2641	46.689004	-126.098659	17	-76	2602	1485	Acous. Srvy.	2614	161, 09 Jun 2012 02:43:35	176, 24 Jun 2012 10:33:31	994	24,824
SIO	67	3	19	46.837078	-126.147683	2617	46.835359	-126.148649	-67	-197	2581	1485	Acous. Srvy.	2594	161, 09 Jun 2012 03:56:59	176, 24 Jun 2012 08:24:09	994	24,380
SIO	92	3	20	46.982170	-126.196107	2596	46.981364	-126.197013	-66	-95	2561	1485	Acous. Srvy.	2574	161, 09 Jun 2012 04:57:51	176, 24 Jun 2012 06:17:53	994	23,928
SIO	78	3	21	47.127237	-126.245323	2549	47.127533	-126.245717	-31	29	2513	1485	Acous. Srvy.	2524	161, 09 Jun 2012 06:01:31	176, 24 Jun 2012 04:20:13	994	23,476
SIO	93	3	22	47.271785	-126.294087	2503	47.271894	-126.293115	73	12	2467	1485	Acous. Srvy.	2479	161, 09 Jun 2012 07:03:25	176, 24 Jun 2012 02:22:07	994	23,007
WHOI	D49	2, 3	23	47.418402	-126.343270	2415	47.417772	-126.342588	54	-71	2378	1484	Acous. Srvy.	2393	162, 10 Jun 2012 05:19:05	176, 24 Jun 2012 00:19:29	994	22,598
WHOI	D40	3	24	47.549568	-126.386020	2353	47.550297	-126.385832	11	79	2316	1484	Acous. Srvy.	2333	161, 09 Jun 2012 08:53:07	175, 23 Jun 2012 22:38:15	994	22,225
WHOI	D50	3	25	47.681318	-126.428425	2315	47.682583	-126.428370	0	138	2263	1484	Acous. Srvy.	2281	161, 09 Jun 2012 09:42:11	175, 23 Jun 2012 21:01:15	994	22,449
WHOI	D62	3	26	47.812507	-126.470852	2266	47.813678	-126.471875	-81	125	2240	1483	Shots	2235	161, 09 Jun 2012 10:39:41	204, 22 Jul 2012 (f)	994	65,195
SIO	38	2	27	47.111337	-124.593202	81	47.111337	-124.593202				1483(c)	(g)	nan	161, 09 Jun 2012 19:17:55	173, 21 Jun 2012 07:58:35	994	7,482
SIO	39	2	28	47.123037	-124.789447	129	47.123037	-124.789447				1483(c)	(g)	nan	161, 09 Jun 2012 20:25:19	173, 21 Jun 2012 09:15:35	994	7,761
SIO	68	2	29	47.147398	-124.984832	300	47.147796	-124.983447	106	41	296	1481(c)	Shots	nan	161, 09 Jun 2012 21:32:39	173, 21 Jun 2012 10:27:07	994	8,019
SIO	56	2	30	47.174617	-125.138572	1260(a), 1403(b)	47.174805	-125.137854	55	18	1384	1480	Shots	1378	161, 09 Jun 2012 22:31:15	173, 21 Jun 2012 11:57:45	994	8,132
SIO	17	2	31	47.201442	-125.290252	1504	47.203650	-125.289418	70	242	1485	1481	Shots	1480	161, 09 Jun 2012 23:19:19	173, 21 Jun 2012 17:33:53	994	8,132

				Drop Location			Relocated Position								Deployment Date	Recovery Date	Shots Recorded	
OBSIP Instrument	OBS ID	Line	Site	Latitude	Longitude	4-12 kHz Depth (m)(e)	Latitude	Longitude	Δlon (m)	Δlat (m)	Depth (m)	Mean Water Sound Velocity from CTD (m/s)	Method	Multibeam Depth at Relocated Position (m)	Julian Day, Date UTC Time	Julian Day, Date UTC Time	First	Last
SIO	40	2	32	47.228675	-125.445843	1768	47.228781	-125.445029	62	8	1746	1481	Shots	1744	162, 10 Jun 2012 00:11:33	173, 21 Jun 2012 19:03:39	994	8,132
SIO	21	2	33	47.255202	-125.600200	1257	47.258299	-125.598405	147	337	1240	1480	Shots	1199	162, 10 Jun 2012 01:07:49	173, 21 Jun 2012 20:22:55	994	8,132
SIO	65	2	34	47.298170	-125.794572	1762	47.298327	-125.793530	79	11	1741	1482	Shots	1739	162, 10 Jun 2012 02:16:35	173, 21 Jun 2012 22:05:17	994	8,824
WHOI	D55	2	35	47.340293	-125.985987	1740(a), 1752(b)	47.340039	-125.984643	100	-36	1731	1482	Shots	1731	162, 10 Jun 2012 03:23:03	173, 21 Jun 2012 23:33:07	994	9,185
WHOI	D06	2	36	47.381838	-126.177248	2180	47.381837	-126.176434	62	-1	2155	1483	Shots	2139	162, 10 Jun 2012 04:27:01	174, 22 Jun 2012 01:19:21	994	9,564
WHOI	D44	2	37	47.463272	-126.555863	2419	47.463554	-126.554381	111	33	2383	1484	Acous. Srvy.	2396	162, 10 Jun 2012 06:22:49	174, 22 Jun 2012 03:35:05	994	10,025
SIO	13	2	38	47.503023	-126.744942	2475	47.503226	-126.743628	98	24	2438	1485	Acous. Srvy.	2450	162, 10 Jun 2012 07:23:01	174, 22 Jun 2012 05:24:21	994	10,341
SIO	50	2	39	47.543120	-126.935630	2542	47.543432	-126.934620	75	36	2505	1485	Acous. Srvy.	2516	162, 10 Jun 2012 08:38:21	174, 22 Jun 2012 07:16:17	994	10,696
SIO	47	2	40	47.582943	-127.127977	2564	47.583499	-127.127117	63	63	2528	1485	Acous. Srvy.	2539	162, 10 Jun 2012 09:48:53	174, 22 Jun 2012 09:17:13	994	11,164
SIO	63	2	41	47.622508	-127.320060	2616	47.622668	-127.319345	53	19	2581	1485	Acous. Srvy.	2592	162, 10 Jun 2012 10:54:23	174, 22 Jun 2012 11:26:51	994	11,666
WHOI	D21	2	42	47.662798	-127.518367	2652	47.662614	-127.517050	99	-19	2617	1485	Acous. Srvy.	2629	162, 10 Jun 2012 11:51:11	174, 22 Jun 2012 13:24:07	994	12,186
WHOI	D03	2	43	47.698115	-127.694047	2680	47.698940	-127.692516	113	94	2642	1485	Acous. Srvy.	2655	162, 10 Jun 2012 12:41:59	174, 22 Jun 2012 15:04:19	994	12,316
WHOI	D34	2	44	47.739083	-127.898748	2658	47.738871	-127.897776	73	-23	2622	1485	Acous. Srvy.	2634	162, 10 Jun 2012 13:42:05	174, 22 Jun 2012 16:55:05	994	15,101
SIO	73	2	45	47.776102	-128.086920	2673	47.775580	-128.084911	151	-56	2638	1485	Acous. Srvy.	2647	162, 10 Jun 2012 14:42:07	174, 22 Jun 2012 18:43:01	994	15,432
SIO	74	2	46	47.814357	-128.280652	2681	47.814240	-128.278675	148	-12	2645	1485	Acous. Srvy.	2657	162, 10 Jun 2012 15:45:33	174, 22 Jun 2012 20:34:23	NO DATA RETURNED	
SIO	94	2	47	47.851827	-128.473485	2686	47.849645	-128.471938	117	-242	2651	1485	Acous. Srvy.	2663	162, 10 Jun 2012 16:46:43	174, 22 Jun 2012 22:24:51	994	16,271
SIO	13	OR	48	44.667820	-124.749237	189	44.667753	-124.749350	-9	-8	187	1484(d)	Shots	nan	177, 25 Jun 2012 09:39:43	191, 09 Jul 2012 20:57:44	30,303	65,195
SIO	68	OR	49	44.651267	-124.509327	135	44.651091	-124.509549	-18	-19	134	1485(d)	Shots	133	177, 25 Jun 2012 11:03:47	191, 09 Jul 2012 19:23:48	30,303	65,195
SIO	39	1, OR	50	44.351000	-124.508040	98	44.351409	-124.508270	-18	46	97	1487(d)	Shots	96	177, 25 Jun 2012 12:43:21	191, 09 Jul 2012 17:08:12	30,529	65,195
SIO	38	OR	51	44.068562	-124.725692	113	44.068364	-124.724427	101	-25	112	1486(d)	Shots	114	177, 25 Jun 2012 15:29:47	192, 10 Jul 2012 02:58:56	31,333	65,195
SIO	20	OR	52	44.060983	-124.445415	123	44.060983	-124.445415				1486(d)	(g)	nan	177, 25 Jun 2012 14:18:57	192, 10 Jul 2012 01:23:56	31,333	65,195
SIO	74	OR	53	44.072052	-124.974182	457	44.072745	-124.973994	17	76	452	1482(d)	Shots	454	177, 25 Jun 2012 16:27:33	192, 10 Jul 2012 04:32:46	31,333	65,195
SIO	67	1	54	44.435780	-124.725625	139	44.435555	-124.725751	-11	-25	138	1485(d)	Shots	139	177, 25 Jun 2012 18:39:59	191, 09 Jul 2012 15:13:40	31,333	65,195
SIO	40	1	55	44.496060	-124.923882	539						1482			177, 25 Jun 2012 19:41:13	191, 09 Jul 2012 13:57:56	NO DATA RETURNED	
SIO	85	1	56	44.540447	-125.067795	1269	44.541114	-125.067222	47	72	1253	1481	Shots	1258	177, 25 Jun 2012 20:32:43	191, 09 Jul 2012 12:54:02	32,062	65,195
WHOI	D15	1	57	44.603248	-125.274575	2166	44.604969	-125.274168	38	189	2147	1484	Acous. Srvy.	2166	177, 25 Jun 2012 21:37:03	191, 09 Jul 2012 11:22:08	31,758	65,195
WHOI	D34	1	58	44.725882	-125.684323	2870	44.728148	-125.684048	30	249	2832	1487	Acous. Srvy.	2846	177, 25 Jun 2012 23:37:51	191, 09 Jul 2012 08:04:10	32,183	65,195
WHOI	D51	1	59	44.776820	-125.854578	2897	44.777669	-125.854484	11	91	2861	1487	Acous. Srvy.	2877	178, 26 Jun 2012 00:32:39	191, 09 Jul 2012 05:25:28	32,364	65,195
WHOI	D16	1	60	44.826960	-126.027432	2856	44.827395	-126.026624	62	47	2818	1487	Acous. Srvy.	2832	178, 26 Jun 2012 01:27:53	191, 09 Jul 2012 02:52:04	32,467	65,195
SIO	71	1	61	44.878630	-126.201433	2832	44.879523	-126.200288	87	100	2807	1487	Shots	2806	178, 26 Jun 2012 02:22:31	191, 09 Jul 2012 00:30:02	33,417	65,195
SIO	94	1	62	44.930325	-126.379057	2828	44.929824	-126.377348	137	-53	2803	1487	Shots	2804	178, 26 Jun 2012 03:15:23	190, 08 Jul 2012 22:16:02	33,839	65,195

				Drop Location			Relocated Position								Deployment Date	Recovery Date	Shots Recorded	
OBSIP Instrument	OBS ID	Line	Site	Latitude	Longitude	4-12 kHz Depth (m)(e)	Latitude	Longitude	Δlon (m)	Δlat (m)	Depth (m)	Mean Water Sound Velocity from CTD (m/s)	Method	Multibeam Depth at Relocated Position (m)	Julian Day, Date UTC Time	Julian Day, Date UTC Time	First	Last
SIO	73	1	63	44.979618	-126.549643	2855	44.979735	-126.548433	95	14	2830	1487	Shots	2828	178, 26 Jun 2012 04:07:23	190, 08 Jul 2012 20:14:32	33,839	65,195
SIO	21	1	64	45.028302	-126.720972	2872	45.027500	-126.719969	82	-88	2847	1487	Shots	2847	178, 26 Jun 2012 04:58:27	190, 08 Jul 2012 18:16:50	33,839	65,195
SIO	65	1	65	45.078455	-126.896560	2867	45.079499	-126.894711	143	119	2842	1487	Shots	2843	178, 26 Jun 2012 05:50:27	190, 08 Jul 2012 16:09:56	33,839	65,195
SIO	56	1	66	45.140468	-127.114450	2890	45.140445	-127.113495	75	-1	2865	1487	Shots	2867	178, 26 Jun 2012 06:55:43	190, 08 Jul 2012 14:06:02	33,839	65,195
WHOI	D50	1	67	45.201015	-127.331528	2899	45.201811	-127.330408	86	90	2864	1487	Acous. Srvy.	2876	178, 26 Jun 2012 08:03:27	190, 08 Jul 2012 11:57:50	33,850	65,195
WHOI	D21	1	68	45.250568	-127.509400	2914	45.250809	-127.508856	42	27	2873	1487	Acous. Srvy.	2887	178, 26 Jun 2012 09:01:21	190, 08 Jul 2012 09:18:36	34,063	65,195
WHOI	D44	1	69	45.299497	-127.687753	2883	45.299927	-127.686854	70	49	2845	1486	Acous. Srvy.	2861	178, 26 Jun 2012 09:56:57	190, 08 Jul 2012 06:42:10	34,275	65,195
WHOI	D06	1	70	45.349635	-127.866738	2954	45.349352	-127.866252	39	-31	2911	1484	Acous. Srvy.	2928	178, 26 Jun 2012 10:56:39	190, 08 Jul 2012 04:15:44	34,502	65,195
SIO	17	1	71	45.397222	-128.045765	2866	45.397068	-128.045529	19	-17	2839	1486	Shots	2844	178, 26 Jun 2012 11:50:31	190, 08 Jul 2012 01:50:40	35,195	65,195
SIO	63	1	72	45.445823	-128.223803	2834	45.446292	-128.223009	62	53	2808	1486	Shots	2813	178, 26 Jun 2012 12:40:51	189, 07 Jul 2012 23:48:18	35,638	65,195
SIO	47	1	73	45.493693	-128.404075	2826	45.493806	-128.402864	95	13	2800	1486	Shots	2802	178, 26 Jun 2012 13:30:43	189, 07 Jul 2012 21:49:26	35,414	65,195
SIO	50	1	74	45.540852	-128.581307	2804	45.540223	-128.578926	186	-69	2778	1486	Shots	2781	178, 26 Jun 2012 14:19:47	189, 07 Jul 2012 19:51:46	35,638	65,195
SIO	92	1, 4	75	45.588482	-128.761385	2797	45.587565	-128.759823	122	-101	2773	1487	Shots	2775	178, 26 Jun 2012 15:11:03	189, 07 Jul 2012 17:47:48	35,867	65,164
SIO	93	1	76	45.635347	-128.940660	2800	45.635029	-128.940754	-7	-35	2774	1486	Shots	2778	178, 26 Jun 2012 16:09:45	189, 07 Jul 2012 15:59:14	35,867	65,133
SIO	78	1	77	45.681962	-129.119658	2767	45.681455	-129.118218	112	-56	2741	1486	Shots	2739	178, 26 Jun 2012 16:58:27	189, 07 Jul 2012 13:57:42	36,298	65,099
SIO	95	1	78	45.728377	-129.299692	2733	45.727101	-129.299192	38	-142	2707	1486	Shots	2715	178, 26 Jun 2012 17:49:23	189, 07 Jul 2012 12:05:30	36,507	65,067
SIO	57	1	79	45.774647	-129.479948	2540	45.774438	-129.479619	25	-23	2515	1485	Shots	2590	178, 26 Jun 2012 18:40:45	189, 07 Jul 2012 10:02:56	36,507	65,033
WHOI	D49	1	80	45.810393	-129.621097	2609	45.809527	-129.621020	5	-96	2544	1485	Acous. Srvy.	2572	178, 26 Jun 2012 19:25:27	189, 07 Jul 2012 08:21:04	36,386	65,006
WHOI	D55	4	81	45.951513	-128.548127	2785	45.951506	-128.549495	-106	-1	2747	1486	Acous. Srvy.	2762	178, 26 Jun 2012 23:52:29	189, 07 Jul 2012 02:23:16	37,310	64,592
WHOI	D03	4	82	45.842630	-128.611712	2795	45.842778	-128.612206	-38	16	2757	1486	Acous. Srvy.	2769	179, 27 Jun 2012 00:42:05	188, 06 Jul 2012 23:59:02	37,443	64,446
WHOI	D40	4	83	45.716563	-128.686270	2806	45.716917	-128.684703	122	40	2769	1486	Acous. Srvy.	2779	179, 27 Jun 2012 01:40:07	188, 06 Jul 2012 21:19:54	37,639	64,298
SIO	2	4	84	45.393187	-128.874498	2820	45.393488	-128.876178	-132	33	2796	1487	Shots	2796	179, 27 Jun 2012 03:52:13	188, 06 Jul 2012 17:41:48	38,867	64,073
SIO	11	4	85	45.197893	-128.986975	2832	45.197440	-128.987154	-14	-50	2806	1486	Shots	2807	179, 27 Jun 2012 05:17:03	188, 06 Jul 2012 15:14:40	39,099	63,340

(a) Depth based on low-res gridded bathmyetry.
(b) Depth based on 4-12 kHz echosounder at the time of CTD cast.
(c) No CTD Casts at these Sites. Mean sound velocity is calculated from CTD cast at Site 30 , averaging up to the seafloor depth of each site.
(d) No CTD Casts at these Sites. Mean sound velocity is calculated from CTD cast at Site 55 , averaging up to the seafloor depth of each site.
(e) Echosounder used 1500 m/s as sound velocity.
(f) WHOI OBS D62 was recovered during *RV Thompson* Cruise TN283.
(g) Not relocated because all source-receiver offsets are larger than 15 km, or no reliable picks for direct water arrival could be made. Using the drop location as the relocated one.

A.6. Data Quality Table

Good	Noisy	Bad or very weak	Dead/no data returned

Site	X SIO Channel 0 WHOI Channel 2	Y SIO Channel 1 WHOI Channel 3	Z SIO Channel 2 WHOI Channel 1	Hydrophone SIO Channel 3 WHOI Channel 4	OBS ID
1					86
2					90
3					23
4					D39
5					D35
6					D09
7					61
8					55
9					71
10					85
11					20
12					11
13					7
14					D15
15					D51
16					D16
17					57
18					95
19					67
20					92
21					78
22					93
23				low gain	D49
24					D40
25					D50
26					D62
27					38
28					39
29					68
30					56
31					17
32					40
33					21
34					65
35					D55
36					D06
37					D44
38					13
39					50
40					47
41					63
42		low gain			D21
43					D03
44		low gain			D34
45					73
46					74
47					94
48					13
49					68

	Good	Noisy	Bad or very weak	Dead/no data returned	
Site	X SIO Channel 0 WHOI Channel 2	Y SIO Channel 1 WHOI Channel 3	Z SIO Channel 2 WHOI Channel 1	Hydrophone SIO Channel 3 WHOI Channel 4	OBS ID
50					39
51					38
52					20
53					74
54					67
55					40
56					85
57					D15
58					D34
59					D51
60		low gain	low gain		D16
61					71
62					94
63					73
64					21
65					65
66					56
67					D50
68		low gain			D21
69					D44
70					D06
71					17
72					63
73					47
74					50
75					92
76					93
77					78
78					95
79					57
80					D49
81		low gain			D55
82					D03
83					D40
84					2
85					11

A.7. MGL1211 Shotlog Files Table

FILE	Median Δx (m)	Median Δt (s)	Minimum Δt (s)	Type	First shot	Last shot	Line
Seq 001	500	215	201	OBS	994	1819	3
Seq 002	500	214	192	OBS	1845	2051	Fan 1
Seq 003	500	217	209	OBS	2133	2156	Fan 1
Seq 004	500	198	183	OBS	2159	2333	transit
Seq 005	500	220	194	OBS	3124	3402	2
Seq 006	500	215	200	OBS	3555	3939	2
Seq 007	37.5	16	14	MCS	6657	8132	2
Seq 008	37.5	16	14	MCS	8716	12316	2
Seq 009	37.6	18	15	MCS	15083	15534	transit
Seq 010	37.6	15	14	MCS	15547	15887	transit
Seq 011	37.5	15	13	MCS	15930	16402	transit
Seq 012	37.5	16	14	MCS	16502	17825	2
Seq 013	37.7	17	14	MCS	18139	18799	3
Seq 014	150	58	55	OBS / Low-fold MCS	19004	19149	3
Seq 015	37.6	17	13	MCS	20167	30879	3
Seq 016	37.5	16	14	MCS	31333	32391	transit
Seq 017	37.5	17	9	MCS	32467	45199	1
Seq 018	37.5	20	17	MCS	46011	46506	Axial
Seq 019	37.6	16	14	MCS	46845	47704	Axial
Seq 020	37.6	19	17	MCS	47851	48318	Axial
Seq 021	37.7	17	15	MCS	48886	49754	Axial
Seq 022	37.6	17	15	MCS	50101	50794	1
Seq 023	500	229	217	OBS	51032	51123	1
Seq 024	150	69	63	OBS / Low-fold MCS	51207	51726	Fan 2
Seq 025	150	63	57	OBS / Low-fold MCS	52013	52656	4
Seq 026 pre leap second	150	67	62	OBS / Low-fold MCS	52711	53142	Fan 2
Seq 026 post leap second	150	68	65	OBS / Low-fold MCS	53143	53206	Fan 2
Seq 027	500	219	205	OBS	53429	53620	1
Seq 028	500	214	193	OBS	54312	54840	1
Seq 029	500	214	203	OBS	55792	55991	1
Seq 030	170	61	59	OBS	56006	56137	OR add-on
Seq 031	170	60	56	OBS	56207	56322	OR add-on
Seq 032	170	65	57	OBS	56433	57059	OR add-on
Seq 033	170	100	70	OBS	58005	58096	OR add-on
Seq 034	170	60	54	OBS	59003	59768	OR add-on
Seq 035	170	62	57	OBS	60015	60160	OR add-on
Seq 036	170	61	56	OBS	61001	61633	OR add-on
Seq 037	170	60	57	OBS	62006	62271	OR add-on
Seq 038	170	61	58	OBS	62304	62533	OR add-on
Seq 039	170	61	56	OBS	62659	63413	OR add-on
Seq 040	170	61	57	OBS	64003	64920	Fan 3
Seq 041	500	215	198	OBS	65002	65195	3

A.8. CTD Table

			DEPLOYMENT				RECOVERY		
Transect	Site	Cast	Date	Latitude	Longitude	Seafloor	Date	Latitude	Longitude
2	47	1	Sun 10 Jun 2012 18:13:55	47.851588	-128.473458	2684	Sun 10 Jun 2012 20:06:27	47.850205	-128.473665
2	46	2	Sun 10 Jun 2012 21:09:23	47.813905	-128.280017	2679			
2	45	3	Mon 11 Jun 2012 00:07:01	47.775947	-128.087268	2672	Mon 11 Jun 2012 01:38:09	47.772995	-128.088248
2	44	4	Mon 11 Jun 2012 02:38:37	47.737838	-127.896437	2659	Mon 11 Jun 2012 04:26:31	47.737553	-127.895833
2	43	5	Mon 11 Jun 2012 05:36:31	47.698067	-127.693328	2680	Mon 11 Jun 2012 07:22:55	47.696767	-127.691622
2	42	6	Mon 11 Jun 2012 08:29:19	47.662570	-127.517283	2651	Mon 11 Jun 2012 10:10:35	47.661922	-127.513010
2	41	7	Mon 11 Jun 2012 11:10:51	47.623012	-127.316685	2614	Mon 11 Jun 2012 12:50:33	47.620370	-127.316195
2	40	8	Mon 11 Jun 2012 13:57:15	47.583493	-127.128907	2564	Mon 11 Jun 2012 15:34:17	47.583182	-127.129202
2	39	9	Mon 11 Jun 2012 16:39:11	47.542488	-126.935535	2542	Mon 11 Jun 2012 18:23:15	47.541873	-126.930958
2	38	10	Mon 11 Jun 2012 19:30:19	47.502995	-126.744707	2475	Mon 11 Jun 2012 20:59:01	47.502633	-126.744752
2	37	11	Mon 11 Jun 2012 21:57:53	47.462818	-126.556428	2419	Mon 11 Jun 2012 23:33:51	47.462940	-126.554760
2	23	12	Tue 12 Jun 2012 00:40:41	47.417710	-126.344172	2415	Tue 12 Jun 2012 02:14:15	47.417200	-126.345468
2	36	13	Tue 12 Jun 2012 03:21:11	47.381533	-126.177295	2164	Tue 12 Jun 2012 04:45:09	47.381863	-126.177760
2	35	14	Tue 12 Jun 2012 05:44:53	47.340063	-125.985062	1752	Tue 12 Jun 2012 06:55:13	47.339383	-125.984067
2	34	15	Tue 12 Jun 2012 07:54:07	47.298758	-125.794595	1762	Tue 12 Jun 2012 09:07:29	47.300053	-125.794413
2	33	16	Tue 12 Jun 2012 10:15:01	47.255185	-125.600718	1253	Tue 12 Jun 2012 11:03:39	47.254397	-125.600920
2	32	17	Tue 12 Jun 2012 12:04:43	47.227677	-125.445898	1765	Tue 12 Jun 2012 13:22:25	47.226985	-125.446405
2	31	18	Tue 12 Jun 2012 15:08:09	47.201370	-125.291907	1509	Tue 12 Jun 2012 16:07:23	47.201795	-125.292233
2	30	19	Tue 12 Jun 2012 17:04:43	47.174715	-125.138523	1403	Tue 12 Jun 2012 18:10:43	47.174782	-125.138455
3	26	20	Wed 13 Jun 2012 02:01:33	47.812918	-126.471480	2262	Wed 13 Jun 2012 03:25:27	47.813355	-126.472483
3	25	21	Wed 13 Jun 2012 04:35:31	47.681318	-126.429613	2307	Wed 13 Jun 2012 06:05:01	47.681207	-126.429508
3	24	22	Wed 13 Jun 2012 07:05:17	47.549670	-126.386757	2357	Wed 13 Jun 2012 08:38:01	47.551780	-126.389815
3	23	23	Wed 13 Jun 2012 09:42:53	47.417605	-126.343478	2423	Wed 13 Jun 2012 11:17:25	47.415657	-126.343678
3	22	24	Wed 13 Jun 2012 12:28:19	47.272342	-126.294403	2503	Wed 13 Jun 2012 14:23:17		
3	21	25	Wed 13 Jun 2012 15:23:03	47.128113	-126.244385	2550	Wed 13 Jun 2012 17:04:25	47.130430	-126.244728
3	20	26	Wed 13 Jun 2012 18:21:31	46.982020	-126.195983	2598	Wed 13 Jun 2012 19:55:23	46.982898	-126.197780

			DEPLOYMENT				RECOVERY		
Transect	Site	Cast	Date	Latitude	Longitude	Seafloor	Date	Latitude	Longitude
3	19	27	Wed 13 Jun 2012 21:28:45	46.837007	-126.148467	2616	Wed 13 Jun 2012 22:40:27	46.837053	-126.148028
3	18	28	Wed 13 Jun 2012 23:48	46.691277	-126.100362		Thu 14 Jun 2012 01:28:55	46.687787	-126.099772
3	17	29	Thu 14 Jun 2012 02:29:49	46.546170	-126.051910	2667	Thu 14 Jun 2012 04:11:45	46.547120	-126.051470
3	16	30	Thu 14 Jun 2012 05:19:35	46.400905	-126.003815	2593	Thu 14 Jun 2012 06:58:11	46.400533	-126.003580
3	15	31	Thu 14 Jun 2012 08:05:21	46.267577	-125.959923	2580	Thu 14 Jun 2012 09:43:15	46.267958	-125.958008
3	14	32	Thu 14 Jun 2012 10:55:19	46.109730	-125.908478	2620	Thu 14 Jun 2012 12:34:49	46.110440	-125.911537
3	13	33	Thu 14 Jun 2012 13:42:01	45.964367	-125.861935	2451	Thu 14 Jun 2012 15:14:07	45.964482	-125.861873
3	12	34	Thu 14 Jun 2012 16:18:03	45.833007	-125.820262	2340	Thu 14 Jun 2012 17:56:33	45.833237	-125.819343
3	11	35	Thu 14 Jun 2012 19:03:25	45.673517	-125.769412	2413	Thu 14 Jun 2012 20:39:17	45.673458	-125.768553
3	10	36	Thu 14 Jun 2012 21:56:53	45.528755	-125.723337	2488	Thu 14 Jun 2012 23:17:25	45.529203	-125.724167
3	9	37	Fri 15 Jun 2012 00:23:15	45.383115	-125.677507	2621	Fri 15 Jun 2012 01:57:49	45.382632	-125.677288
3	8	38	Fri 15 Jun 2012 03:10:57	45.237355	-125.631397	2680	Fri 15 Jun 2012 04:50:55	45.237087	-125.631288
3	7	39	Fri 15 Jun 2012 05:59:59	45.092123	-125.585935	2735	Fri 15 Jun 2012 07:42:03	45.092932	-125.583062
3	6	40	Fri 15 Jun 2012 09:27:11	44.921735	-125.532042	2795	Fri 15 Jun 2012 10:46:09	44.921933	-125.531892
3	5	41	Fri 15 Jun 2012 11:47:11	44.800823	-125.495422	2836	Fri 15 Jun 2012 13:36:45	44.799902	-125.494315
3	4	42	Fri 15 Jun 2012 14:42:35	44.655372	-125.450902	2880	Fri 15 Jun 2012 16:31:45	44.652018	-125.449640
3	3	43	Fri 15 Jun 2012 17:27:39	44.539785	-125.415998	2931	Fri 15 Jun 2012 19:17:55	44.541310	-125.417542
3	2	44	Fri 15 Jun 2012 20:48:49	44.391668	-125.370457	2970	Fri 15 Jun 2012 22:19:25	44.390003	-125.371350
3	1	45	Fri 15 Jun 2012 23:18:55	44.259640	-125.329852	2990	Sat 16 Jun 2012 01:08:45	44.259420	-125.328217
4	85	46	Wed 27 Jun 2012 06:30:21	45.198025	-128.986385	2832	Wed 27 Jun 2012 08:13:21	45.196407	-128.987072
4	84	47	Wed 27 Jun 2012 09:42:41	45.393153	-128.874338	2820	Wed 27 Jun 2012 11:32:29	45.395248	-128.876110
4	75	48	Wed 27 Jun 2012 14:18:25	45.588215	-128.761195	2797	Wed 27 Jun 2012 14:52:05	45.588248	-128.763780
4	83	49	Wed 27 Jun 2012 15:50:57	45.716438	-128.685888		Wed 27 Jun 2012 17:44:13	45.717057	-128.686090
4	82	50	Wed 27 Jun 2012 18:41:45	45.842890	-128.612303	2792	Wed 27 Jun 2012 20:30:59	45.840475	-128.612628
4	81	51	Wed 27 Jun 2012 23:10:39	45.949337	-128.552212	2783	Wed 27 Jun 2012 23:11:43	45.949370	-128.555530
1	80	52	Fri 29 Jun 2012 23:20:35	45.810395	-129.620870	2613	Sat 30 Jun 2012 00:44:19	45.806632	-129.617522

			DEPLOYMENT				RECOVERY		
Transect	Site	Cast	Date	Latitude	Longitude	Seafloor	Date	Latitude	Longitude
1	79	53	Sat 30 Jun 2012 01:38:55	45.774372	-129.479868	2561	Sat 30 Jun 2012 03:10:29	45.774188	-129.481883
1	78	54	Sat 30 Jun 2012 04:18:35	45.728352	-129.300127	2737	Sat 30 Jun 2012 06:03:21	45.728018	-129.303392
1	77	55	Sat 30 Jun 2012 06:57:13	45.682020	-129.121065	2763	Sat 30 Jun 2012 08:37:13	45.681832	-129.121127
1	76	56	Sat 30 Jun 2012 09:38:37	45.635477	-128.941405	2798	Sat 30 Jun 2012 11:26:25	45.637405	-128.938200
1	75	57	Sat 30 Jun 2012 12:22:05	45.588143	-128.761520	2796	Sat 30 Jun 2012 14:09:15	45.590113	-128.760415
1	74	58	Sat 30 Jun 2012 15:06:49	45.541113	-128.582230	2805	Sat 30 Jun 2012 16:54:03	45.541393	-128.582088
1	73	59	Sat 30 Jun 2012 17:51:45	45.493272	-128.402477	2826	Sat 30 Jun 2012 19:43:47	45.495918	-128.401065
1	72	60	Sat 30 Jun 2012 21:17:13	45.445837	-128.223767	2833	Sat 30 Jun 2012 22:31:45	45.446890	-128.222612
1	71	61	Sat 30 Jun 2012 23:29:25	45.397538	-128.044653	2858	Sun 01 Jul 2012 01:15:40	45.397863	-128.040355
1	70	62	Sun 01 Jul 2012 02:10:46	45.348697	-127.866630	2954	Sun 01 Jul 2012 03:59:56	45.349160	-127.866640
1	69	63	Sun 01 Jul 2012 05:24:30	45.299488	-127.687662	2884	Sun 01 Jul 2012 06:49:48	45.301258	-127.688280
1	68	64	Sun 01 Jul 2012 07:50:16	45.250163	-127.509512	2919	Sun 01 Jul 2012 09:48:30	45.253728	-127.515413
1	CC1	65	Sun 01 Jul 2012 10:15:56	45.237057	-127.458717	3003	Sun 01 Jul 2012 12:10:08	45.237317	-127.460355
1	CC2	66	Sun 01 Jul 2012 12:37:50	45.216808	-127.383038	2976	Sun 01 Jul 2012 14:28:46	45.217520	-127.381672
1	67	67	Sun 01 Jul 2012 15:24:56	45.201003	-127.332108	2899	Sun 01 Jul 2012 17:17:24	45.201068	-127.331750
1	66	68	Sun 01 Jul 2012 18:19:36	45.140050	-127.113657	2894	Sun 01 Jul 2012 20:11:56	45.141315	-127.111948
1	65	69	Sun 01 Jul 2012 21:29:22	45.078568	-126.896405	2867	Sun 01 Jul 2012 23:08:32	45.079188	-126.894535
1	64	70	Mon 02 Jul 2012 00:33:20	45.028495	-126.719852	2871	Mon 02 Jul 2012 02:13:18	45.026795	-126.721622
1	63	71	Mon 02 Jul 2012 03:11:30	44.979115	-126.549507	2853	Mon 02 Jul 2012 04:57:18	44.979490	-126.552030
1	62	72	Mon 02 Jul 2012 06:58:20	44.930058	-126.379430	2830	Mon 02 Jul 2012 08:39:46	44.931028	-126.379485
1	61	73	Mon 02 Jul 2012 09:38:20	44.878955	-126.201683	2831	Mon 02 Jul 2012 11:27:50	44.879285	-126.200497
1	60	74	Mon 02 Jul 2012 12:22:42	44.827687	-126.026487	2855	Mon 02 Jul 2012 14:11:56	44.828258	-126.027530
1	59	75	Mon 02 Jul 2012 15:07:14	44.776562	-125.854868	2895	Mon 02 Jul 2012 16:57:50	44.778795	-125.856193
1	58	76	Mon 02 Jul 2012 18:09:52	44.726232	-125.684542	2872	Mon 02 Jul 2012 20:30:20	44.699575	-125.594703
1	4	77	Mon 02 Jul 2012 21:21:12	44.655107	-125.450797	2880	Mon 02 Jul 2012 23:29:32		-125.421343
1	57	78	Tue 03 Jul 2012 03:56:16	44.602992	-125.274568	2171	Tue 03 Jul 2012 05:22:00	44.600655	-125.266770

			DEPLOYMENT				RECOVERY		
Transect	**Site**	**Cast**	**Date**	**Latitude**	**Longitude**	**Seafloor**	**Date**	**Latitude**	**Longitude**
1	56	79	Tue 03 Jul 2012 07:26:10	44.539207	-125.066738	1268	Tue 03 Jul 2012 08:24:06	44.540862	-125.068358
1	55	80	Tue 03 Jul 2012 09:20:34	44.496072	-124.922462	537	Tue 03 Jul 2012 09:55:12	44.496317	-124.921827
TOW-YO 01	AX01		Thu 28 Jun 2012 07:17:53	45.936243	-129.982382		Thu 28 Jun 2012 09:29:31	45.902275	-129.974370
TOW-YO 05	AX09		Thu 28 Jun 2012 09:49:37	45.933725	-130.013225	1567	Thu 28 Jun 2012 13:35:45	45.934372	-129.910902
TOW-YO 07	AX13		Thu 28 Jun 2012 15:14:13	45.953212	-129.970138	1562	Thu 28 Jun 2012 18:21:15	45.897197	-129.993023
TOW-YO 02	AX03		Thu 28 Jun 2012 19:42:17	45.978045	-130.000103	1585	Thu 28 Jun 2012 23:58:59	45.879067	-129.961867
TOW-YO 03	AX05		Fri 29 Jun 2012 02:42:41	45.953413	-129.972555	1548	Fri 29 Jun 2012 07:58:03	45.881887	-130.001032
TOW-YO 04	AX07		Fri 29 Jun 2012 12:12:05	45.953892	-129.974498	1543	Fri 29 Jun 2012 16:07:31	45.866517	-130.013903
TOW-YO 08			Fri 29 Jun 2012 16:41:25	45.940507	-130.013827	1571	Fri 29 Jun 2012 17:57:37	45.938203	-130.005115
TOW-YO 08B			Fri 29 Jun 2012 18:16:41	45.941105	-129.959247	1560	Fri 29 Jun 2012 21:00:23	45.947035	-130.038623

A.9. Electronic Cruise Log (ELOG)

R2R ELOG Cruise OC1206A

Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Wed 06 Jun 2012 23:21:25	Ship	other	NaN	NaN	NaN	44.625678	-124.044805		test at pier
Thu 07 Jun 2012 18:38:17	Ship	startCruise	NaN	NaN	NaN	44.625687	-124.044805		
Thu 07 Jun 2012 21:44:45	Ship	other	NaN	NaN	NaN	44.530372	-124.368232		engine work needed expect to be 4h behind schedule
Thu 07 Jun 2012 23:42:59	Ship	other	NaN	NaN	NaN	44.503430	-124.373180		engine back on, moving towards site 1
Fri 08 Jun 2012 03:48:01	OBS_SIO	other	NaN	site 1 rosette	NaN	44.262228	-125.329328		arrival on site
Fri 08 Jun 2012 03:56:21	OBS_SIO	deploy	NaN	site 1 rosette	NaN	44.265037	-125.328713	2987	1st set of acoustic transponders
Fri 08 Jun 2012 05:45:39	OBS_SIO	recover	NaN	site 1 rosette	NaN	44.265203	-125.326430	2980	1st set of acoustic transponders
Fri 08 Jun 2012 06:08:49	OBS_SIO	deploy	NaN	site 1 rosette	NaN	44.271157	-125.323528	2988	2nd set of acoustic transponders
Fri 08 Jun 2012 07:02:37	OBS_SIO	other	NaN	Site 1 rosette	NaN	44.266910	-125.322398	2987	rosette fully out starting 2nd acoustic test
Fri 08 Jun 2012 07:08:47	OBS_SIO	other	NaN	Site 1 rosette	NaN	44.265560	-125.322860		all acoustic test OK starting rosette coming up at 60 m minute
Fri 08 Jun 2012 07:53:27	OBS_SIO	recover	NaN	site 1 rosette	NaN	44.257772	-125.325022		rosette on board
Fri 08 Jun 2012 08:10:55	OBS_SIO	deploy	3	1	86	44.259570	-125.329770	2990	Im using the CAST number as datalogger ID Station is Site number
Fri 08 Jun 2012 09:24:13	OBS_SIO	deploy	3	2	90	44.391623	-125.370525	2972	
Fri 08 Jun 2012 10:42:19	OBS_SIO	deploy	3	3	23	44.539598	-125.415457	2932	
Fri 08 Jun 2012 11:44:29	OBS_WHOI	deploy	3	4	D39	44.654888	-125.450827	2882	
Fri 08 Jun 2012 12:45:11	OBS_WHOI	deploy	3	5	D35	44.801130	-125.495880	2838	
Fri 08 Jun 2012 13:36:03	OBS_WHOI	deploy	3	6	D09	44.921912	-125.532663	2795	
Fri 08 Jun 2012 14:41:09	OBS_SIO	deploy	3	7	61	45.092023	-125.585762	2734	
Fri 08 Jun 2012 15:50:17	OBS_SIO	deploy	3	8	55	45.238032	-125.632253	2678	
Fri 08 Jun 2012 17:02:19	OBS_SIO	deploy	3	9	71	45.383623	-125.677870	2621	
Fri 08 Jun 2012 18:09:05	OBS_SIO	deploy	3	10	85	45.532425	-125.722795	2489	I missed the deployment signal, this event occurred about 3 minutes after deployment. The bridge date/position at deployment is 18:01:56 45deg 31.669'N 125deg 43.385W
Fri 08 Jun 2012 19:08:55	OBS_SIO	deploy	3	11	20	45.674677	-125.770007	2424	
Fri 08 Jun 2012 20:22:21	OBS_SIO	deploy	3	12	11	45.833083	-125.819270	2341	
Fri 08 Jun 2012 21:25:35	OBS_SIO	deploy	3	13	7	45.964572	-125.861758	2454	
Fri 08 Jun 2012 22:37:59	OBS_WHOI	deploy	3	14	D15	46.109972	-125.909232	2622	
Fri 08 Jun 2012 23:39:55	OBS_WHOI	deploy	3	15	D51	46.266950	-125.959798	2579	
Sat 09 Jun 2012 00:32:33	OBS_WHOI	deploy	3	16	D16	46.401128	-126.004118	2599	
Sat 09 Jun 2012 01:29:37	OBS_SIO	deploy	3	17	57	46.545113	-126.051255	2673	
Sat 09 Jun 2012 02:43:35	OBS_SIO	deploy	3	18	95	46.689658	-126.098838	2641	
Sat 09 Jun 2012 03:56:59	OBS_SIO	deploy	3	19	67	46.837078	-126.147683	2617	
Sat 09 Jun 2012 04:57:51	OBS_SIO	deploy	3	20	92	46.982170	-126.196107	2596	
Sat 09 Jun 2012 06:01:31	OBS_SIO	deploy	3	21	78	47.127237	-126.245323	2549	
Sat 09 Jun 2012 07:03:25	OBS_SIO	deploy	3	22	93	47.271785	-126.294087	2503	
Sat 09 Jun 2012 08:53:07	OBS_WHOI	deploy	3	24	D40	47.549568	-126.386020	2353	
Sat 09 Jun 2012 09:42:11	OBS_WHOI	deploy	3	25	D50	47.681318	-126.428425	2315	
Sat 09 Jun 2012 10:39:41	OBS_WHOI	deploy	3	26	D62	47.812507	-126.470852	2266	

R2R ELOG Cruise OC1206A

Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Sat 09 Jun 2012 19:17:55	OBS_SIO	deploy	2	27	38	47.111337	-124.593202	81	
Sat 09 Jun 2012 20:25:19	OBS_SIO	deploy	2	28	39	47.123037	-124.789447	129	
Sat 09 Jun 2012 21:32:39	OBS_SIO	deploy	2	29	68	47.147398	-124.984832	300	depth could not be read because of 3.5 kHz settings; 300m is expected depth at site
Sat 09 Jun 2012 22:31:15	OBS_SIO	deploy	2	30	56	47.174617	-125.138572		seafloor depth could not be read; expected to be 1260 m at this site
Sat 09 Jun 2012 23:19:19	OBS_SIO	deploy	2	31	17	47.201442	-125.290252	1504	
Sun 10 Jun 2012 00:11:33	OBS_SIO	deploy	2	32	40	47.228675	-125.445843	1768	
Sun 10 Jun 2012 01:07:49	OBS_SIO	deploy	2	33	21	47.255202	-125.600200	1257	
Sun 10 Jun 2012 02:16:35	OBS_SIO	deploy	2	34	65	47.298170	-125.794572	1762	
Sun 10 Jun 2012 03:23:03	OBS_WHOI	deploy	2	35	D55	47.340293	-125.985987		no reliable depth info; 1740 m expected
Sun 10 Jun 2012 04:27:01	OBS_WHOI	deploy	2	36	D06	47.381838	-126.177248	2180	
Sun 10 Jun 2012 05:19:05	OBS_WHOI	deploy	2	23	D49	47.418402	-126.343270	2415	
Sun 10 Jun 2012 06:22:49	OBS_WHOI	deploy	2	37	D44	47.463272	-126.555863	2419	This OBS had its penetrator cable repaired onboard.
Sun 10 Jun 2012 07:23:01	OBS_SIO	deploy	2	38	13	47.503023	-126.744942	2475	
Sun 10 Jun 2012 08:38:21	OBS_SIO	deploy	2	39	50	47.543120	-126.935630	2542	
Sun 10 Jun 2012 09:48:53	OBS_SIO	deploy	2	40	47	47.582943	-127.127977	2564	
Sun 10 Jun 2012 10:54:23	OBS_SIO	deploy	2	41	63	47.622508	-127.320060	2616	
Sun 10 Jun 2012 11:51:11	OBS_WHOI	deploy	2	42	D21	47.662798	-127.518367	2652	
Sun 10 Jun 2012 12:41:59	OBS_WHOI	deploy	2	43	D03	47.698115	-127.694047	2680	
Sun 10 Jun 2012 13:42:05	OBS_WHOI	deploy	2	44	D34	47.739083	-127.898748	2658	
Sun 10 Jun 2012 14:25:49	Ship	other	NaN	NaN	NaN	47.775573	-128.027998		Cross path with RV Thompson
Sun 10 Jun 2012 14:42:07	OBS_SIO	deploy	2	45	73	47.776102	-128.086920	2673	
Sun 10 Jun 2012 15:45:33	OBS_SIO	deploy	2	46	74	47.814357	-128.280652	2681	
Sun 10 Jun 2012 16:46:43	OBS_SIO	deploy	2	47	94	47.851827	-128.473485	2686	
Sun 10 Jun 2012 18:13:55	CTD911	deploy	2	47	1	47.851588	-128.473458	2684	
Sun 10 Jun 2012 20:06:27	CTD911	recover	2	47	1	47.850205	-128.473665		
Sun 10 Jun 2012 21:09:23	CTD911	deploy	2	46	2	47.813905	-128.280017	2679	did not log recovery time...
Mon 11 Jun 2012 00:07:01	CTD911	deploy	2	45	3	47.775947	-128.087268	2672	deployment started at 23:53
Mon 11 Jun 2012 01:38:09	CTD911	recover	2	45	3	47.772995	-128.088248		
Mon 11 Jun 2012 02:38:37	CTD911	deploy	2	44	4	47.737838	-127.896437	2659	
Mon 11 Jun 2012 04:26:31	CTD911	recover	2	44	4	47.737553	-127.895833		
Mon 11 Jun 2012 05:36:31	CTD911	deploy	2	43	5	47.698067	-127.693328	2680	
Mon 11 Jun 2012 07:22:55	CTD911	recover	2	43	5	47.696767	-127.691622		
Mon 11 Jun 2012 08:29:19	CTD911	deploy	2	42	6	47.662570	-127.517283	2651	
Mon 11 Jun 2012 10:10:35	CTD911	recover	2	42	6	47.661922	-127.513010		
Mon 11 Jun 2012 11:10:51	CTD911	deploy	2	41	7	47.623012	-127.316685	2614	
Mon 11 Jun 2012 12:50:33	CTD911	recover	2	41	7	47.620370	-127.316195		
Mon 11 Jun 2012 13:57:15	CTD911	deploy	2	40	8	47.583493	-127.128907	2564	
Mon 11 Jun 2012 15:34:17	CTD911	recover	2	40	8	47.583182	-127.129202		
Mon 11 Jun 2012 16:39:11	CTD911	deploy	2	39	9	47.542488	-126.935535	2542	
Mon 11 Jun 2012 18:23:15	CTD911	recover	2	39	9	47.541873	-126.930958		

R2R ELOG Cruise OC1206A

Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Mon 11 Jun 2012 19:30:19	CTD911	deploy	2	38	10	47.502995	-126.744707	2475	deployment started at 19:21
Mon 11 Jun 2012 20:59:01	CTD911	recover	2	38	10	47.502633	-126.744752		
Mon 11 Jun 2012 21:57:53	CTD911	deploy	2	37	11	47.462818	-126.556428	2419	
Mon 11 Jun 2012 23:33:51	CTD911	recover	2	37	11	47.462940	-126.554760		
Tue 12 Jun 2012 00:40:41	CTD911	deploy	2	23	12	47.417710	-126.344172	2415	
Tue 12 Jun 2012 02:14:15	CTD911	recover	2	23	12	47.417200	-126.345468		
Tue 12 Jun 2012 03:21:11	CTD911	deploy	2	36	13	47.381533	-126.177295	2164	deployment started at 03:15
Tue 12 Jun 2012 04:45:09	CTD911	recover	2	36	13	47.381863	-126.177760		
Tue 12 Jun 2012 05:44:53	CTD911	deploy	2	35	14	47.340063	-125.985062	1752	
Tue 12 Jun 2012 06:55:13	CTD911	recover	2	35	14	47.339383	-125.984067		
Tue 12 Jun 2012 07:54:07	CTD911	deploy	2	34	15	47.298758	-125.794595	1762	
Tue 12 Jun 2012 09:07:29	CTD911	recover	2	34	15	47.300053	-125.794413		
Tue 12 Jun 2012 10:15:01	CTD911	deploy	2	33	16	47.255185	-125.600718	1253	
Tue 12 Jun 2012 11:03:39	CTD911	recover	2	33	16	47.254397	-125.600920		
Tue 12 Jun 2012 12:04:43	CTD911	deploy	2	32	17	47.227677	-125.445898	1765	
Tue 12 Jun 2012 13:22:25	CTD911	recover	2	32	17	47.226985	-125.446405		
Tue 12 Jun 2012 15:08:09	CTD911	deploy	2	31	18	47.201370	-125.291907	1509	
Tue 12 Jun 2012 16:07:23	CTD911	recover	2	31	18	47.201795	-125.292233		
Tue 12 Jun 2012 17:04:43	CTD911	deploy	2	30	19	47.174715	-125.138523	1403	
Tue 12 Jun 2012 18:10:43	CTD911	recover	2	30	19	47.174782	-125.138455		
Wed 13 Jun 2012 02:01:33	CTD911	deploy	3	26	20	47.812918	-126.471480	2262	
Wed 13 Jun 2012 03:25:27	CTD911	recover	3	26	20	47.813355	-126.472483		
Wed 13 Jun 2012 04:35:31	CTD911	deploy	3	25	21	47.681318	-126.429613	2307	
Wed 13 Jun 2012 06:05:01	CTD911	recover	3	25	21	47.681207	-126.429508		
Wed 13 Jun 2012 07:05:17	CTD911	deploy	3	24	22	47.549670	-126.386757	2357	
Wed 13 Jun 2012 08:38:01	CTD911	recover	3	24	22	47.551780	-126.389815		
Wed 13 Jun 2012 09:42:53	CTD911	deploy	3	23	23	47.417605	-126.343478	2423	
Wed 13 Jun 2012 11:17:25	CTD911	recover	3	23	23	47.415657	-126.343678		
Wed 13 Jun 2012 12:28:19	CTD911	deploy	3	22	24	47.272342	-126.294403	2503	
Wed 13 Jun 2012 14:23:17	CTD911	recover	3	22	24				The elog hung up while entering this event so it didnt read lat lon. Latop rebooted.
Wed 13 Jun 2012 15:23:03	CTD911	deploy	3	21	25	47.128113	-126.244385	2550	
Wed 13 Jun 2012 17:04:25	CTD911	recover	3	21	25	47.130430	-126.244728		
Wed 13 Jun 2012 18:21:31	CTD911	deploy	3	20	26	46.982020	-126.195983	2598	
Wed 13 Jun 2012 19:55:23	CTD911	recover	3	20	26	46.982898	-126.197780		
Wed 13 Jun 2012 21:28:45	CTD911	deploy	3	19	27	46.837007	-126.148467	2616	deployment started at 20:59
Wed 13 Jun 2012 22:40:27	CTD911	recover	3	19	27	46.837053	-126.148028		
Thu 14 Jun 2012 01:28:55	CTD911	recover	3	18	28	46.687787	-126.099772	2637	was deployed at 23:48, lat 46.691277 lon -126.100362
Thu 14 Jun 2012 02:29:49	CTD911	deploy	3	17	29	46.546170	-126.051910	2667	
Thu 14 Jun 2012 04:11:45	CTD911	recover	3	17	29	46.547120	-126.051470		
Thu 14 Jun 2012 05:19:35	CTD911	deploy	3	16	30	46.400905	-126.003815	2593	
Thu 14 Jun 2012 06:58:11	CTD911	recover	3	16	30	46.400533	-126.003580		

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Thu 14 Jun 2012 08:05:21	CTD911	deploy	3	15	31	46.267577	-125.959923	2580	
Thu 14 Jun 2012 09:43:15	CTD911	recover	3	15	31	46.267958	-125.958008		
Thu 14 Jun 2012 10:55:19	CTD911	deploy	3	14	32	46.109730	-125.908478	2620	
Thu 14 Jun 2012 12:34:49	CTD911	recover	3	14	32	46.110440	-125.911537		
Thu 14 Jun 2012 13:42:01	CTD911	deploy	3	13	33	45.964367	-125.861935	2451	
Thu 14 Jun 2012 15:14:07	CTD911	recover	3	13	33	45.964482	-125.861873		
Thu 14 Jun 2012 16:18:03	CTD911	deploy	3	12	34	45.833007	-125.820262	2340	
Thu 14 Jun 2012 17:56:33	CTD911	recover	3	12	34	45.833237	-125.819343		
Thu 14 Jun 2012 19:03:25	CTD911	deploy	3	11	35	45.673517	-125.769412	2413	
Thu 14 Jun 2012 20:39:17	CTD911	recover	3	11	35	45.673458	-125.768553		
Thu 14 Jun 2012 21:56:53	CTD911	deploy	3	10	36	45.528755	-125.723337	2488	deployment started at 21:42
Thu 14 Jun 2012 23:17:25	CTD911	recover	3	10	36	45.529203	-125.724167		
Fri 15 Jun 2012 00:23:15	CTD911	deploy	3	9	37	45.383115	-125.677507	2621	
Fri 15 Jun 2012 01:57:49	CTD911	recover	3	9	37	45.382632	-125.677288		
Fri 15 Jun 2012 03:10:57	CTD911	deploy	3	8	38	45.237355	-125.631397	2680	
Fri 15 Jun 2012 04:50:55	CTD911	recover	3	8	38	45.237087	-125.631288		
Fri 15 Jun 2012 05:59:59	CTD911	deploy	3	7	39	45.092123	-125.585935	2735	
Fri 15 Jun 2012 06:02:15	Ship	other	3	7	NaN	45.092035	-125.585928		Langseth is about 13 miles south of us. According to capt we will finish this site and get out of their way 45 minutes before they reach us.
Fri 15 Jun 2012 07:42:03	CTD911	recover	3	7	39	45.092932	-125.583062		
Fri 15 Jun 2012 07:59:57	Ship	other	NaN	NaN	NaN	45.067205	-125.529702		Crossing paths with Langseth between sites 6&7. Hi Langseth watchstanders!!
Fri 15 Jun 2012 09:27:11	CTD911	deploy	3	6	40	44.921735	-125.532042	2795	The time if this deployment was 20120615.0858
Fri 15 Jun 2012 10:46:09	CTD911	recover	3	6	40	44.921933	-125.531892		
Fri 15 Jun 2012 11:47:11	CTD911	deploy	3	5	41	44.800823	-125.495422	2836	
Fri 15 Jun 2012 13:36:45	CTD911	recover	3	5	41	44.799902	-125.494315		
Fri 15 Jun 2012 14:42:35	CTD911	deploy	3	4	42	44.655372	-125.450902	2880	
Fri 15 Jun 2012 16:31:45	CTD911	recover	3	4	42	44.652018	-125.449640		
Fri 15 Jun 2012 17:27:39	CTD911	deploy	3	3	43	44.539785	-125.415998	2931	Several fin whales in the area
Fri 15 Jun 2012 19:17:55	CTD911	recover	3	3	43	44.541310	-125.417542		
Fri 15 Jun 2012 20:48:49	CTD911	deploy	3	2	44	44.391668	-125.370457	2970	deployment started at 20:29
Fri 15 Jun 2012 22:19:25	CTD911	recover	3	2	44	44.390003	-125.371350		
Fri 15 Jun 2012 23:18:55	CTD911	deploy	3	1	45	44.259640	-125.329852	2990	
Sat 16 Jun 2012 01:08:45	CTD911	recover	3	1	45	44.259420	-125.328217		
Sat 16 Jun 2012 01:27:47	OBS_SIO	other	3	1	86	44.246872	-125.335985	2990	start of acoustic survey counter-clockwise from S @ 6-7kt with 1.5 km radius
Sat 16 Jun 2012 02:12:47	OBS_SIO	other	3	1	86	44.254972	-125.348142		end of acoustic survey; transit to next site
Sat 16 Jun 2012 03:01:03	OBS_SIO	other	3	2	90	44.374223	-125.376472	2972	approach to S point on circle
Sat 16 Jun 2012 03:04:07	OBS_SIO	other	3	2	90	44.378880	-125.377108		start of acoustic survey
Sat 16 Jun 2012 03:50:11	OBS_SIO	other	3	2	90	44.388530	-125.387002		end of acoustic survey; transit to next site

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Sat 16 Jun 2012 04:46:13	OBS_SIO	other	3	3	23	44.528265	-125.424735	2932	start of acoustic survey
Sat 16 Jun 2012 05:27:15	OBS_SIO	other	3	3	23	44.534593	-125.432918		end of acoustic survey; transit to next site
Sat 16 Jun 2012 06:20:15	OBS_WHOI	other	3	4	D39	44.655150	-125.450893	2882	on top of it; instrument enabled
Sat 16 Jun 2012 06:33:07	OBS_WHOI	other	3	4	D39	44.656550	-125.438377		start of acoustic surevy counter-clockwise from E @ 5 kt with 1 km radius
Sat 16 Jun 2012 07:04:09	OBS_WHOI	other	3	4	D39	44.647965	-125.450985		end of acoustic survey; heading to disable instrument
Sat 16 Jun 2012 08:10:05	OBS_WHOI	other	3	5	D35	44.800258	-125.496375	2838	Start acoustic survey. Over the instrument. Enabled.
Sat 16 Jun 2012 08:55:19	OBS_WHOI	other	3	5	D35	44.801228	-125.495300		End of acoustic survey. Instrument disabled. Transit to next site
Sat 16 Jun 2012 09:43:23	OBS_WHOI	other	3	6	D09	44.921233	-125.532303	2795	Start acoustic survey. Over the instrument. Enabled.
Sat 16 Jun 2012 10:23:11	OBS_WHOI	other	3	6	D09	44.920982	-125.531853		End of acoustic survey. Instrument disabled. Transit to next site
Sat 16 Jun 2012 11:20:29	OBS_SIO	other	3	7	61	45.072042	-125.576285		Enabled. 1.4 nm to Site.
Sat 16 Jun 2012 11:25:41	OBS_SIO	other	3	7	61	45.080203	-125.579832		start of acoustic survey counter-clockwise from S @ 6-7kt with 1.3 km radius
Sat 16 Jun 2012 12:08:07	OBS_SIO	other	3	7	61	45.079958	-125.583593		Testing acoustics at 9 knt. Loud and clear!
Sat 16 Jun 2012 12:10:53	OBS_SIO	other	3	7	61	45.082387	-125.575195		End of acoustic survey. Instrument disabled. Transit to next site
Sat 16 Jun 2012 13:03:57	OBS_SIO	other	3	8	55	45.219677	-125.625063		start of acoustic survey counter-clockwise from S @ 6-7kt with 1.3 km radius. Enabled 1 nm from OBS
Sat 16 Jun 2012 13:39:51	OBS_SIO	other	3	8	55	45.227752	-125.622790		End of acoustic survey. Instrument disabled. Transit to next site
Sat 16 Jun 2012 14:40:51	OBS_SIO	other	3	9	71	45.378352	-125.661708		start of acoustic survey counter-clockwise from S @ 6-7kt with 1.3 km radius. Enabled
Sat 16 Jun 2012 15:09:21	OBS_SIO	other	3	9	71	45.374482	-125.665348		End of acoustic survey. Instrument disabled. Transit to next site
Sat 16 Jun 2012 16:00:09	OBS_SIO	other	3	10	85	45.506293	-125.721742		start of acoustic survey counter-clockwise from S @ 6-7kt with 1.3 km radius. Enabled
Sat 16 Jun 2012 16:39:41	OBS_SIO	other	3	10	85	45.516613	-125.717967		End of acoustic survey. Instrument disabled. Transit to next site
Sat 16 Jun 2012 17:30:51	OBS_SIO	other	3	11	20	45.656253	-125.766358		start of acoustic survey counter-clockwise from S @ 8-9kt with 1.3 km radius. Enabled
Sat 16 Jun 2012 18:10:01	OBS_SIO	other	3	11	20	45.662433	-125.764737		End of acoustic survey. Instrument disabled. Transit to next site
Sat 16 Jun 2012 19:10:11	OBS_SIO	other	3	12	11	45.813287	-125.812682	2341	start of acoustic survey counter-clockwise from S @ 8-9 kt with 1.5 km radius; instrument enabled
Sat 16 Jun 2012 19:40:43	OBS_SIO	other	3	12	11	45.822955	-125.828665		end of acoustic survey; instrument disabled; transit to next site

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Sat 16 Jun 2012 20:29:29	OBS_SIO	other	3	13	7	45.953747	-125.858095	2454	start of acoustic survey counter-clockwise from S @ 8-9 kt with 1.5 km radius; instrument enabled
Sat 16 Jun 2012 21:06:59	OBS_SIO	other	3	13	7	45.976560	-125.868433		end of acoustic survey; instrument disabled; transit to next site
Sat 16 Jun 2012 21:57:45	OBS_WHOI	other	3	14	D15	46.110192	-125.909512	2622	on top of instrument; enabled; start of survey counter-clockwise from E @ 5-6 kt with 1 km radius
Sat 16 Jun 2012 22:36:47	OBS_WHOI	other	3	14	D15	46.109872	-125.909732		end of acoustic survey; instrument disabled; transit to next site
Sat 16 Jun 2012 23:37:31	OBS_WHOI	other	3	15	D51	46.262705	-125.958205	2579	on top of instrument; enabled; start of survey counter-clockwise from E @ 5-6 kt with 1 km radius
Sun 17 Jun 2012 00:17:49	OBS_WHOI	other	3	15	D51	46.265930	-125.959933		end of acoustic survey; instrument disabled; transit to next site
Sun 17 Jun 2012 01:10:47	OBS_WHOI	other	3	16	D16	46.401038	-126.003560	2599	on top of instrument; enabled; start of survey counter-clockwise from E @ 5-6 kt with 1 km radius
Sun 17 Jun 2012 01:58:43	OBS_WHOI	other	3	16	D16	46.401437	-126.004620		end of acoustic survey; instrument disabled; transit to next site
Sun 17 Jun 2012 02:52:03	OBS_SIO	other	3	17	57	46.535928	-126.049903	2673	start of acoustic survey counter-clockwise from S @ 7 kt with 1.5 km radius; instrument enabled
Sun 17 Jun 2012 03:23:03	OBS_SIO	other	3	17	57	46.540328	-126.065648		end of acoustic survey; instrument disabled; transit to next site
Sun 17 Jun 2012 04:16:19	OBS_SIO	other	3	18	95	46.678958	-126.094508	2641	start of acoustic survey counter-clockwise from S @ 7kt with 1.5 km radius
Sun 17 Jun 2012 04:48:05	OBS_SIO	other	3	18	95	46.684023	-126.112700		end of acoustic survey; instrument disabled; transit to next site
Sun 17 Jun 2012 05:37:47	OBS_SIO	other	3	19	67	46.825660	-126.142528	2617	instrument enabled; start of acoustic survey counter-clockwise from S @ 7kt with 1.5 km radius
Sun 17 Jun 2012 06:09:39	OBS_SIO	other	3	19	67	46.829895	-126.161418		end of acoustic survey; instrument disabled; transit to next site
Sun 17 Jun 2012 06:59:51	OBS_SIO	other	3	20	92	46.961498	-126.190928	2596	start of acoustic survey counter-clockwise from S @ 6-7kt with 1.3 km radius; instrument enabled
Sun 17 Jun 2012 07:37:29	OBS_SIO	other	3	20	92	46.972642	-126.190307	2596	End of acoustic survey. Instrument disabled. Transit to next site
Sun 17 Jun 2012 08:30:19	OBS_SIO	other	3	21	78	47.113318	-126.240627		start of acoustic survey counter-clockwise from S @ 6-7kt with 1.3 km radius. Enabled
Sun 17 Jun 2012 09:08:45	OBS_SIO	other	3	21	78	47.117138	-126.241643		End of acoustic survey. Instrument disabled. Transit to next site

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Sun 17 Jun 2012 10:00:41	OBS_SIO	other	3	22	93	47.257595	-126.288618		start of acoustic survey counter-clockwise from S @ 6-7kt with 1.3 km radius. Enabled
Sun 17 Jun 2012 10:36:49	OBS_SIO	other	3	22	93	47.265050	-126.291582		End of acoustic survey. Instrument disabled. Transit to next site
Sun 17 Jun 2012 11:35:49	OBS_WHOI	other	3	23	D49	47.416713	-126.342870	2439	on top of instrument; enabled; start of survey counter-clockwise from E @ 5-6 kt with 1 km radius
Sun 17 Jun 2012 12:18:37	OBS_WHOI	other	3	23	D49	47.415680	-126.342567		End of acoustic survey. Instrument disabled. Transit to next site
Sun 17 Jun 2012 13:32:25	OBS_WHOI	other	3	24	D40	47.550442	-126.385893		start of acoustic survey counter-clockwise from S @ 6-7kt with 1.3 km radius. Enabled
Sun 17 Jun 2012 13:45:53	OBS_WHOI	other	NaN	24	D40	47.550140	-126.372613		Not getting good acoustic readings. Seas are rough.
Sun 17 Jun 2012 14:21:55	OBS_WHOI	other	3	24	D40	47.546957	-126.384692		End of acoustic survey. Instrument disabled. Transit to next site
Sun 17 Jun 2012 15:16:49	OBS_WHOI	other	3	25	D50	47.681777	-126.427387	2313	Start acoustic survey. Over the instrument. Enabled.
Sun 17 Jun 2012 15:57:37	OBS_WHOI	other	3	25	D50	47.684792	-126.429065		End of acoustic survey. Instrument disabled. Transit to next site
Sun 17 Jun 2012 17:04:21	OBS_WHOI	other	3	26	D62	47.812828	-126.471420	2262	Over the instrument. No success enabling it. NO ACOUSTIC SURVEY AT THIS SITE. This OBS accepted commands in the van, but it may have trouble transmitting back,
Mon 18 Jun 2012 00:54:33	Ship	other				47.850592	-128.451177		nearing the end of 8-hour transit to site 47
Mon 18 Jun 2012 00:57:59	OBS_SIO	other	2	47	94	47.855162	-128.456667	2686	start of acoustic surevy counter-clockwise from E @ 6 kts with 1.5 km radius; instrument enabled
Mon 18 Jun 2012 01:28:47	OBS_SIO	other	2	47	94	47.839788	-128.472642		end of acoustic survey; instrument disabled; transit to next site
Mon 18 Jun 2012 02:13:09	OBS_SIO	other	2	46	74	47.816778	-128.297100	2681	start of acoustic survey counter-clockwise from W @ 7 kt with 1.5 km radius; instrument enabled
Mon 18 Jun 2012 02:51:29	OBS_SIO	other	2	46	94	47.826018	-128.282007		end of acoustic survey; instrument disabled; transit to next site
Mon 18 Jun 2012 03:39:29	OBS_SIO	other	2	45	73	47.780973	-128.101960	2673	start of acoustic survey counter-clockwise from W @ 8 kt with 1.5 km radius; instrument enabled
Mon 18 Jun 2012 04:10:47	OBS_SIO	other	2	45	73	47.787788	-128.088685		end of acoustic survey; instrument disabled; transit to next site
Mon 18 Jun 2012 04:58:11	OBS_WHOI	other	2	44	D34	47.740360	-127.903547	2658	on top of instrument; enabled; start of survey counter-clockwise from E @ 6 kt with 1 km radius

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Mon 18 Jun 2012 05:39:11	OBS_WHOI	other	2	44	D34	47.737563	-127.898155		end of acoustic survey; instrument disabled; transit to next site
Mon 18 Jun 2012 06:31:13	OBS_WHOI	other	2	43	D03	47.699878	-127.700393	2680	on top of instrument; enabled; start of survey counter-clockwise from E @ 6 kt with 1 km radius
Mon 18 Jun 2012 07:21:11	OBS_WHOI	other	2	43	D03	47.698022	-127.692420		End of acoustic survey. Instrument disabled. Transit to next site
Mon 18 Jun 2012 08:07:53	OBS_WHOI	other	2	42	D21	47.662557	-127.517752	2654	start of acoustic surevy counter-clockwise from E @ 6 kts with 1.5 km radius; instrument enabled
Mon 18 Jun 2012 08:44:05	OBS_WHOI	other	2	42	D21	47.661547	-127.517202		End of acoustic survey. Instrument disabled. Transit to next site
Mon 18 Jun 2012 09:29:21	OBS_SIO	other	2	41	63	47.627790	-127.347002		start of acoustic survey @ 6-7kt. Enabled
Mon 18 Jun 2012 10:13:11	OBS_SIO	other	2	41	63	47.623003	-127.337070		End of acoustic survey. Instrument disabled. Transit to next site
Mon 18 Jun 2012 10:59:27	OBS_SIO	other	2	40	47	47.586883	-127.151100		start of acoustic sure @ 6 kts instrument enabled
Mon 18 Jun 2012 11:42:17	OBS_SIO	other	2	40	47	47.583283	-127.139707		End of acoustic survey. Instrument disabled. Transit to next site
Mon 18 Jun 2012 12:33:55	OBS_SIO	other	2	39	50	47.543950	-126.951915		start of acoustic survey @ 6 kts instrument enabled
Mon 18 Jun 2012 13:14:05	OBS_SIO	other	2	39	50	47.545988	-126.950315		End of acoustic survey. Instrument disabled. Transit to next site
Mon 18 Jun 2012 14:02:53	OBS_SIO	other	2	38	13	47.508638	-126.772097		start of acoustic survey @ 6 kts instrument enabled
Mon 18 Jun 2012 14:46:07	OBS_SIO	other	2	38	13	47.503535	-126.749145		End of acoustic survey. Instrument disabled. Transit to next site
Mon 18 Jun 2012 15:36:59	OBS_WHOI	other	2	37	D44	47.463220	-126.558462	2429	Start acoustic survey. Over the instrument. Enabled.
Mon 18 Jun 2012 16:25:37	OBS_WHOI	other	2	37	D44	47.459347	-126.553292	2429	End of acoustic survey. Instrument disabled.
Mon 18 Jun 2012 17:16:05	Ship	other	NaN	NaN	NaN	47.325617	-126.436028		On transit back to Newport.
Tue 19 Jun 2012 13:41:43	Ship	other	NaN	NaN	NaN	44.708813	-124.204630		In front of Newport. ETA at dock: 09:00 local.
Tue 19 Jun 2012 16:17:37	Ship	other	NaN	NaN	NaN	44.625687	-124.044807		At the OSU dock in Newport.
Wed 20 Jun 2012 17:10:27	Ship	other	NaN	NaN	NaN	44.601963	-124.106452		Left Newport; on the way to Site 27 to start recoveries
Thu 21 Jun 2012 07:39:21	OBS_SIO	other	2	27	38	47.104923	-124.589958		Enabled.
Thu 21 Jun 2012 07:41:23	OBS_SIO	release	2	27	38	47.106392	-124.590788	82	
Thu 21 Jun 2012 07:50:05	OBS_SIO	on surface	2	27	38	47.108265	-124.593077		
Thu 21 Jun 2012 07:58:35	OBS_SIO	recover	2	27	38	47.108958	-124.594637		
Thu 21 Jun 2012 08:56:45	OBS_SIO	other	2	28	39	47.122870	-124.787102		Enabled.
Thu 21 Jun 2012 08:57:19	OBS_SIO	release	2	28	39	47.122513	-124.787552	131	

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Thu 21 Jun 2012 09:07:21	OBS_SIO	on surface	2	28	39	47.121102	-124.788443		
Thu 21 Jun 2012 09:15:35	OBS_SIO	recover	2	28	39	47.122963	-124.790008		
Thu 21 Jun 2012 10:04:47	OBS_SIO	other	2	29	68	47.146447	-124.978095	216	Enabled.
Thu 21 Jun 2012 10:06:05	OBS_SIO	release	2	29	68	47.146820	-124.980598		
Thu 21 Jun 2012 10:20:15	OBS_SIO	on surface	2	29	68	47.144415	-124.979738		
Thu 21 Jun 2012 10:27:07	OBS_SIO	recover	2	29	68	47.148142	-124.984333		
Thu 21 Jun 2012 11:12:39	OBS_SIO	other	2	30	56	47.173588	-125.131257		Enabled.
Thu 21 Jun 2012 11:13:29	OBS_SIO	release	2	30	56	47.173845	-125.132733		
Thu 21 Jun 2012 11:48:47	OBS_SIO	on surface	2	30	56	47.172597	-125.132480		
Thu 21 Jun 2012 11:57:45	OBS_SIO	recover	2	30	56	47.174055	-125.139177		
Thu 21 Jun 2012 12:16:41	Ship	other	NaN	NaN	NaN	47.178963	-125.170567		Transiting at 6 knots since we cant recover Site 31 until Langseth shoots over Site 40 at ~08:00
Thu 21 Jun 2012 16:48:09	Ship	other	NaN	NaN	NaN	47.216240	-125.317338		Ready to recover Site 31. 2 km away; approaching OBS.
Thu 21 Jun 2012 16:52:15	OBS_SIO	release	2	31	17	47.207835	-125.302597	1506	Enabled.
Thu 21 Jun 2012 17:28:49	OBS_SIO	on surface	2	31	17	47.204727	-125.294687		
Thu 21 Jun 2012 17:33:53	OBS_SIO	recover	2	31	17	47.204548	-125.288137		
Thu 21 Jun 2012 18:10:15	OBS_SIO	other	2	32	40	47.226830	-125.435720		Enabled.
Thu 21 Jun 2012 18:10:55	OBS_SIO	release	2	32	40	47.227175	-125.437592	1767	
Thu 21 Jun 2012 18:54:19	OBS_SIO	on surface	2	32	40	47.227363	-125.438467	1767	
Thu 21 Jun 2012 19:03:39	OBS_SIO	recover	2	32	40	47.230790	-125.446457	1767	
Thu 21 Jun 2012 19:42:41	OBS_SIO	other	2	33	21	47.254120	-125.595615	1257	Enabled
Thu 21 Jun 2012 19:43:45	OBS_SIO	release	2	33	21	47.253847	-125.596178		
Thu 21 Jun 2012 20:17:45	OBS_SIO	on surface	2	33	21	47.253868	-125.599253		
Thu 21 Jun 2012 20:22:55	OBS_SIO	recover	2	33	21	47.254657	-125.603770		For SIO OBS, logging moment the instrument is secure on deck as recovery time
Thu 21 Jun 2012 21:05:07	OBS_SIO	other	2	34	65	47.295775	-125.783570	1762	Enabled
Thu 21 Jun 2012 21:06:35	OBS_SIO	release	2	34	65	47.296465	-125.787685		
Thu 21 Jun 2012 21:49:27	OBS_SIO	on surface	2	34	65	47.295890	-125.791190		
Thu 21 Jun 2012 22:05:17	OBS_SIO	recover	2	34	65	47.297722	-125.792735		
Thu 21 Jun 2012 22:52:31	OBS_WHOI	other	2	35	D55	47.338445	-125.979092	1740	Enabled
Thu 21 Jun 2012 22:54:03	OBS_WHOI	release	2	35	D55	47.338733	-125.979555		
Thu 21 Jun 2012 23:27:47	OBS_WHOI	on surface	2	35	D55	47.336658	-125.984132		
Thu 21 Jun 2012 23:33:07	OBS_WHOI	recover	2	35	D55	47.341010	-125.985515		For WHOI OBS, logging moment the OBS is hooked on the pole as recovery time
Fri 22 Jun 2012 00:20:19	OBS_WHOI	other	2	36	D06	47.380415	-126.171128	2180	Enabled
Fri 22 Jun 2012 00:22:07	OBS_WHOI	release	2	36	D06	47.380673	-126.172493		
Fri 22 Jun 2012 01:04:11	OBS_WHOI	on surface	2	36	D06	47.379325	-126.172452		
Fri 22 Jun 2012 01:10:15	OBS_WHOI	other	2	36	D06	47.382827	-126.177417		first attempt at recovering the instrument
Fri 22 Jun 2012 01:19:21	OBS_WHOI	recover	2	36	D06	47.383342	-126.178382		
Fri 22 Jun 2012 02:03:37	Ship	other	NaN	NaN	NaN	47.392342	-126.363713		Langseth on starboard

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Fri 22 Jun 2012 02:50:35	OBS_WHOI	other	2	37	D44	47.462210	-126.546927	2419	Enabled
Fri 22 Jun 2012 02:52:43	OBS_WHOI	release	2	37	D44	47.462588	-126.546650		
Fri 22 Jun 2012 03:32:23	OBS_WHOI	on surface	2	37	D44	47.463108	-126.552632		
Fri 22 Jun 2012 03:35:05	OBS_WHOI	recover	2	37	D44	47.463883	-126.554568		
Fri 22 Jun 2012 04:17:39	OBS_SIO	other	2	38	13	47.500142	-126.731188	2475	Enabled
Fri 22 Jun 2012 04:19:39	OBS_SIO	release	2	38	13	47.500953	-126.733123		
Fri 22 Jun 2012 05:18:17	OBS_SIO	on surface	2	38	13	47.502075	-126.739210		
Fri 22 Jun 2012 05:24:21	OBS_SIO	recover	2	38	13	47.504185	-126.744282		
Fri 22 Jun 2012 06:07:49	OBS_SIO	other	2	39	50	47.540042	-126.923888	2542	Enabled
Fri 22 Jun 2012 06:09:19	OBS_SIO	release	2	39	50	47.540375	-126.924842		
Fri 22 Jun 2012 07:08:19	OBS_SIO	on surface	2	39	50	47.544325	-126.930535		
Fri 22 Jun 2012 07:16:17	OBS_SIO	recover	2	39	50	47.544877	-126.935473		
Fri 22 Jun 2012 08:02:17	OBS_SIO	other	2	40	47	47.581080	-127.120020	2560	Enabled.
Fri 22 Jun 2012 08:03:05	OBS_SIO	release	2	40	47	47.581368	-127.121297	2560	
Fri 22 Jun 2012 08:19:21	OBS_SIO	other	2	40	47	47.582845	-127.122125	2563	off the bottom
Fri 22 Jun 2012 09:01:01	OBS_SIO	on surface	2	40	47	47.581938	-127.120642		
Fri 22 Jun 2012 09:17:13	OBS_SIO	recover	2	40	47	47.583062	-127.127060		
Fri 22 Jun 2012 10:13:13	OBS_SIO	other	2	41	63	47.620370	-127.310612	2613	Enabled.
Fri 22 Jun 2012 10:14:07	OBS_SIO	release	2	41	63	47.620590	-127.312017	2614	
Fri 22 Jun 2012 11:14:15	OBS_SIO	on surface	2	41	63	47.617877	-127.319592		
Fri 22 Jun 2012 11:26:51	OBS_SIO	recover	2	41	63	47.621597	-127.320832		
Fri 22 Jun 2012 12:24:25	OBS_WHOI	other	2	42	D21	47.661555	-127.511548	2651	Enabled.
Fri 22 Jun 2012 12:26:13	OBS_WHOI	release	2	42	D21	47.662235	-127.513347	2651	
Fri 22 Jun 2012 13:16:39	OBS_WHOI	on surface	2	42	D21	47.659332	-127.512907		
Fri 22 Jun 2012 13:24:07	OBS_WHOI	recover	2	42	D21	47.658905	-127.517648		
Fri 22 Jun 2012 14:08:37	OBS_WHOI	other	2	43	D03	47.695742	-127.687608	2677	Enabled.
Fri 22 Jun 2012 14:10:03	OBS_WHOI	release	2	43	D03	47.695588	-127.690000		
Fri 22 Jun 2012 14:57:01	OBS_WHOI	on surface	2	43	D03	47.694913	-127.692833		
Fri 22 Jun 2012 15:04:19	OBS_WHOI	recover	2	43	D03	47.697850	-127.692015		
Fri 22 Jun 2012 15:54:31	OBS_WHOI	other	2	44	D34	47.737712	-127.892363	2656	Enabled.
Fri 22 Jun 2012 15:56:21	OBS_WHOI	release	2	44	D34	47.738183	-127.894993	2656	
Fri 22 Jun 2012 16:50:49	OBS_WHOI	on surface	2	44	D34	47.737342	-127.896033		
Fri 22 Jun 2012 16:55:05	OBS_WHOI	recover	2	44	D34	47.738237	-127.897937		
Fri 22 Jun 2012 17:38:21	OBS_SIO	other	2	45	73	47.774240	-128.075857	2671	Enabled.
Fri 22 Jun 2012 17:39:09	OBS_SIO	release	2	45	73	47.774590	-128.077027		
Fri 22 Jun 2012 18:38:05	OBS_SIO	on surface	2	45	73	47.775135	-128.079738		
Fri 22 Jun 2012 18:43:01	OBS_SIO	recover	2	45	73	47.775643	-128.083812		
Fri 22 Jun 2012 19:27:05	OBS_SIO	other	2	46	74	47.810183	-128.260012	2681	Enabled
Fri 22 Jun 2012 19:27:57	OBS_SIO	release	2	46	74	47.810902	-128.263783		
Fri 22 Jun 2012 20:29:45	OBS_SIO	on surface	2	46	74	47.813013	-128.277862		
Fri 22 Jun 2012 20:34:23	OBS_SIO	recover	2	46	74	47.814283	-128.276650		
Fri 22 Jun 2012 21:18:35	OBS_SIO	other	2	47	94	47.848272	-128.455478	2686	enabled
Fri 22 Jun 2012 21:19:19	OBS_SIO	release	2	47	94	47.848970	-128.458662		

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Fri 22 Jun 2012 22:19:25	OBS_SIO	on surface	2	47	94	47.848815	-128.469408		
Fri 22 Jun 2012 22:24:51	OBS_SIO	recover	2	47	94	47.849315	-128.471188		
Sat 23 Jun 2012 03:28:45	Ship	other	NaN	NaN	NaN	47.847720	-127.784035		transiting at 5.5 kt towards site 26
Sat 23 Jun 2012 15:36:29	OBS_WHOI	other	3	26	D62	47.812580	-126.470972	2262	Enabled commsand sent. This OBS does not reply. 4kHz echo off. Langseth TB 2.3 km SE.
Sat 23 Jun 2012 15:50:29	OBS_WHOI	release	3	26	D62	47.812868	-126.471712		This first burn didnt work. A second one sent 15 minutes after the time of this entry.
Sat 23 Jun 2012 19:14:33	OBS_WHOI	other	3	26	D62	47.812472	-126.476137		After 8 tries of release no indtrument on surface (no visual no radio). 2 disable commands sent. OBS abandoned.
Sat 23 Jun 2012 19:24:53	OBS_WHOI	other	3	26	D62	47.812300	-126.470192		departing site 26
Sat 23 Jun 2012 20:08:13	OBS_WHOI	other	3	25	D50	47.682985	-126.429143	2315	Enabled
Sat 23 Jun 2012 20:10:21	OBS_WHOI	release	3	25	D50	47.681485	-126.429287		
Sat 23 Jun 2012 20:56:53	OBS_WHOI	on surface	3	25	D50	47.682115	-126.425758		
Sat 23 Jun 2012 21:01:15	OBS_WHOI	recover	3	25	D50	47.683878	-126.428197		
Sat 23 Jun 2012 21:49:57	OBS_WHOI	other	3	24	D40	47.550213	-126.386197	2353	Enabled
Sat 23 Jun 2012 21:51:07	OBS_WHOI	release	3	24	D40	47.549065	-126.385213		
Sat 23 Jun 2012 22:34:43	OBS_WHOI	on surface	3	24	D40	47.548763	-126.384987		
Sat 23 Jun 2012 22:38:15	OBS_WHOI	recover	3	24	D40	47.552008	-126.386068		
Sat 23 Jun 2012 23:30:01	OBS_WHOI	other	3	23	D49	47.418967	-126.344003	2415	Enabled
Sat 23 Jun 2012 23:30:51	OBS_WHOI	release	3	23	D49	47.418543	-126.344203		Instrument responding to ship's 4kHz echo-sounder; subsequently turned off
Sun 24 Jun 2012 00:13:39	OBS_WHOI	on surface	3	23	D49	47.414678	-126.342485		
Sun 24 Jun 2012 00:19:29	OBS_WHOI	recover	3	23	D49	47.419190	-126.342227		
Sun 24 Jun 2012 01:06:07	OBS_SIO	other	3	22	93	47.291662	-126.299943	2503	Enabled; 4 kHz is back on
Sun 24 Jun 2012 01:10:07	OBS_SIO	release	3	22	93	47.278488	-126.296208		
Sun 24 Jun 2012 02:08:39	OBS_SIO	on surface	3	22	93	47.271507	-126.293585		
Sun 24 Jun 2012 02:22:07	OBS_SIO	recover	3	22	93	47.271745	-126.292778		
Sun 24 Jun 2012 03:14:33	OBS_SIO	other	3	21	78	47.133918	-126.247560	2549	Enabled
Sun 24 Jun 2012 03:15:13	OBS_SIO	release	3	21	78	47.133525	-126.247630		
Sun 24 Jun 2012 04:13:43	OBS_SIO	on surface	3	21	78	47.130408	-126.247425		
Sun 24 Jun 2012 04:20:13	OBS_SIO	recover	3	21	78	47.127373	-126.247008		
Sun 24 Jun 2012 05:07:35	OBS_SIO	other	3	20	92	46.987547	-126.197725	2596	Enabled
Sun 24 Jun 2012 05:09:11	OBS_SIO	release	3	20	92	46.986735	-126.197168		ETA 23:10
Sun 24 Jun 2012 05:29:45	OBS_SIO	release	3	20	92	46.987193	-126.196478		Noise on the acoustics (transducer malfunction?); second burn command sent; too noisy to get ranges
Sun 24 Jun 2012 05:49:31	OBS_SIO	release	3	20	92	46.989247	-126.196253		New burn command sent on 2nd burn wire
Sun 24 Jun 2012 06:08:29	OBS_SIO	on surface	3	20	92	46.986162	-126.195478		
Sun 24 Jun 2012 06:17:53	OBS_SIO	recover	3	20	92	46.980342	-126.197098		
Sun 24 Jun 2012 07:08:59	OBS_SIO	release	3	19	67	46.837498	-126.148115	2616	
Sun 24 Jun 2012 08:18:05	OBS_SIO	on surface	3	19	67	46.837077	-126.151580		

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Sun 24 Jun 2012 08:24:09	OBS_SIO	recover	3	19	67	46.836757	-126.149622		
Sun 24 Jun 2012 09:21:41	OBS_SIO	other	3	18	95	46.708328	-126.104748	2640	Enabled.
Sun 24 Jun 2012 09:22:49	OBS_SIO	release	3	18	95	46.704848	-126.103975	2640	
Sun 24 Jun 2012 10:21:17	OBS_SIO	on surface	3	18	95	46.694998	-126.098600		
Sun 24 Jun 2012 10:33:31	OBS_SIO	recover	3	18	95	46.690535	-126.098872		
Sun 24 Jun 2012 11:20:19	OBS_SIO	other	3	17	57	46.571322	-126.058668	2664	Enabled.
Sun 24 Jun 2012 11:21:25	OBS_SIO	release	3	17	57	46.567920	-126.057438		
Sun 24 Jun 2012 12:21:35	OBS_SIO	on surface	3	17	57	46.547892	-126.051088		
Sun 24 Jun 2012 12:29:53	OBS_SIO	recover	3	17	57	46.543847	-126.050938		
Sun 24 Jun 2012 13:26:01	OBS_WHOI	other	3	16	D16	46.402673	-126.001785	2596	Enabled.
Sun 24 Jun 2012 13:28:57	OBS_WHOI	release	3	16	D16	46.402223	-126.001298		
Sun 24 Jun 2012 14:17:47	OBS_WHOI	on surface	3	16	D16	46.403035	-126.002272		
Sun 24 Jun 2012 14:23:05	OBS_WHOI	recover	3	16	D16	46.400143	-126.002655		
Sun 24 Jun 2012 15:09:19	OBS_WHOI	other	3	15	D51	46.268902	-125.960340	2576	Enabled.
Sun 24 Jun 2012 15:10:59	OBS_WHOI	release	3	15	D51	46.267353	-125.959933		
Sun 24 Jun 2012 15:53:59	OBS_WHOI	on surface	3	15	D51	46.263610	-125.960707		
Sun 24 Jun 2012 16:00:49	OBS_WHOI	recover	3	15	D51	46.265422	-125.958055		
Sun 24 Jun 2012 16:53:13	OBS_WHOI	other	3	14	D15	46.116675	-125.910347	2623	Enabled.
Sun 24 Jun 2012 16:56:25	OBS_WHOI	release	3	14	D15	46.111603	-125.909253		
Sun 24 Jun 2012 17:49:25	OBS_WHOI	on surface	3	14	D15	46.113103	-125.910705		
Sun 24 Jun 2012 17:54:19	OBS_WHOI	recover	3	14	D15	46.111425	-125.907360		
Sun 24 Jun 2012 18:51:03	OBS_SIO	release	3	13	7	45.973447	-125.864022	2481	burn command was sent at 18:36
Sun 24 Jun 2012 19:34:55	OBS_SIO	on surface	3	13	7	45.966303	-125.849500	2454	
Sun 24 Jun 2012 19:43:31	OBS_SIO	recover	3	13	7	45.967858	-125.858557		
Sun 24 Jun 2012 20:27:50	OBS_SIO	other	3	12	11	45.846102	-125.824273	2341	Enabled
Sun 24 Jun 2012 20:30:15	Other	start	NaN	NaN	NaN	45.836850	-125.819377		just rebooted laptop
Sun 24 Jun 2012 20:31:27	OBS_SIO	release	3	12	11	45.835927	-125.818853		release command was sent at 20:25 UTC
Sun 24 Jun 2012 21:21:27	OBS_SIO	on surface	3	12	11	45.831983	-125.816912		
Sun 24 Jun 2012 21:31:49	OBS_SIO	recover	3	12	11	45.836718	-125.816678		
Sun 24 Jun 2012 22:24:25	OBS_SIO	other	3	11	20	45.690487	-125.775262	2424	Enabled
Sun 24 Jun 2012 22:25:35	OBS_SIO	release	3	11	20	45.686778	-125.774317		
Sun 24 Jun 2012 23:57:55	OBS_SIO	on surface	3	11	20	45.676298	-125.771057		
Mon 25 Jun 2012 00:03:15	OBS_SIO	recover	3	11	20	45.675967	-125.769680		
Mon 25 Jun 2012 00:49:19	OBS_SIO	other	3	10	85	45.544438	-125.728553		Enabled
Mon 25 Jun 2012 00:51:39	OBS_SIO	release	3	10	85	45.537082	-125.725895		
Mon 25 Jun 2012 01:47:47	OBS_SIO	on surface	3	10	85	45.530867	-125.719827		
Mon 25 Jun 2012 01:57:07	OBS_SIO	recover	3	10	85	45.526707	-125.723393		
Mon 25 Jun 2012 02:42:49	OBS_SIO	other	3	9	71	45.389847	-125.678978	2621	Enabled
Mon 25 Jun 2012 02:43:51	OBS_SIO	release	3	9	71	45.387548	-125.678233		
Mon 25 Jun 2012 03:43:09	OBS_SIO	on surface	3	9	71	45.383702	-125.680560		
Mon 25 Jun 2012 03:49:01	OBS_SIO	recover	3	9	71	45.380692	-125.676903		

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Mon 25 Jun 2012 03:50:31	Ship	other	NaN	NaN	NaN	45.380540	-125.676607		End of recoveries of deployment #1! Captain informs we'll be shut down for 1 hour to look at the engine.
Mon 25 Jun 2012 04:33:33	Ship	other	NaN	NaN	NaN	45.373625	-125.664795		engine back on; in transit towards site 48
Mon 25 Jun 2012 09:39:43	OBS_SIO	deploy	1	48	13	44.667820	-124.749237	189	
Mon 25 Jun 2012 11:03:47	OBS_SIO	deploy	1	49	68	44.651267	-124.509327	135	RDF signal at bridge OK
Mon 25 Jun 2012 12:43:21	OBS_SIO	deploy	1	50	39	44.351000	-124.508040	98	RDF signal at bridge OK
Mon 25 Jun 2012 14:18:57	OBS_SIO	deploy	1	52	20	44.060983	-124.445415	123	
Mon 25 Jun 2012 15:29:47	OBS_SIO	deploy	1	51	38	44.068562	-124.725692	113	
Mon 25 Jun 2012 16:27:33	OBS_SIO	deploy	1	53	74	44.072052	-124.974182	457	
Mon 25 Jun 2012 18:39:59	OBS_SIO	deploy	1	54	67	44.435780	-124.725625	139	
Mon 25 Jun 2012 19:41:13	OBS_SIO	deploy	1	55	40	44.496060	-124.923882	539	
Mon 25 Jun 2012 20:32:43	OBS_SIO	deploy	1	56	85	44.540447	-125.067795	1269	
Mon 25 Jun 2012 21:37:03	OBS_WHOI	deploy	1	57	D15	44.603248	-125.274575	2166	
Mon 25 Jun 2012 23:37:51	OBS_WHOI	deploy	1	58	D34	44.725882	-125.684323	2870	
Tue 26 Jun 2012 00:32:39	OBS_WHOI	deploy	1	59	D51	44.776820	-125.854578	2897	
Tue 26 Jun 2012 01:27:53	OBS_WHOI	deploy	1	60	D16	44.826960	-126.027432	2856	
Tue 26 Jun 2012 02:22:31	OBS_SIO	deploy	1	61	71	44.878630	-126.201433	2832	
Tue 26 Jun 2012 03:15:23	OBS_SIO	deploy	1	62	94	44.930325	-126.379057	2828	
Tue 26 Jun 2012 04:07:23	OBS_SIO	deploy	1	63	73	44.979618	-126.549643	2855	
Tue 26 Jun 2012 04:58:27	OBS_SIO	deploy	1	64	21	45.028302	-126.720972	2872	
Tue 26 Jun 2012 05:50:27	OBS_SIO	deploy	1	65	65	45.078455	-126.896560	2867	
Tue 26 Jun 2012 06:55:43	OBS_SIO	deploy	1	66	56	45.140468	-127.114450	2890	
Tue 26 Jun 2012 08:03:27	OBS_WHOI	deploy	1	67	D50	45.201015	-127.331528	2899	
Tue 26 Jun 2012 09:01:21	OBS_WHOI	deploy	1	68	D21	45.250568	-127.509400	2914	
Tue 26 Jun 2012 09:56:57	OBS_WHOI	deploy	1	69	D44	45.299497	-127.687753	2883	
Tue 26 Jun 2012 10:56:39	OBS_WHOI	deploy	1	70	D06	45.349635	-127.866738	2954	
Tue 26 Jun 2012 11:50:31	OBS_SIO	deploy	1	71	17	45.397222	-128.045765	2866	
Tue 26 Jun 2012 12:40:51	OBS_SIO	deploy	1	72	63	45.445823	-128.223803	2834	
Tue 26 Jun 2012 13:30:43	OBS_SIO	deploy	1	73	47	45.493693	-128.404075	2826	
Tue 26 Jun 2012 14:19:47	OBS_SIO	deploy	1	74	50	45.540852	-128.581307	2804	
Tue 26 Jun 2012 15:11:03	OBS_SIO	deploy	1	75	92	45.588482	-128.761385	2797	
Tue 26 Jun 2012 16:09:45	OBS_SIO	deploy	1	76	93	45.635347	-128.940660	2800	
Tue 26 Jun 2012 16:58:27	OBS_SIO	deploy	1	77	78	45.681962	-129.119658	2767	
Tue 26 Jun 2012 17:49:23	OBS_SIO	deploy	1	78	95	45.728377	-129.299692	2733	
Tue 26 Jun 2012 18:40:45	OBS_SIO	deploy	1	79	57	45.774647	-129.479948	2540	
Tue 26 Jun 2012 19:25:27	OBS_WHOI	deploy	1	80	D49	45.810393	-129.621097	2609	
Tue 26 Jun 2012 23:52:29	OBS_WHOI	deploy	4	81	D55	45.951513	-128.548127	2785	
Wed 27 Jun 2012 00:42:05	OBS_WHOI	deploy	4	82	D03	45.842630	-128.611712	2795	
Wed 27 Jun 2012 01:40:07	OBS_WHOI	deploy	4	83	D40	45.716563	-128.686270	2806	
Wed 27 Jun 2012 03:52:13	OBS_SIO	deploy	4	84	2	45.393187	-128.874498	2820	
Wed 27 Jun 2012 05:17:03	OBS_SIO	deploy	4	85	11	45.197893	-128.986975	2832	
Wed 27 Jun 2012 06:30:21	CTD911	deploy	4	85	46	45.198025	-128.986385	2832	CTD cast started at 06:28 UTC

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Wed 27 Jun 2012 08:13:21	CTD911	recover	4	85	46	45.196407	-128.987072		
Wed 27 Jun 2012 09:42:41	CTD911	deploy	4	84	47	45.393153	-128.874338	2820	
Wed 27 Jun 2012 11:32:29	CTD911	recover	4	84	47	45.395248	-128.876110		
Wed 27 Jun 2012 14:18:25	CTD911	deploy	4	75	48	45.588215	-128.761195	2797	CTD cast started at 12:59 UTC
Wed 27 Jun 2012 14:52:05	CTD911	recover	4	75	48	45.588248	-128.763780		
Wed 27 Jun 2012 15:50:57	CTD911	deploy	4	83	49	45.716438	-128.685888		
Wed 27 Jun 2012 17:44:13	CTD911	recover	4	83	49	45.717057	-128.686090		
Wed 27 Jun 2012 18:41:45	CTD911	deploy	4	82	50	45.842890	-128.612303	2792	
Wed 27 Jun 2012 20:30:59	CTD911	recover	4	82	50	45.840475	-128.612628		
Wed 27 Jun 2012 23:10:39	CTD911	deploy	4	81	51	45.949337	-128.552212	2783	was deployed at 21:24 UTC at 45deg 57.077'N 128deg 32.941'W
Wed 27 Jun 2012 23:11:43	CTD911	recover	4	81	51	45.949370	-128.555530		starting transit to Axial
Thu 28 Jun 2012 07:17:53	CTD911	deploy	TOW-YO 01	AX01	NaN	45.936243	-129.982382		CTD deployed at 05:16 UTC
Thu 28 Jun 2012 09:29:31	CTD911	recover	TOW-YO 01	AX01	NaN	45.902275	-129.974370		CTD recovered at 09:15 UTC
Thu 28 Jun 2012 09:49:37	CTD911	deploy	TOW-YO 05	AX09	NaN	45.933725	-130.013225	1567	
Thu 28 Jun 2012 13:35:45	CTD911	recover	TOW-YO 05		NaN	45.934372	-129.910902		
Thu 28 Jun 2012 15:14:13	CTD911	deploy	TOW-YO 07	AX13	NaN	45.953212	-129.970138	1562	
Thu 28 Jun 2012 18:21:15	CTD911	recover	TOW-YO 07		NaN	45.897197	-129.993023		
Thu 28 Jun 2012 19:42:17	CTD911	deploy	TOW-YO 02	AX03	NaN	45.978045	-130.000103	1585	
Thu 28 Jun 2012 23:58:59	CTD911	recover	TOW-YO 02	SE of AX04	NaN	45.879067	-129.961867		
Fri 29 Jun 2012 02:42:41	CTD911	deploy	TOW-YO 03	AX05	NaN	45.953413	-129.972555	1548	started at 04:05 UTC
Fri 29 Jun 2012 07:58:03	CTD911	recover	TOW-YO 03	S of AX06	NaN	45.881887	-130.001032	1673	
Fri 29 Jun 2012 12:12:05	CTD911	deploy	TOW-YO 04	AX07	NaN	45.953892	-129.974498	1543	
Fri 29 Jun 2012 16:07:31	CTD911	recover	TOW-YO 04		NaN	45.866517	-130.013903		
Fri 29 Jun 2012 16:41:25	CTD911	deploy	TOW-YO 08	NaN	NaN	45.940507	-130.013827	1571	
Fri 29 Jun 2012 17:45:17	CTD911	abort	TOW-YO 08	NaN	NaN	45.939303	-130.006177		Towyo aborted because cable is getting under the ship. We'll try again from east to west.
Fri 29 Jun 2012 17:57:37	CTD911	recover	TOW-YO 08	NaN	NaN	45.938203	-130.005115		
Fri 29 Jun 2012 18:16:41	CTD911	deploy	TOW-YO 08B	NaN	NaN	45.941105	-129.959247	1560	
Fri 29 Jun 2012 21:00:23	CTD911	recover	TOW-YO 08B	NaN	NaN	45.947035	-130.038623		
Fri 29 Jun 2012 23:20:35	CTD911	deploy	1	80	52	45.810395	-129.620870	2613	CTD cast started at 23:07 UTC
Sat 30 Jun 2012 00:44:19	CTD911	recover	1	80	52	45.806632	-129.617522		rebooted laptop just before
Sat 30 Jun 2012 01:38:55	CTD911	deploy	1	79	53	45.774372	-129.479868	2561	CTD cast started at 01:30 UTC
Sat 30 Jun 2012 02:36:05	Other	start	NaN	NaN	NaN	45.774572	-129.479735		rebooted laptop twice more: keyboard/trackpad are getting blocked; plugged in my USB mouse to see if it helps
Sat 30 Jun 2012 03:10:29	CTD911	recover	1	79	53	45.774188	-129.481883		
Sat 30 Jun 2012 04:18:35	CTD911	deploy	1	78	54	45.728352	-129.300127	2737	
Sat 30 Jun 2012 05:26:45	Other	start	NaN	NaN	NaN	45.728233	-129.299952		rebooted laptop again
Sat 30 Jun 2012 06:03:21	CTD911	recover	1	78	54	45.728018	-129.303392		
Sat 30 Jun 2012 06:57:13	CTD911	deploy	1	77	55	45.682020	-129.121065	2763	
Sat 30 Jun 2012 08:37:13	CTD911	recover	1	77	55	45.681832	-129.121127		

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Sat 30 Jun 2012 09:38:37	CTD911	deploy	1	76	56	45.635477	-128.941405	2798	
Sat 30 Jun 2012 11:26:25	CTD911	recover	1	76	56	45.637405	-128.938200		
Sat 30 Jun 2012 12:22:05	CTD911	deploy	1	75	57	45.588143	-128.761520	2796	
Sat 30 Jun 2012 14:09:15	CTD911	recover	1	75	57	45.590113	-128.760415		
Sat 30 Jun 2012 15:06:49	CTD911	deploy	1	74	58	45.541113	-128.582230	2805	
Sat 30 Jun 2012 16:54:03	CTD911	recover	1	74	58	45.541393	-128.582088		
Sat 30 Jun 2012 17:51:45	CTD911	deploy	1	73	59	45.493272	-128.402477	2826	
Sat 30 Jun 2012 19:43:47	CTD911	recover	1	73	59	45.495918	-128.401065		
Sat 30 Jun 2012 21:17:13	CTD911	deploy	1	72	60	45.445837	-128.223767	2833	CTD cast started at 20:44 UTC
Sat 30 Jun 2012 22:31:45	CTD911	recover	1	72	60	45.446890	-128.222612		
Sat 30 Jun 2012 23:29:25	CTD911	deploy	1	71	61	45.397538	-128.044653	2858	
Sun 01 Jul 2012 00:02:44	Ship	other	NaN	NaN	NaN	45.397345	-128.044797		leap second a couple of minutes ago!
Sun 01 Jul 2012 01:15:40	CTD911	recover	1	71	61	45.397863	-128.040355		
Sun 01 Jul 2012 02:10:46	CTD911	deploy	1	70	62	45.348697	-127.866630	2954	
Sun 01 Jul 2012 03:59:56	CTD911	recover	1	70	62	45.349160	-127.866640		
Sun 01 Jul 2012 05:24:30	CTD911	deploy	1	69	63	45.299488	-127.687662	2884	CTD cast started at 05:00 UTC
Sun 01 Jul 2012 06:49:48	CTD911	recover	1	69	63	45.301258	-127.688280		
Sun 01 Jul 2012 07:50:16	CTD911	deploy	1	68	64	45.250163	-127.509512	2919	
Sun 01 Jul 2012 09:48:30	CTD911	recover	1	68	64	45.253728	-127.515413		
Sun 01 Jul 2012 10:15:56	CTD911	deploy	1	CC1	65	45.237057	-127.458717	3003	
Sun 01 Jul 2012 12:10:08	CTD911	recover	1	CC1	65	45.237317	-127.460355		
Sun 01 Jul 2012 12:37:50	CTD911	deploy	1	CC2	66	45.216808	-127.383038	2976	
Sun 01 Jul 2012 14:28:46	CTD911	recover	1	CC2	66	45.217520	-127.381672		
Sun 01 Jul 2012 15:24:56	CTD911	deploy	1	67	67	45.201003	-127.332108	2899	
Sun 01 Jul 2012 17:17:24	CTD911	recover	1	67	67	45.201068	-127.331750		
Sun 01 Jul 2012 18:19:36	CTD911	deploy	1	66	68	45.140050	-127.113657	2894	
Sun 01 Jul 2012 20:11:56	CTD911	recover	1	66	68	45.141315	-127.111948		
Sun 01 Jul 2012 21:29:22	CTD911	deploy	1	65	69	45.078568	-126.896405	2867	
Sun 01 Jul 2012 23:08:32	CTD911	recover	1	65	69	45.079188	-126.894535		
Mon 02 Jul 2012 00:33:20	CTD911	deploy	1	64	70	45.028495	-126.719852	2871	
Mon 02 Jul 2012 02:13:18	CTD911	recover	1	64	70	45.026795	-126.721622		
Mon 02 Jul 2012 03:11:30	CTD911	deploy	1	63	71	44.979115	-126.549507	2853	
Mon 02 Jul 2012 04:57:18	CTD911	recover	1	63	71	44.979490	-126.552030		
Mon 02 Jul 2012 06:04:22	CTD911	other	1	62		44.930350	-126.378838		Daryl replacing conductivity sensor
Mon 02 Jul 2012 06:58:20	CTD911	deploy	1	62	72	44.930058	-126.379430	2830	
Mon 02 Jul 2012 08:39:46	CTD911	recover	1	62	72	44.931028	-126.379485		
Mon 02 Jul 2012 09:38:20	CTD911	deploy	1	61	73	44.878955	-126.201683	2831	
Mon 02 Jul 2012 11:27:50	CTD911	recover	1	61	73	44.879285	-126.200497		
Mon 02 Jul 2012 12:22:42	CTD911	deploy	1	60	74	44.827687	-126.026487	2855	
Mon 02 Jul 2012 14:11:56	CTD911	recover	1	60	74	44.828258	-126.027530		
Mon 02 Jul 2012 15:07:14	CTD911	deploy	1	59	75	44.776562	-125.854868	2895	
Mon 02 Jul 2012 16:57:50	CTD911	recover	1	59	75	44.778795	-125.856193		
Mon 02 Jul 2012 18:09:52	CTD911	deploy	1	58	76	44.726232	-125.684542	2872	

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Mon 02 Jul 2012 20:30:20	CTD911	recover	1	58	76	44.699575	-125.594703		CTD was recovered at 19:55 UTC
Mon 02 Jul 2012 21:21:12	CTD911	deploy	1	4	77	44.655107	-125.450797	2880	
Mon 02 Jul 2012 23:29:32	CTD911	recover	1	4	77		-125.421343		
Tue 03 Jul 2012 02:51:02	Ship	other	NaN	NaN	NaN	44.584147	-125.294820		Near site 57; Langseth on port side
Tue 03 Jul 2012 03:56:16	CTD911	deploy	1	57	78	44.602992	-125.274568	2171	
Tue 03 Jul 2012 05:22:00	CTD911	recover	1	57	78	44.600655	-125.266770		
Tue 03 Jul 2012 05:49:14	Ship	other	1	SHR1	NaN	44.570092	-125.182445		arrived at SHR1
Tue 03 Jul 2012 06:57:54	Ship	other	1	SHR2	NaN	44.569025	-125.113570		end of bubble survey
Tue 03 Jul 2012 07:26:10	CTD911	deploy	1	56	79	44.539207	-125.066738	1268	
Tue 03 Jul 2012 08:24:06	CTD911	recover	1	56	79	44.540862	-125.068358		
Tue 03 Jul 2012 09:20:34	CTD911	deploy	1	55	80	44.496072	-124.922462	537	
Tue 03 Jul 2012 09:55:12	CTD911	recover	1	55	80	44.496317	-124.921827		
Tue 03 Jul 2012 17:46:02	Ship	other	NaN	NaN	NaN	44.625688	-124.044810		At the OSU dock in Newport.
Thu 05 Jul 2012 18:01:10	Ship	other	NaN	NaN	NaN	44.603460	-124.098388		Departure from Newport
Fri 06 Jul 2012 14:05:06	OBS_SIO	other	4	85	11	45.193730	-128.951442		Enabled.
Fri 06 Jul 2012 14:06:54	OBS_SIO	release	4	85	11	45.194775	-128.959057	2837	
Fri 06 Jul 2012 15:09:02	OBS_SIO	on surface	4	85	11	45.196778	-128.982615		
Fri 06 Jul 2012 15:14:40	OBS_SIO	recover	4	85	11	45.195840	-128.988492		
Fri 06 Jul 2012 16:29:10	OBS_SIO	other	4	84	2	45.381138	-128.880902		Enabled.
Fri 06 Jul 2012 16:31:54	OBS_SIO	release	4	84	2	45.388118	-128.876865	2820	
Fri 06 Jul 2012 17:36:00	OBS_SIO	on surface	4	84	2	45.391877	-128.871753		
Fri 06 Jul 2012 17:41:48	OBS_SIO	recover	4	84	2	45.392927	-128.874635		
Fri 06 Jul 2012 19:45:28	OBS_WHOI	other	4	83	D40	45.714518	-128.686980		Enabled. On top of instrument. Start of acoustic survey (circle ccwise from E)
Fri 06 Jul 2012 20:26:22	OBS_WHOI	release	4	83	D40	45.716042	-128.686118		
Fri 06 Jul 2012 20:27:46	OBS_WHOI	release	4	83	D40	45.716598	-128.686423		End of acoustic survey. Release command sent
Fri 06 Jul 2012 21:13:44	OBS_WHOI	on surface	4	83	D40	45.716412	-128.682082		
Fri 06 Jul 2012 21:19:54	OBS_WHOI	recover	4	83	D40	45.717060	-128.684812		
Fri 06 Jul 2012 22:14:28	OBS_WHOI	other	4	82	D03	45.841505	-128.612900		Enabled.
Fri 06 Jul 2012 22:19:18	OBS_WHOI	other	4	82	D03	45.841895	-128.614083		start of acoustic survey
Fri 06 Jul 2012 22:58:02	OBS_WHOI	release	4	82	D03	45.842202	-128.611800		end of acoustic survey, release command sent
Fri 06 Jul 2012 23:50:40	OBS_WHOI	on surface	4	82	D03	45.838815	-128.610028		
Fri 06 Jul 2012 23:59:02	OBS_WHOI	recover	4	82	D03	45.842193	-128.612752		
Sat 07 Jul 2012 00:44:34	OBS_WHOI	other	4	81	D55	45.947048	-128.550720		Enabled
Sat 07 Jul 2012 01:24:20	OBS_WHOI	release	4	81	D55	45.950615	-128.548908		End of acoustic survey. Release command sent
Sat 07 Jul 2012 02:14:46	OBS_WHOI	on surface	4	81	D55	45.951140	-128.549217		
Sat 07 Jul 2012 02:23:16	OBS_WHOI	recover	4	81	D55	45.950993	-128.549295		
Sat 07 Jul 2012 06:33:52	OBS_WHOI	other	1	80	D49	45.811060	-129.616255		Enabled
Sat 07 Jul 2012 06:41:12	OBS_WHOI	other	1	80	D49	45.810502	-129.620485		start of acoustic survey

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Sat 07 Jul 2012 07:17:08	OBS_WHOI	release	1	80	D49	45.809833	-129.621630		End of acoustic survey. Release command sent
Sat 07 Jul 2012 08:10:20	OBS_WHOI	on surface	1	80	D49	45.810732	-129.622153		
Sat 07 Jul 2012 08:21:04	OBS_WHOI	recover	1	80	D49	45.809997	-129.622208		
Sat 07 Jul 2012 08:56:12	OBS_SIO	other	1	79	57	45.780830	-129.504942		Enabled.
Sat 07 Jul 2012 08:58:36	OBS_SIO	release	1	79	57	45.778108	-129.494817		
Sat 07 Jul 2012 09:54:10	OBS_SIO	on surface	1	79	57	45.771612	-129.484308		
Sat 07 Jul 2012 10:02:56	OBS_SIO	recover	1	79	57	45.774320	-129.480507		
Sat 07 Jul 2012 10:51:42	OBS_SIO	other	1	78	95	45.734567	-129.325130		Enabled.
Sat 07 Jul 2012 10:53:36	OBS_SIO	release	1	78	95	45.732463	-129.316952		
Sat 07 Jul 2012 11:57:34	OBS_SIO	on surface	1	78	95	45.725855	-129.298153		
Sat 07 Jul 2012 12:05:30	OBS_SIO	recover	1	78	95	45.727280	-129.300385		
Sat 07 Jul 2012 12:50:30	OBS_SIO	other	1	77	78	45.689412	-129.150442		Enabled.
Sat 07 Jul 2012 12:51:58	OBS_SIO	release	1	77	78	45.687900	-129.144122		
Sat 07 Jul 2012 13:48:50	OBS_SIO	on surface	1	77	78	45.680727	-129.125733		
Sat 07 Jul 2012 13:57:42	OBS_SIO	recover	1	77	78	45.680898	-129.116097		
Sat 07 Jul 2012 14:41:02	OBS_SIO	other	1	76	93	45.642235	-128.967200		Enabled.
Sat 07 Jul 2012 14:43:14	OBS_SIO	release	1	76	93	45.639683	-128.958015		
Sat 07 Jul 2012 15:46:42	OBS_SIO	on surface	1	76	93	45.644983	-128.933752		
Sat 07 Jul 2012 15:59:14	OBS_SIO	recover	1	76	93	45.631883	-128.939127		
Sat 07 Jul 2012 16:40:22	OBS_SIO	other	1	75	92	45.595457	-128.789873		Enabled.
Sat 07 Jul 2012 16:47:10	OBS_SIO	release	1	75	92	45.589647	-128.764777		
Sat 07 Jul 2012 17:47:24	OBS_SIO	on surface	1	75	92	45.586437	-128.758012		
Sat 07 Jul 2012 17:47:48	OBS_SIO	recover	1	75	92	45.586518	-128.757965		
Sat 07 Jul 2012 18:38:42	OBS_SIO	other	1	74	50	45.543167	-128.589055		Enabled.
Sat 07 Jul 2012 18:39:46	OBS_SIO	release	1	74	50	45.542443	-128.587697		
Sat 07 Jul 2012 19:44:02	OBS_SIO	on surface	1	74	50	45.537483	-128.586042		
Sat 07 Jul 2012 19:51:46	OBS_SIO	recover	1	74	50	45.536167	-128.579757		
Sat 07 Jul 2012 20:39:48	OBS_SIO	release	1	73	47	45.500835	-128.433293		
Sat 07 Jul 2012 21:40:26	OBS_SIO	on surface	1	73	47	45.493918	-128.410113		
Sat 07 Jul 2012 21:49:26	OBS_SIO	recover	1	73	47	45.492325	-128.400582		
Sat 07 Jul 2012 22:39:14	OBS_SIO	other	1	72	63	45.452900	-128.253262		Enabled
Sat 07 Jul 2012 22:40:08	OBS_SIO	release	1	72	63	45.451837	-128.249403		
Sat 07 Jul 2012 23:42:38	OBS_SIO	on surface	1	72	63	45.443433	-128.226523		
Sat 07 Jul 2012 23:48:18	OBS_SIO	recover	1	72	63	45.443660	-128.222057		
Sun 08 Jul 2012 00:36:08	OBS_SIO	release	1	71	17	45.398443	-128.048647		
Sun 08 Jul 2012 01:38:28	OBS_SIO	on surface	1	71	17	45.395045	-128.039292		
Sun 08 Jul 2012 01:50:40	OBS_SIO	recover	1	71	17	45.396810	-128.044365		
Sun 08 Jul 2012 02:40:00	OBS_WHOI	other	1	70	D06	45.348695	-127.870892		Enabled
Sun 08 Jul 2012 02:44:38	OBS_WHOI	other	1	70	D06	45.348047	-127.864150		Start of acoustic survey
Sun 08 Jul 2012 03:19:32	OBS_WHOI	release	1	70	D06	45.348222	-127.865960		End of acoustic survey, release command sent
Sun 08 Jul 2012 04:09:58	OBS_WHOI	on surface	1	70	D06	45.345858	-127.866818		

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Sun 08 Jul 2012 04:15:44	OBS_WHOI	recover	1	70	D06	45.348763	-127.866908		
Sun 08 Jul 2012 05:02:18	OBS_WHOI	other	1	69	D44	45.301375	-127.694088		Enabled
Sun 08 Jul 2012 05:06:12	OBS_WHOI	other	1	69	D44	45.299582	-127.687967		Start of acoustic survey
Sun 08 Jul 2012 05:42:46	OBS_WHOI	release	1	69	D44	45.300172	-127.687358		End of acoustic survey. Release command sent
Sun 08 Jul 2012 06:36:52	OBS_WHOI	on surface	1	69	D44	45.297663	-127.686900		
Sun 08 Jul 2012 06:42:10	OBS_WHOI	recover	1	69	D44	45.300810	-127.687188		
Sun 08 Jul 2012 07:34:30	OBS_WHOI	other	1	68	D21	45.251738	-127.514475		Enabled.
Sun 08 Jul 2012 07:41:02	OBS_WHOI	other	1	68	D21	45.251568	-127.507623		Start acoustic survey.
Sun 08 Jul 2012 08:17:56	OBS_WHOI	release	1	68	D21	45.251397	-127.509862		End of acoustic survey. Release command sent.
Sun 08 Jul 2012 09:06:20	OBS_WHOI	on surface	1	68	D21	45.248300	-127.507918		
Sun 08 Jul 2012 09:18:36	OBS_WHOI	recover	1	68	D21	45.252762	-127.507528		
Sun 08 Jul 2012 10:10:32	OBS_WHOI	other	1	67	D50	45.202112	-127.335610		Enabled.
Sun 08 Jul 2012 10:13:38	OBS_WHOI	other	1	67	D50	45.201410	-127.331790		Start of acoustic survey.
Sun 08 Jul 2012 10:52:58	OBS_WHOI	release	1	67	D50	45.201012	-127.331477		End of acoustic survey. Release command sent.
Sun 08 Jul 2012 11:45:34	OBS_WHOI	on surface	1	67	D50	45.196587	-127.334675		
Sun 08 Jul 2012 11:57:50	OBS_WHOI	recover	1	67	D50	45.201752	-127.332475		
Sun 08 Jul 2012 12:52:14	OBS_SIO	other	1	66	56	45.145178	-127.133758		Enabled.
Sun 08 Jul 2012 12:53:46	OBS_SIO	release	1	66	56	45.143663	-127.127470		
Sun 08 Jul 2012 13:57:48	OBS_SIO	on surface	1	66	56	45.136562	-127.113073		
Sun 08 Jul 2012 14:06:02	OBS_SIO	recover	1	66	56	45.141082	-127.115302		
Sun 08 Jul 2012 14:59:52	OBS_SIO	other	1	65	65	45.088383	-126.930905		Enabled.
Sun 08 Jul 2012 15:01:10	OBS_SIO	release	1	65	65	45.086903	-126.925698		
Sun 08 Jul 2012 16:05:02	OBS_SIO	on surface	1	65	65	45.075105	-126.896792		
Sun 08 Jul 2012 16:09:56	OBS_SIO	recover	1	65	65	45.076787	-126.895743		
Sun 08 Jul 2012 17:01:36	OBS_SIO	other	1	64	21	45.035983	-126.750907		Enabled.
Sun 08 Jul 2012 17:02:26	OBS_SIO	release	1	64	21	45.035248	-126.747362		
Sun 08 Jul 2012 18:11:12	OBS_SIO	on surface	1	64	21	45.025392	-126.723423		
Sun 08 Jul 2012 18:16:50	OBS_SIO	recover	1	64	21	45.027450	-126.718153		
Sun 08 Jul 2012 19:01:02	OBS_SIO	other	1	63	73	44.991860	-126.592808		Enabled
Sun 08 Jul 2012 19:02:52	OBS_SIO	release	1	63	73	44.989937	-126.585503		
Sun 08 Jul 2012 20:07:06	OBS_SIO	on surface	1	63	73	44.976912	-126.548597		
Sun 08 Jul 2012 20:14:32	OBS_SIO	recover	1	63	73	44.980098	-126.548545		
Sun 08 Jul 2012 21:03:56	OBS_SIO	other	1	62	94	44.938338	-126.405645		Enabled
Sun 08 Jul 2012 21:06:02	OBS_SIO	release	1	62	94	44.935167	-126.397293		
Sun 08 Jul 2012 22:10:12	OBS_SIO	on surface	1	62	94	44.926943	-126.379675		
Sun 08 Jul 2012 22:16:02	OBS_SIO	recover	1	62	94	44.930130	-126.379362		
Sun 08 Jul 2012 23:15:01	OBS_SIO	other	1	61	71	44.879600	-126.204715		Enabled
Sun 08 Jul 2012 23:17:06	OBS_SIO	release	1	61	71	44.878243	-126.200277		
Mon 09 Jul 2012 00:21:18	OBS_SIO	on surface	1	61	71	44.876655	-126.203682		
Mon 09 Jul 2012 00:30:02	OBS_SIO	recover	1	61	71	44.881503	-126.202100		

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Mon 09 Jul 2012 01:20:34	OBS_WHOI	other	1	60	D16	44.828247	-126.030090		Enabled
Mon 09 Jul 2012 01:25:16	OBS_WHOI	other	1	60	D16	44.827948	-126.026438		Start of acoustic survey
Mon 09 Jul 2012 01:56:20	OBS_WHOI	release	1	60	D16	44.827368	-126.027127		End of acoustic survey. Release command sent.
Mon 09 Jul 2012 02:46:50	OBS_WHOI	on surface	1	60	D16	44.824750	-126.027747		
Mon 09 Jul 2012 02:52:04	OBS_WHOI	recover	1	60	D16	44.827232	-126.026598		
Mon 09 Jul 2012 03:39:12	OBS_WHOI	other	1	59	D51	44.777128	-125.856287		Enabled
Mon 09 Jul 2012 03:44:10	OBS_WHOI	other	1	59	D51	44.776593	-125.853928		Start of acoustic survey
Mon 09 Jul 2012 04:20:16	OBS_WHOI	release	1	59	D51	44.777285	-125.854833		End of acoustic survey. Release command sent.
Mon 09 Jul 2012 05:18:54	OBS_WHOI	on surface	1	59	D51	44.773407	-125.854225		
Mon 09 Jul 2012 05:25:28	OBS_WHOI	recover	1	59	D51	44.777103	-125.852457		
Mon 09 Jul 2012 06:09:50	OBS_WHOI	other	1	58	D34	44.727127	-125.687747		Enabled
Mon 09 Jul 2012 06:14:04	OBS_WHOI	other	1	58	D34	44.725800	-125.684182		Start of acoustic survey
Mon 09 Jul 2012 06:51:52	OBS_WHOI	release	1	58	D34	44.725735	-125.683670		End of acoustic survey. Release command sent.
Mon 09 Jul 2012 07:42:34	OBS_WHOI	on surface	1	58	D34	44.722175	-125.682362		
Mon 09 Jul 2012 08:04:10	OBS_WHOI	recover	1	58	D34	44.721638	-125.682185		
Mon 09 Jul 2012 09:49:44	OBS_WHOI	other	1	57	D15	44.604117	-125.277123		Enabled.
Mon 09 Jul 2012 09:54:02	OBS_WHOI	other	1	57	D15	44.603823	-125.274510		Start of acoustic survey.
Mon 09 Jul 2012 10:30:04	OBS_WHOI	release	1	57	D15	44.603375	-125.273870		End of acoustic survey. Release command sent.
Mon 09 Jul 2012 11:08:24	OBS_WHOI	on surface	1	57	D15	44.599125	-125.274408		
Mon 09 Jul 2012 11:22:08	OBS_WHOI	recover	1	57	D15	44.604618	-125.273867		
Mon 09 Jul 2012 12:14:04	OBS_SIO	other	1	56	85	44.545553	-125.082432		Enabled.
Mon 09 Jul 2012 12:15:52	OBS_SIO	release	1	56	85	44.542938	-125.075347		
Mon 09 Jul 2012 12:46:04	OBS_SIO	on surface	1	56	85	44.537308	-125.069887		
Mon 09 Jul 2012 12:54:02	OBS_SIO	recover	1	56	85	44.538948	-125.066718		
Mon 09 Jul 2012 13:34:10	OBS_SIO	other	1	55	40	44.497842	-124.929233		Enabled.
Mon 09 Jul 2012 13:35:46	OBS_SIO	release	1	55	40	44.497323	-124.926983		
Mon 09 Jul 2012 13:49:28	OBS_SIO	on surface	1	55	40	44.493073	-124.926042		
Mon 09 Jul 2012 13:57:56	OBS_SIO	recover	1	55	40	44.494603	-124.924470		
Mon 09 Jul 2012 14:58:58	OBS_SIO	other	1	54	67	44.438395	-124.737912		Enabled.
Mon 09 Jul 2012 15:02:44	OBS_SIO	release	1	54	67	44.435533	-124.727390		
Mon 09 Jul 2012 15:07:16	OBS_SIO	on surface	1	54	67	44.430667	-124.729583		
Mon 09 Jul 2012 15:13:40	OBS_SIO	recover	1	54	67	44.433250	-124.727658		
Mon 09 Jul 2012 16:20:22	OBS_SIO	other	1	50	39	44.354002	-124.515622		Enabled.
Mon 09 Jul 2012 16:22:18	OBS_SIO	release	1	50	39	44.352133	-124.509653		
Mon 09 Jul 2012 16:48:26	OBS_SIO	other	1	50	39	44.351417	-124.508248		The OBS is having trouble with the burning. It jumps out of the burn cycle every minute. Hopefully with 8 burn commands will go through the complete cycle.
Mon 09 Jul 2012 17:03:16	OBS_SIO	on surface	1	50	39	44.350253	-124.507303		

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Mon 09 Jul 2012 17:08:12	OBS_SIO	recover	1	50	39	44.350362	-124.508998		
Mon 09 Jul 2012 19:08:16	OBS_SIO	other	1	49	68	44.648617	-124.509570		Enabled
Mon 09 Jul 2012 19:09:34	OBS_SIO	release	1	49	68	44.650262	-124.509873		
Mon 09 Jul 2012 19:16:08	OBS_SIO	on surface	1	49	68	44.649830	-124.511307		
Mon 09 Jul 2012 19:23:48	OBS_SIO	recover	1	49	68	44.649230	-124.510443		
Mon 09 Jul 2012 20:40:16	OBS_SIO	release	1	48	13	44.667380	-124.746415		
Mon 09 Jul 2012 20:53:18	OBS_SIO	on surface	1	48	13	44.666050	-124.750212		
Mon 09 Jul 2012 20:57:44	OBS_SIO	recover	1	48	13	44.667622	-124.749580		
Tue 10 Jul 2012 01:11:22	OBS_SIO	other	1	52	20	44.065525	-124.447062		Enabled
Tue 10 Jul 2012 01:12:52	OBS_SIO	release	1	52	20	44.064048	-124.445752		
Tue 10 Jul 2012 01:18:50	OBS_SIO	on surface	1	52	20	44.060748	-124.443775		
Tue 10 Jul 2012 01:23:56	OBS_SIO	recover	1	52	20	44.060880	-124.445752		
Tue 10 Jul 2012 02:45:28	OBS_SIO	other	1	51	38	44.068170	-124.720925		Enabled.
Tue 10 Jul 2012 02:47:24	OBS_SIO	release	1	51	38	44.068192	-124.724350		
Tue 10 Jul 2012 02:54:40	OBS_SIO	on surface	1	51	38	44.065867	-124.725747		
Tue 10 Jul 2012 02:58:56	OBS_SIO	recover	1	51	38	44.067010	-124.725847		
Tue 10 Jul 2012 04:13:22	OBS_SIO	other	1	53	74	44.071935	-124.969728		Enabled.
Tue 10 Jul 2012 04:14:30	OBS_SIO	release	1	53	74	44.071840	-124.972432		
Tue 10 Jul 2012 04:28:02	OBS_SIO	on surface	1	53	74	44.070365	-124.974227		
Tue 10 Jul 2012 04:32:46	OBS_SIO	recover	1	53	74	44.071730	-124.974150		
Tue 10 Jul 2012 06:31:10	OBS_SIO	other	3	1	86	44.251587	-125.313327		Enabled
Tue 10 Jul 2012 06:32:34	OBS_SIO	release	3	1	86	44.253820	-125.317937		
Tue 10 Jul 2012 07:39:04	OBS_SIO	on surface	3	1	86	44.256812	-125.336877		
Tue 10 Jul 2012 07:54:56	OBS_SIO	recover	3	1	86	44.261685	-125.331075		
Tue 10 Jul 2012 08:51:52	OBS_SIO	other	3	2	90	44.377238	-125.365068		Enabled.
Tue 10 Jul 2012 08:53:16	OBS_SIO	release	3	2	90	44.380982	-125.366278		
Tue 10 Jul 2012 10:14:52	OBS_SIO	on surface	3	2	90	44.389647	-125.373670		
Tue 10 Jul 2012 10:26:20	OBS_SIO	recover	3	2	90	44.393945	-125.371220		
Tue 10 Jul 2012 11:19:04	OBS_SIO	other	3	3	23	44.516750	-125.408020		Enabled.
Tue 10 Jul 2012 11:20:02	OBS_SIO	release	3	3	23	44.519533	-125.408855		
Tue 10 Jul 2012 12:24:12	OBS_SIO	on surface	3	3	23	44.535758	-125.416597		
Tue 10 Jul 2012 12:33:32	OBS_SIO	recover	3	3	23	44.540360	-125.413820		
Tue 10 Jul 2012 13:22:28	OBS_WHOI	other	3	4	D39	44.651943	-125.449770		Enabled.
Tue 10 Jul 2012 13:23:24	OBS_WHOI	release	3	4	D39	44.653567	-125.450098		
Tue 10 Jul 2012 14:20:10	OBS_WHOI	on surface	3	4	D39	44.653442	-125.449125		
Tue 10 Jul 2012 14:30:30	OBS_WHOI	recover	3	4	D39	44.654902	-125.448318		
Tue 10 Jul 2012 15:28:30	OBS_WHOI	other	3	5	D35	44.798917	-125.495148		Enabled.
Tue 10 Jul 2012 15:30:18	OBS_WHOI	release	3	5	D35	44.800427	-125.495878		
Tue 10 Jul 2012 16:18:20	OBS_WHOI	on surface	3	5	D35	44.798152	-125.496168		
Tue 10 Jul 2012 16:24:54	OBS_WHOI	recover	3	5	D35	44.799702	-125.498457		
Tue 10 Jul 2012 17:13:34	OBS_WHOI	other	3	6	D09	44.920415	-125.532308		Enabled.
Tue 10 Jul 2012 17:16:18	OBS_WHOI	release	3	6	D09	44.921570	-125.531763		
Tue 10 Jul 2012 18:02:58	OBS_WHOI	on surface	3	6	D09	44.919400	-125.533108		

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Date	Instrument	Action	Transect	Station	Cast	Latitude	Longitude	Seafloor	Comment
Tue 10 Jul 2012 18:08:06	OBS_WHOI	recover	3	6	D09	44.921247	-125.534063		
Tue 10 Jul 2012 19:08:20	OBS_SIO	other	3	7	61	45.071398	-125.578050		Enabled
Tue 10 Jul 2012 19:09:20	OBS_SIO	release	3	7	61	45.074082	-125.578973		
Tue 10 Jul 2012 20:10:52	OBS_SIO	on surface	3	7	61	45.089500	-125.588805		
Tue 10 Jul 2012 20:20:56	OBS_SIO	recover	3	7	61	45.087198	-125.580842		
Tue 10 Jul 2012 21:20:58	OBS_SIO	other	3	8	55	45.222122	-125.627012		Enabled
Tue 10 Jul 2012 21:21:38	OBS_SIO	release	3	8	55	45.223898	-125.627412		
Tue 10 Jul 2012 22:22:24	OBS_SIO	on surface	3	8	55	45.234367	-125.628875		
Tue 10 Jul 2012 22:30:06	OBS_SIO	recover	3	8	55	45.237602	-125.632738		
Tue 10 Jul 2012 22:59:38	Ship	other	NaN	NaN	NaN	45.273520	-125.645657		On the way to Site 26 to reattempt recovery of WHOI OBS D62. ETA Jul 11 07:00 local.
Wed 11 Jul 2012 14:17:32	OBS_WHOI	other	3	26	D62	47.808942	-126.470317		Arrived to Site to reattempt recovery.
Wed 11 Jul 2012 14:18:46	OBS_WHOI	other	3	26	D62	47.810373	-126.470728		Enable command sent
Wed 11 Jul 2012 14:20:10	OBS_WHOI	other	3	26	D62	47.811888	-126.471300		No response. Enable comm sent again.
Wed 11 Jul 2012 14:21:58	OBS_WHOI	release	3	26	D62	47.812972	-126.471955		Burn 1 sent.
Wed 11 Jul 2012 14:43:32	OBS_WHOI	release	3	26	D62	47.813055	-126.471687		Burn 2.
Wed 11 Jul 2012 15:14:20	OBS_WHOI	release	3	26	D62	47.812728	-126.471070		Burn 3 sent @ 15:03UTC
Wed 11 Jul 2012 15:24:32	OBS_WHOI	release	3	26	D62	47.813113	-126.471837		Burn 4
Wed 11 Jul 2012 15:51:34	OBS_WHOI	release	3	26	D62	47.821480	-126.471530		Burn 5 sent @15:43UTC from 0.5 nm North of site.
Wed 11 Jul 2012 16:05:48	OBS_WHOI	release	3	26	D62	47.821358	-126.471422		Burn 6 sent from 0.5 nm North of site.
Wed 11 Jul 2012 16:35:54	OBS_WHOI	release	3	26	D62	47.812877	-126.465418		Burn 7 sent from 0.25 nm East of site @16:24
Wed 11 Jul 2012 19:43:08	Ship	other	NaN	NaN	NaN	47.783100	-126.441307		No success with the recovery of D62. Transiting back to Newport.
Fri 13 Jul 2012 14:53:44	Ship	endCruise	NaN	NaN	NaN	44.774610	-124.360690		