GLOBEC Northeast Pacific, Northern California Current

Cruise Report, R/V *Wecoma* (W0008A)

29 July – 17 August 2000

This cruise was
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Port of Departure: Newport, OR
Port of Return: Newport, OR

Cruise Objectives

- To conduct a mesoscale hydrographic, velocity, bioacoustic and bio-optical survey of coastal waters between Newport, OR and Crescent City, CA;
- To conduct at least two finescale hydrographic, velocity, bioacoustic and bio-optical surveys over the continental shelf and shallow continental slope: one over Heceta Bank, the other bracketing Cape Blanco;
- To deploy optical drifters during each of the finescale surveys;
- To obtain high-resolution underway measurements of surface hydrographic, optical (ac-9), and photosynthetic properties, along with frequent discrete samples for nutrients, chlorophyll, HPLC, phytoplankton species, and particulate absorption;
- To obtain profiles of hydrographic, bio-optical and photosynthetic properties near the optical drifters;
- To obtain CTD profiles of hydrographic properties along the mesoscale survey lines as time and conditions permit.

Summaries of each of the GLOBEC projects may be found at the web site: http://globec.coas.oregonstate.edu/groups/nep/projs.html.

Table 1. GLOBEC Cruise Participants

Jack Barth	Chief Scientist, Oregon State University, Corvallis
Mark Abbott	Scientist, Oregon State University, Corvallis, (disembarked 4 Aug 2000)
Anatoli Erofeev	Scientist
Linda Fayler	Marine Technician, Oregon State University, Newport
Alejandro Gonzalez	Technician, (University of Minnesota)
Cidney Howard	Graduate Student, Oregon State University, Corvallis
Ricardo Letelier	Scientist, Oregon State University, Corvallis, (disembarked 4 Aug 2000)
Toby Martin	Marine Technician, Oregon State University, Corvallis
Steve Meacham	Observer, (NSF), (disembarked 4 Aug 2000)
Robert O'Malley	Technician, Oregon State University, Corvallis
Steve Pierce	Scientist, Oregon State University, Corvallis
Rachel Sanders	Graduate Student, Oregon State University, Corvallis
Daryl Swensen	Marine Technician, Oregon State University, Corvallis
Malinda Sutor	Graduate Student, Oregon State University, Corvallis
Christopher Wingard	Technician, Oregon State University, Corvallis

GLOBEC Research Components Represented:

Barth, Cowles, Pierce: *Mesoscale patterns in physical and bio-optical distributions* (SeaSoar, ADCP)
Participants: Barth, Pierce, Erofeev, O'Malley, Wingard, Howard, Sutor, Fayler, Swenson, Martin

Abbott and Letelier: *Phytoplankton biomass and physiology*
Participants: Abbott, Letelier, Sanders

Huntley and Zhou: *Zooplankton distributions from optical plankton counter* (OPC)
Participants: Gonzalez

Peterson: *Zooplankton distributions from 4-frequency bioacoustical system* (HTI)
Participants: Pierce, Sutor

Cruise Narrative

July 29. We departed Newport onboard R/V *Wecoma* at 0900 (all times local PDT, -7 hours from UTC). Our first day was spent in transit to the southern boundary of our study region in preparation for the inshore mapping survey (Figure 1). Along the way, we stopped a number of times to perform dip tests with the SeaSoar, seeking to eliminate the cross-talk between the Optical Plankton Counter (OPC) and the SeaBird CTD. The CTD is used to help fly the SeaSoar in normal towing operations, and noise in that signal is undesirable. While work proceeded in trying to tune the OPC signal voltage to work with the CTD signal, two WOCE SVP-style surface drifters were released at NH-15 and NH-10 (Table 2). We also took the opportunity to map the location of crab pots along the inshore ends of lines 1 and 2 as we headed southward.

A total of four dip tests were performed as we steamed southward, with adjustments to the OPC signal voltage after each test. Work halted near midnight and we continued to transit to the nearshore end of line 12.

July 30. We arrived at 0630 and scouted for crab pots while attaching the OPC to the SeaSoar in preparation for towing. One final dip test was performed to observe the result of setting the OPC voltage signal at 4.0 volts.

The bioacoustic (HTI) package was deployed for towing, and data collection began at 0730 (Table 3). Deployment of the SeaSoar followed at 0749 as we began tow 1 and the inshore mapping survey (July 30 - August 4) (Table 4).

Inshore Survey

Winds were upwelling favorable (southward) over all of our mapping surveys, with an average of 14 knot winds for the duration of our study (Figure 2). The inshore survey, in particular, took place during a week-long upwelling event, which had maximum wind gusts of 38 knots on August 2.

It would end up taking us four SeaSoar tows to complete the mapping from line 12 to line 1 of the inshore survey. We started by heading offshore along line 12 for just over nine hours before heading north to line 11 and turning to head inshore again. Columbia River water was observed on the western edge of these lines, and a separated jet was still present downstream of Cape Blanco. During this period, the OPC-CTD crosstalk caused the CTD to reset about once every six hours at the beginning of tow 1. However, this rate would increase as we headed inshore on line 11. Tow 1 came to a close as we were running the inshore connecting line going between line 11 and line 10. At 0320 on July 31, we snagged a piece of relic, subsurface crab gear, losing communications with the CTD and ending tow 1.

In the next four hours we determined that a board internal to the CTD had come loose, and we replaced the CTD with our backup unit. One of the FlashPAKs was also damaged and had to be removed from the SeaSoar.

By 0640 the SeaSoar was ready to go back in the water again, and we finished our transit to the inshore end of line 10. The SeaSoar was deployed for the start of tow 2 at 0724 and headed offshore along line 10. As the tow headed out on line 10, then back on line 9, it was determined that we would not go inshore of 100 m depth during night operations, neither this night nor any other. As we arrived at the 100 m contour on line 9, the SeaSoar was recovered at 2325 and we proceeded to finish the line with four CTD stations (Figure 3) (Table 5). At the same time, the OPC was again removed from the SeaSoar and the signal voltage was decreased from 4.0 to 3.8 volts. Deck tests indicated the OPC was going to have troubles with 3.8 volts, and we settled on trying 3.9 volts for the next tow. It would turn out, however, that the adjustment would not improve the errors being received from the SeaBird unit, and it would degrade the data quality on the OPC. Corrosion problems were also observed on the exterior of the OPC, suggesting a short to sea water. The SeaSoar was back together shortly after the completion of the 4^{th} CTD station, and we transited to the inshore end of line 8 in preparation for the start of tow 3.

As we headed out on line 8, we extended the western boundaries to allow us to define the cold, separated jet offshore, as well as to delay our approach to shallow water until sunrise the next day (August 2). We extended the line out to 126.2º W longitude before heading north to line 7, then heading back towards shore. We arrived at the 100 m isobath before sunrise, and we doubled back on line 7 for an hour before heading back towards shore. The R/V *New Horizon* was in the vicinity at the time, doing CTD casts and vertical net tows.

Towing continued on the inshore survey, as we covered the map from south to north. Lines were adjusted to only have us towing the SeaSoar shallower than 100 m in daylight hours. As we were heading offshore along line 6, we observed a deep chlorophyll maximum between 25 and 75 meters depth, and the western end of line 6 was extended further offshore to better observe the extent of this feature.

Our progress northward on the inshore survey was monitored by the R/V *New Horizon*, as they attempted to synchronize their station work with our towing. We were able to do a loop around the R/V *New Horizon* on line 4, obtaining bioacoustic data on the HTI as they were collecting MOCNESS data.

Tow 3 came to its scheduled completion on the inshore side of line 3, at 2337 on August 3. We completed the night operations with nearshore CTD stations on line 3 and line 2 (Figure 3). Tow 4 began at 0400 on line 2, heading offshore.

The inshore survey came to a close with the release of four bio-optical drifters along the northern edge of our study area as we were completing line 1 (~ 1450 on August 4). Mapping the inshore survey ended shortly thereafter, at 1619. Earlier in the day, the SeaSoar had snarled another submerged crab pot on Stonewall Bank; the only damage to the SeaSoar this time was the loss of the PAR sensor.

Twenty minutes after the SeaSoar was onboard, we rendezvoused with the R/V *Sacajawea* and offloaded science personnel Abbott, Letelier, and Meacham.

Northern Finescale Survey

The north survey began with Tethered Spectral Radiometer Buoy (TSRB) (Table 6) and SLOWDROP (Table 7) station work in the vicinity of the four bio-optical drifters before starting to tow the SeaSoar again. At 1800, we were alongside the drifters, and the HTI was deployed shortly thereafter, followed by the TSRB at ~ 1815. The TSRB was recovered 45 minutes later, and then what followed were five hours of repeat SLOWDROP station work through the remainder of the night.

While station work was going on, the OPC was removed from the SeaSoar and substantial amounts of corrosion were observed on the exterior of the pressure case. The OPC was replaced with a backup unit, and reinstalled on the SeaSoar. Another PAR sensor was also installed on the SeaSoar, replacing the one that was lost in the tangle with the submerged relic crab gear. At the completion of the SLOWDROP observations, we transited to the offshore end of line 2A in preparation for the mapping of the north survey (Figure 1). We were ready to start towing at 0600 on August 5.

The SeaSoar survey to map out the finescale northern features was intended to last two days, running from line 2a to line 5 and bracketing the process work on lines 3 and 4 by the R/V *New Horizon* and the F/V *Sea Eagle*. Line spacing on the finescale maps is half that of the initial inshore map that began this study. Line 2a was also started farther offshore in an attempt to define the flow sweeping around Heceta Bank. Along the way, we were able to perform another inter-calibration of data with the R/V *New Horizon* on line 3, as they collected MOCNESS data and we obtained HTI bio-acoustics.

The northern survey was completed using tow 5 through the first part of tow 7. The SeaSoar was recovered while running the inshore line between 3a and 4 in order to clean the conductivity cells as well as the ac-9 optics. The ac-9 data had indicated clogging, likely due to the extensive amount of jellyfish in the waters. Total time for the SeaSoar to be recovered, sensors cleaned, and redeployed was 25 minutes. A brief tow 6 followed, which ended in the SeaSoar being recovered when it snagged on crab gear. The turnaround time between tow 6 and tow 7 was less than 25 minutes; our remaining FlashPAK needed to be reseated after the snag, but was not damaged.

The trackline for inbound line 4a shows a jog to the south to line 5 (Figure 1); this was necessitated to avoid large numbers of fishing boats and concern over their use of long lines. However, when we got to the inshore end of line 5, we then headed north to finish the coverage of line 4a, then jogged back down to extend line 5 offshore. Line 5 was surveyed far offshore in preparation for the next mapping survey.

Filament Survey

We had been observing a layer of high-chlorophyll, relatively cool water coming off the coast along the western flank of an anti-cyclonic meander with its base near Coos Bay. The purpose of the filament survey was to define this feature which had been first identified during the initial inshore mapping. The filament survey began as we reached the western extent of line 5 at 1847 on August 7. The filament mapping was intended to track through the center of this feature, as well as to contrast it with areas on the outside (Figure 1). Positions of the filament core were communicated to scientists aboard the R/V *New Horizon* and F/V *Sea Eagle* so that they could conduct coordinated sampling of the filament.

The filament survey extended to the southern edge of our study area before heading back towards the inshore side of line 7. In the process of heading southward, we encountered deep chlorophyll features down to 100 m on the flanks of the offshore jet. Sometimes these occurred when surface chlorophyll was high, but not always.

This survey finished its mapping by coming in to the nearshore end of line 7. We arrived at the eastern end of line 7 at 2211 on August 8, and continued with tow 7.

Southern Finescale Survey

The southern finescale survey, similar to the northern survey, was designed to take about two days of towing. We started at line 7 and continued at the finescale spacing until we finished line 11 (Figure 2). As we headed offshore on line 7, we deployed three more optical drifters as we passed the 100 m isobath. Line 7 showed upwelling nearshore with enhanced chlorophyll and acoustic backscatter near the drifter deployment site; however, the strongest southward flow, upwelled isopycnals, surface chlorophyll, and acoustic backscatter, was found farther offshore in the "separated" jet near 125º 12' W. We continued outbound on line 7 until 125º 15'W, which just defined the southward jet core. We then steamed south to line 7a and headed towards the shore.

Tow 7 came to a close as we were surveying from line 7a to line 8 on the nearshore side. A crab pot was snagged and we recovered the SeaSoar to check for damage. While on deck, we cleaned the conductivity cells and checked the OPC connections. The backup OPC which had been installed at the end of the inshore survey to eliminate the cross-talk problems with the CTD, had initially been collecting clean data, but subsequent noise problems began to show up. The SeaSoar was out of the water for 30 minutes before continuing with tow 8 and the southern survey.

The remainder of the southern survey proceeded without incident, although the OPC data continued to look suspicious. We observed very high surface and water column chlorophyll values nearshore near Port Orford. The surface water exceeded 11º C, and the bottom water was newly upwelled and around 8.3º C. Tow 8 came to a close at the nearshore end of line 11 at approximately 1900 on August 10.

Northern Survey 2

Our plan was to now transit north to line 4 and conduct a second mapping of the northern survey area in concert with station work by the R/V *New Horizon* and F/V *Sea Eagle*. Afterwards, we would transit to the northern drifter cluster and do TSRB and SLOWDROP station work. This would be followed by similar sampling near the southern cluster of drifters.

As we transited to the north, the OPC was removed from the SeaSoar, and was found to have been flooded. Alejandro Gonzalez proceeded to dry the electronics and clean the salt deposits. Since external corrosion was still a problem, the grounding strip was removed per the manufacturers recommendation to see if that would improve the situation. The OPC passed deck testing, and it was reassembled and reinstalled on the SeaSoar around 0630 on August 11. The SeaSoar was in the water and tow 9 began half an hour later at the offshore end of line 4.

As we began towing on line 4, the OPC data was okay, but cross-talk with the CTD signal was causing frequent resets of the CTD deck-unit. As we headed towards the shelf break, we determined there were too many lost records and noise in the CTD data to safely fly the SeaSoar based on the CTD pressure signal. We turned off the OPC for this line and kept surveying up the shelf with the SeaSoar while the R/V *New Horizon* and the F/V *Sea Eagle* continued to do station work near this line.

At the eastern end of line 4, we recovered the SeaSoar at 1330 and transited to the north while the OPC was again removed from the SeaSoar, and the grounding strap reattached. The system again tested out fine on the bench, and was reinstalled on the SeaSoar.

Two hours after the SeaSoar was recovered at the end of line 4, it was deployed again for the start of tow 10 (1530, August 11). The repair work on the OPC was a success, and we headed outbound on line 3. Three hours later, however, the SeaSoar snagged on one of the four northern bio-optical drifters (which was heading south), as we mapped along line 3 heading west. As improbable as it was, fortunately, there was no damage to either the SeaSoar or the drifter. Both were redeployed.

We continued with our second northern mapping, going from line 3 to line 2. A coordinated "fly-by" of the R/V *New Horizon* took place, thus acquiring another inter-calibration between our bioacoustic data and their MOCNESS data. SeaSoaring continued up through the end of line 1, and the tow ended on the offshore end of line 1 at 1230 on August 12.

Station work followed for the next 43 hours. We started with two more CTD stations along line 1 (Figure 3). We then transited to locate the other three bio-optical drifters in the northern study area. The drifters had remained closely together since their release, and we were beside all three of them between 1715 and 1730. We recovered one of the drifters, which was transmitting a scrambled signal, as we prepared for our station work. The HTI was redeployed, followed by the TSRB. This was followed by two successive SLOWDROP deployments and recoveries. During the first SLOWDROP deployment, we released another drifter to replace the one that we recovered. After the final SLOWDROP recovery, the HTI was brought back on deck (2245) as we prepared for transit to find the bio-optical drifters that were released in the southern survey area.

We arrived near the southern drifter cluster early the next morning (0545, August 13) near 43º N latitude. The TSRB was deployed, as was the HTI. After the TSRB was recovered, we maneuvered near another of the southern drifters and deployed the SLOWDROP. Upon recovery, we maneuvered near the third drifter and did another TSRB deployment and recovery. The HTI was also recovered, and we proceeded to recover all three drifters in this area. We discovered that the third drifter we recovered, (ID 27355), had its drogue cut off just below the intermediate float, and was in need of repair.

We then shifted our study area westward with a three-hour transit further offshore, out to 125º 13.5' W longitude and 43º 12.8' N latitude. We redeployed (1715) the two undamaged drifters that we had just recovered, along with one other that was available, in a strong SW current. This was followed by deploying the HTI, then one more SLOWDROP deployment and recovery.

During this period, the SeaSoar was getting reconfigured to operate in deep water on faired cable. This involves swapping from unfaired to faired cable, and reterminating the connection with the SeaSoar. After the SLOWDROP was recovered, we performed a dip test of the SeaSoar to be sure all the systems were working. At 2000 (August 13) the SeaSoar was recovered, the HTI recovered, and we bagan to transit to the southern edge of our survey area in preparation for our final mapping survey.

Offshore Survey

We arrived at the inshore end of line 12 after an eight-hour transit. We did four shallow CTD stations on the shelf (Figure 3) with complete nutrient sampling as we headed towards deeper water. At 0740 (August 14) we began deploying the SeaSoar for deep-water towing. We then headed offshore to 126º W longitude, starting the offshore survey (Figure 2). The SeaSoar operated smoothly on the faired cable, getting sections down to 300+ meters with all data recording. As the offshore survey continued, it was necessary to sample a coarser number of lines for time constraints. After 34 hours of towing, it was necessary to recover the SeaSoar to clean the temperature probes and conductivity cells. We took this opportunity to get one more CTD station with a full set of nutrients (Figure 3).

At 2000 on August 15, the SeaSoar went in the water one more time to start the final tow of the cruise (tow 12). We finished up with lines 5, 3, and 1, and the SeaSoar was recovered at 0524 on 17 August, offshore of Newport. By 0900 we were dockside at Newport.

At the end of this survey, we had collected exactly 14 days of SeaSoaring (336 hours of towing) with over 9,000 SeaSoar profiles, including two inter-calibration fly-bys with the R/V *New Horizon*. Additionally, our station work included 15 CTD rosette casts, seven SLOWDROP stations, and four TSRB stations. We also deployed eight optical drifters and two WOCE-style drifters over the course of the survey.

Data collection during W0008A

SeaSoar CTD and Bio-Optics (Barth and Cowles)

Temperature and conductivity data were collected during all SeaSoar operations with dual Seabird temperature and conductivity sensors that were mounted in the nosecone of the SeaSoar vehicle. We monitored real-time displays of temperature and conductivity data to detect clogging of the sensors. The system functioned well during the cruise, with few interruptions in data acquisition or degradation of data quality.

Bio-optical sensors (ac-9 and two fluorometers) were mounted on the SeaSoar and sampled water via an intake port in the nosecone of the SeaSoar vehicle. Real-time display of ac-9 data was used to reveal spatial patterns of phytoplankton abundance (based on light absorption at 676 nm) in relation to hydrographic features. Two fluorometers were in-line with the ac-9, each recording pigment fluorescence at 685 nm, where one system used 440 nm excitation and the other 500 nm excitation. Quantum-corrected ratios of 685 nm fluorescence reveals the contribution of accessory pigments to the photosynthetic apparatus.

A complete set of SeaSoar CTD and chlorophyll maps and vertical sections can be found at:

http://damp.coas.oregonstate.edu/globec/nep/seasoar/index.html.

Two WOCE Surface Velocity Program-style surface drifters (satellite-tracked, 15-m drogued, surface T) were deployed along the Newport Hydrographic line at the start of the cruise.

Optical drifters (Abbott and Letelier)

One cluster of four optical drifters was deployed at 44º 39.0N, 124º 20.0W at the beginning of the Northern fine scale survey and a second cluster of three optical drifters was deployed at 43º 12.9N, 124º 36.5W at the start of the Southern fine scale survey. A final cluster of three optical drifters was deployed on August 13 at 43º 12.8N, 125º 13.4W before the start of the Offshore Mesoscale survey. Each drifter contained optical sensors in a surface float to record downwelling light intensity and another to record upwelling radiance at seven wavelengths. Many of the drifters were recovered after the end of their use during the finescale surveys, but others were left to drift in the California Current System. When possible, a Tethered Spectral Radiometer Buoy was deployed in the vicinity of the drifters for calibration purposes.

SLOWDROP optical profiling (Cowles)

We deployed a free-fall profiling system to provide high resolution vertical profiles of temperature, salinity, and density (using Seabird 911+ CTD), along with bio-optical properties based on multi-wavelength absorption and attenuation (WET Labs ac-9), as well as multi-wavelength fluorescence. These profiles were conducted near the optical drifters in order to provide water column assessments of the optical properties detected by the surface drifters. The optical instruments on the SLOWDROP profiler also provide calibration for the ac-9 and fluorometers used on the SeaSoar.

Underway optical properties (Abbott and Letelier)

This program component focused on the assessment of the spatial and temporal variability in phytoplankton biomass and physiology. This goal was achieved principally by gathering a continuous record of phytoplankton *in vivo* fluorescence, variable fluorescence, and water absorption and attenuation, using a 10-AU Turner Designs fluorometer, a Chelsea fast Repetition Rate fluorometer, and a WET Labs ac-9 in a flow-through mode during SeaSoar survey periods.

In addition to the continuous records, discrete samples for chlorophyll fluorometric determinations, pigment analysis, particle absorption, and nutrients were collected every 2 hours during the SeaSoar mesoscale survey (approximately every 15 nm), except when over the shelf, when samples were collected every half hour. Samples for phytoplankton specific determination were collected at selected locations and preserved with formaldehyde.

Shipboard Acoustic Doppler Current Profiler (Pierce)

Acoustic Doppler Current Profiler (ADCP) data were collected nearly continuously throughout the cruise using a 153-kHz RD Instruments narrow-band model mounted in the hull of the R/V *Wecoma*. The instrument was configured with a pulse length of 8 m, bin width of 8 m, and blanking interval of 4 m. The depth range of good quality data was approximately 17 to 350 m. Bottom-tracking was enabled when the bottom depth was less than 500 m. P-code GPS was integrated into the ADCP data at the end of each ensemble. Ship's heading was by a combination of Sperry gyro compass and Ashtech attitude GPS, both recorded at 1 Hz. The ensemble averaging time for velocity data was 2.5 min. The instrument was also configured to collect raw backscatter amplitude data at a 1 s. rate, using a special option of the UE4 user-exit program. These data will be used to create 12-second averages, to match the HTI data ensembles. The ADCP operated continuously, except for planned brief interruptions to change system parameters or diskettes. The Ashtech GPS experienced occasional dropouts, but the gyro compass was still available for heading, so this implies only a small decrease in velocity accuracy. A preliminary analysis suggested overall ADCP data quality for the cruise was excellent and maps and vertical sections of velocity can be found at: *http://damp.coas.oregonstate.edu/globec/nep/adcp/index.html.*

Bioacoustical system (Peterson and Pierce)

A four-frequency bioacoustics instrument was towed on a short cable off the port quarter of the R/V *Wecoma* during most of the cruise. This was a Hydroacoustic Technology, Inc. Model 244 instrument (HTI), mounted on a towed sled at 2-3 m depth, 3 m off from the side of the ship. The four frequencies were 38, 120, 200, and 420 kHz.

The instrument was usually deployed during the same time periods as the SeaSoar. We configured the HTI to collect echo integration data and to use a raw ping rate of about 4 pings/s, or 1 ping/s for each frequency. Depth bins were 1 m in width, and depth range was 200 m (38 and 120 kHz), 150 m (200 kHz), and 100 m (420 kHz). The ensemble averaging time was 12 s.

From the start of the cruise until August 8, intermittent data dropouts caused the loss of up to about 25 m of the deepest bins at 120 and 200 kHz. On August 8, the instrument was reconfigured with the 40logR target strength threshold set to “9.999” for every other bin, disabling single particle tracking for half the bins. The data dropouts in the deepest bins disappeared after this change. The echo integration data (20logR) relevant for biomass estimation continued to be collected for every 1-m bin. The loss of half of the single particle tracking data is of minimal concern to this project; these data are mostly for users interested in individual fish tracking, not biomass estimation. Nevertheless, the manufacturer is working on a fix to this bug in the data acquisition software.

On August 16, the HTI towed vehicle became tangled in the SeaSoar cable. This incident occurred while the ship was in the midst of a gradual turn and the SeaSoar cable was pulling to one side. The HTI tail fins were bent but the instrument appeared undamaged otherwise. To avoid this mishap in the future, the HTI towing cable was shortened slightly (by adjustment of the crane boom length), and the bridge officers were requested to turn the ship even more gradually, when both the SeaSoar and the HTI are deployed.

Optical Plankton Counter (Huntley and Zhou)

An Optical Plankton Counter (OPC) was attached to the bottom of the SeaSoar to complement the bio-acoustic and fluorescence observations. There were difficulties tuning the OPC signal to work without cross-talk problems with the CTD also installed on the SeaSoar. This was never satisfactorily resolved, and the OPC unit was replaced with a backup unit. Initially, the alternate unit worked fine, but then data quality degraded. Later, repair indicated that water had gotten into the electronics. This was corrected and we were able to continue recording data over the survey; while the data retained some level of intermittent noise, it did not get worse.

Table 2: Optical Drifters

Event#	Instr	Cast	Sta	Sta	Day std	Mos	Time	S/E Flag	Lat	Long	Water Depth	Cast Depth	SI	Reg	Comments
WE21100.07	Drifter 15895	nd	nd	NH-15	29	7	1213	S	44.65167	-124.41133	nd	nd	Barth	nd	WOCE SVP. Not recovered.
WE21100.08	Drifter 15900	nd	nd	NH-10	29	7	1307	S	44.65100	-124.29500	nd	nd	Barth	nd	WOCE SVP. Not recovered.
WE21700.07	Drifter 26913	nd	nd	nd	4	8	1448	S	44.65083	-124.48417	nd	nd	Abbott/Letelier	NFS	Deployed along line 1.
WE21700.07	Drifter 26913	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE21700.08	Drifter 26912	nd	nd	nd	4	8	1449	S	44.65083	-124.48100	nd	nd	Abbott/Letelier	NFS	Deployed along line 1.
WE21700.08	Drifter 26912	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered
WE21700.09	Drifter 26911	nd	nd	nd	4	8	1450	S	44.65083	-124.47783	nd	nd	Abbott/Letelier	NFS	Deployed along line 1.
WE21700.09	Drifter 26911	nd	nd	nd	13	8	1728	E	44.36717	-124.70250	nd	nd	nd	nd	Did not work.
WE21700.10	Drifter 26910	nd	nd	nd	4	8	1451	S	44.65083	-124.47483	nd	nd	Abbott/Letelier	NFS	Deployed along line 1.
WE21700.10	Drifter 26910	nd	nd	nd	11	8	1835	E	44.24667	-124.70933	nd	nd	nd	Nd	Snagged by SeaSoar!!
WE22100.01	Drifter 27355	nd	nd	nd	8	8	2309	S	43.21550	-124.60250	100	nd	Barth/Letelier	nd	Along line 7.
WE22100.01	Drifter 27355	nd	nd	nd	13	8	1342	E	42.98433	-124.53167	nd	nd	nd	nd	Drogue off.
WE22100.02	Drifter 27356	nd	nd	nd	8	8	2311	S	43.21567	-124.60667	100	nd	Barth/Letelier	nd	Along line 7.
WE22100.02	Drifter 27356	nd	nd	nd	13	8	1235	E	43.03067	-124.50733	nd	nd	nd	nd	
WE22100.03	Drifter 27357	nd	nd	nd	8	8	2312	S	43.21583	-124.60867	100	nd	Barth/Letelier	nd	Along line 7.
WE22100.03	Drifter 27357	nd	nd	nd	13	8	1242	E	43.03083	-124.50417	nd	nd	nd	nd	
WE22400.04	Drifter 26910	nd	nd	nd	11	8	1924	S	44.24700	-124.76700	nd	nd	Barth/Letelier	nd	On line 3.
WE22400.04	Drifter 26910	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE22500.07	Drifter 27353	nd	nd	nd	12	8	2111	S	44.36200	-124.69900	121	nd	Barth/Letelier	nd	Near drifters 26912/13.
WE22500.07	Drifter 27353	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE22600.05	Drifter 26914	nd	nd	nd	13	8	1712	S	43.21317	-125.22517	nd	nd	Barth/Letelier	nd	
WE22600.05	Drifter 26914	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE22600.06	Drifter 27356	nd	nd	nd	13	8	1715	S	43.21383	-125.22400	nd	nd	Barth/Letelier	nd	
WE22600.06	Drifter 27356	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE22600.07	Drifter 27357	nd	nd	nd	13	8	1717	S	43.21450	-125.22267	nd	nd	Barth/Letelier	nd	
WE22600.07	Drifter 27357	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.

Table 3: HTI Deployments

Event#	Instr	Cast	Sta	Sta std	Day	Mos	Time	S/E Flag	Lat	Long	Water Depth	Cast Depth	SI	Reg	Comments
WE21200.01	HTI	1	1	12E	30	7	0724	S	41.90050	-124.31300	nd	v	Pierce	IMS	Inshore MS, 12E.
WE21200.01	HTI	1	nd	nd	31	7	0650	E	42.45733	-124.54867	nd	nd	Pierce	nd	
WE21300.01	HTI	2	2	nd	31	7	0655	S	42.45733	-124.54867	nd	v	Pierce	IMS	Inshore MS, near 10E.
WE21300.01	HTI	2	nd	nd	31	7	2340	E	42.64000	-124.59633	nd	nd	Pierce	nd	
WE21400.05	HTI	3	3	nd	1	8	0616	S	42.94550	-124.53750	50	v	Pierce	IMS	Inshore MS, near 8E.
WE21400.05	HTI	3	nd	nd	3	8	2338	E	44.23267	-124.23317	67	nd	nd	nd	
WE21700.05	HTI	4	4	nd	4	8	0358	S	44.47517	-124.22500	66	v	Pierce	IMS	Near 2E.
WE21700.05	HTI	4	nd	nd	4	8	1630	E	44.64650	-124.23067	70	nd	nd	nd	Near 1E.
WE21700.11	HTI	5	5	nd	4	8	1813	S	44.63750	-124.47700	113	v	Pierce	nd	Near drifters 269##.
WE21700.11	HTI	5	nd	nd	5	8	0038	E	44.61750	-124.59400	nd	nd	nd	nd	Near drifters 269##.
WE21800.01	HTI	6	nd	2AW	5	8	0604	S	44.38083	-125.76183	2956	v	Pierce	NFS	North Fine Scale, 2AW.
WE21800.01	HTI	6	nd	nd	10	8	1915	E	42.19483	-124.40400	44	nd	nd	SFS	South Fine Scale, 11E.
WE22400.01	HTI	7	7	4W	11	8	0701	S	43.98883	-125.25183	2100	v	Pierce	NSF2	
WE22400.01	HTI	7	nd	NH-35	11	8	1337	E	44.65133	-124.90033	542	nd	nd	nd	
WE22500.02	HTI	8	nd	NH-25	12	8	1450	S	44.65200	-124.65000	298	v	Pierce	nd	
WE22500.02	HTI	8	nd	nd	12	8	1632	E	44.65000	-124.85167	nd	nd	nd	nd	
WE22500.04	HTI	9	nd	nd	12	8	1745	S	44.37100	-124.71050	126	v	Pierce	nd	Near drifter 26912/13.
WE22500.04	HTI	9	nd	nd	12	8	2245	E	44.34200	-124.69150	nd	nd	nd	nd	
WE22600.02	HTI	10	nd	nd	13	8	0626	S	43.03600	-124.54050	81	v	Pierce	nd	Near drifter 27356.
WE22600.02	HTI	10	nd	nd	13	8	1220	E	43.02333	-124.50483	58	nd	nd	nd	
WE22600.08	HTI	11	nd	nd	13	8	1727	S	43.21200	-125.22333	2280	v	Pierce	nd	Near drifters 26914/27356/7.
WE22600.08	HTI	11	nd	nd	13	8	2007	E	43.20067	-125.24450	2280	nd	nd	nd	
WE22700.05	HTI	12	nd	nd	14	8	0727	S	41.89233	-124.63767	604	v	Pierce	OMS	Offshore mesoscale, 12M.
WE22700.05	HTI	12	nd	nd	16	8	0810	E	43.78033	-124.80617	550	nd	nd	nd	Near 5M.
WE22900.01	HTI	13	nd	nd	16	8	0848	S	43.78267	-124.81667	558	v	Pierce	OMS	Near 5M.
WE22900.01	HTI	13	nd	nd	17	8	0526	E	44.61867	-124.90033	596	nd	nd	nd	

Table 4: SeaSoar Deployments

Event#	Instr	Cast	Sta	Sta std	Day	Mos	Time	S/E Flag	Lat	Long	Water Depth	Cast Depth	SI	Reg	Comments
WE21200.02	SeaSoar	1	1	12E	30	7	0749	S	41.89767	-124.29817	36	v	Barth	IMS	Inshore MS, 12E.
WE21200.02	SeaSoar	1	nd	nd	31	7	0325	E	42.32333	-124.50100	94	nd	nd	nd	
WE21300.02	SeaSoar	2	2	nd	31	7	0724	S	42.49550	-124.52450	nd	v	Barth	IMS	Inshore MS, near 10E.
WE21200.02	SeaSoar	2	nd	nd	31	7	0325	E	42.32333	-124.50100	94	nd	nd	nd	
WE21400.06	SeaSoar	3	3	nd	1	8	0621	S	42.94550	-124.53750	50	v	Barth	IMS	Inshore MS, near 8E.
WE21400.06	SeaSoar	3	nd	nd	3	8	2327	E	44.23717	-124.23500	67	nd	nd	nd	
WE21700.06	SeaSoar	4	4	nd	4	8	0404	S	44.47500	-124.22800	67	v	Barth	IMS	Near 2E.
WE21700.06	SeaSoar	4	nd	nd	4	8	1619	E	44.64650	-124.23067	70	nd	nd	nd	Near 1E.
WE21800.02	SeaSoar	5	5	2AW	5	8	0606	S	44.38083	-125.76183	2953	v	Barth	NFS	North Fine Scale, 2AW.
WE21800.02	SeaSoar	5	nd	nd	6	8	1021	E	44.03717	-124.19000	51	nd	nd	nd	Near 3AE.
WE21900.01	SeaSoar	6	6	nd	6	8	1041	S	44.02467	-124.19200	51	v	Barth	NFS	Near 3AE.
WE21900.01	SeaSoar	6	nd	nd	6	8	1317	E	44.00033	-124.54217	148	nd	nd	nd	
WE21900.02	SeaSoar	7	7	nd	6	8	1340	S	43.99933	-124.53433	148	v	Barth	NFS	NFS, filament, SFS.
WE21900.02	SeaSoar	7	nd	nd	9	8	0914	E	43.00233	-124.52900	68	nd	nd	nd	
WE22200.01	SeaSoar	8	8	nd	9	8	0944	S	42.97817	-124.55017	74	v	Barth	SFS	
WE22200.01	SeaSoar	8	nd	nd	10	8	1906	E	42.19633	-124.40167	43	nd	nd	SFS	11E.
WE22400.02	SeaSoar	9	9	4W	11	8	0706	S	43.98983	-125.25200	2100	v	Barth	NFS2	
WE22400.02	SeaSoar	9	nd	4E	11	8	1341	E	44.00367	-124.17733	40	nd	nd	nd	
WE22400.03	SeaSoar	10	10	3E	11	8	1532	S	44.23967	-124.16917	50	v	Barth	NFS2	
WE22400.03	SeaSoar	10	nd	1W	12	8	1226	E	44.64767	-124.91500	619	nd	nd	nd	
WE22700.06	SeaSoar	11	nd	nd	14	8	0738	S	41.89283	-124.63800	605	v	Barth	OMS	offshore mesoscale, 12M
WE22700.06	SeaSoar	11	nd	nd	15	8	1851	E	43.25717	-126.05333	3070	nd	nd	nd	sensor cleaning, 7D
WE22800.02	SeaSoar	12	nd	nd	15	8	1956	S	43.21717	-126.05017	3070	v	Barth	nd	near 7D
WE22800.02	SeaSoar	12	nd	nd	17	8	0524	E	44.61933	-124.90067	597	nd	nd	nd	

Table 5: CTD Casts

Event#	Instr	Cast	Sta	Sta std	Day	Mos	Time	S/E Flag	Lat	Long	Water Depth	Cast Depth	SI	Reg	Comments
WE21400.01	CTD	1	nd	nd	1	8	0042	S	42.68333	-124.56283	95	90	Barth	nd	Inshore end of line 9.
WE21400.01	CTD	1	nd	nd	1	8	0101	E	42.68333	-124.56283	nd	nd	nd	nd	
WE21400.02	CTD	2	nd	nd	1	8	0119	S	42.68333	-124.54217	85	80	Barth	nd	Inshore end of line 9.
WE21400.02	CTD	2	nd	nd	1	8	0137	E	42.68333	-124.54217	nd	nd	nd	nd	
WE21400.03	CTD	3	nd	nd	1	8	0235	S	42.68333	-124.52033	75	65	Barth	nd	Inshore end of line 9.
WE21400.03	CTD	3	nd	nd	1	8	0249	E	42.68333	-124.52033	nd	nd	nd	nd	
WE21400.04	CTD	4	nd	9E	1	8	0309	S	42.68333	-124.50133	62	56	Barth	nd	Inshore end of line 9.
WE21400.04	CTD	4	nd	nd	1	8	0322	E	42.68333	-124.52033	nd	nd	nd	nd	
WE21700.01	CTD	5	nd	nd	4	8	0004	S	44.24700	-124.20667	58	53	Barth	nd	Inshore end of line 3.
WE21700.01	CTD	5	nd	nd	4	8	0014	E	44.24700	-124.20667	nd	nd	nd	nd	
WE21700.02	CTD	6	nd	3E	4	8	0038	S	44.24800	-124.16933	50	45	Barth	nd	Inshore end of line 3.
WE21700.02	CTD	6	nd	nd	4	8	0050	E	44.24800	-124.16933	nd	nd	nd	nd	
WE21700.03	CTD	7	nd	2E	4	8	0250	S	44.47517	-124.15883	50	43	Barth	nd	Inshore end of line 2.
WE21700.03	CTD	7	nd	nd	4	8	0258	E	44.47517	-124.15883	nd	nd	nd	nd	
WE21700.04	CTD	8	nd	nd	4	8	0324	S	44.47550	-124.19567	60	53	Barth	nd	Inshore end of line 2.
WE21700.04	CTD	8	nd	nd	4	8	0333	E	44.47550	-124.19567	nd	nd	nd	nd	
WE22500.01	CTD	9	nd	NH-35	12	8	1257	S	44.65300	-124.89250	486	470	Barth	nd	On NH line.
WE22500.01	CTD	9	nd	nd	12	8	1330	E	44.65150	-124.90000	nd	nd	nd	nd	
WE22500.03	CTD	10	nd	NH-25	12	8	1459	S	44.65283	-124.65000	298	292	Barth	nd	
WE22500.03	CTD	10	nd	nd	12	8	1527	E	44.65283	-124.65000	nd	nd	nd	nd	
WE22700.01	CTD	11	nd	CR-1	14	8	0401	S	41.90000	-124.30000	41	35	Barth	nd	
WE22700.01	CTD	11	nd	nd	14	8	0415	E	41.90000	-124.30000	nd	nd	nd	nd	
WE22700.02	CTD	12	nd	CR-2	14	8	0446	S	41.90000	-124.39983	67	62	Barth	nd	
WE22700.02	CTD	12	nd	nd	14	8	0456	E	41.90000	-124.39983	nd	nd	nd	nd	
WE22700.03	CTD	13	nd	CR-3	14	8	0529	S	41.89983	-124.50067	136	130	Barth	nd	
WE22700.03	CTD	13	nd	nd	14	8	0553	E	41.89983	-124.50067	nd	nd	nd	nd	
WE22700.04	CTD	14	nd	CR-4	14	8	0625	S	41.89983	-124.59967	508	500	Barth	nd	
WE22700.04	CTD	14	nd	nd	14	8	0709	E	41.89983	-124.59967	nd	nd	nd	nd	
WE22800.01	CTD	15	nd	7D	15	8	1927	S	43.21617	-126.04883	3070	400	Barth	nd	7D.
WE22800.01	CTD	15	nd	nd	15	8	1948	E	43.21683	-126.05000	nd	nd	nd	nd	

Table 6: Tethered Spectral Radiometer Buoy (TSRB) Deployments

Event#	Instr	Cast	Sta	Sta std	Day	Mos	Time	S/E Flag	Lat	Long	Water Depth	Cast Depth	SI	Reg	Comments
WE21700.12	TSRB	1	nd	nd	4	8	1817	S	44.63750	-124.47817	124	0	Wingard/Letelier	nd	Near drifters 269##.
WE21700.12	TSRB	1	nd	nd	4	8	1902	E	44.63117	-124.49050	nd	nd	nd	nd	
WE22500.05	TSRB	2	nd	nd	12	8	1748	S	44.37083	-124.71017	126	0	Wingard/Letelier	nd	Near drifter 26912/13.
WE22500.05	TSRB	2	nd	nd	12	8	1820	E	44.36367	-124.70533	123	nd	nd	nd	
WE22600.01	TSRB	3	nd	nd	13	8	0612	S	43.03533	-124.53700	79	0	Wingard/Letelier	nd	Near drifter 27356.
WE22600.01	TSRB	3	nd	nd	13	8	0749	E	43.03767	-124.55033	87	nd	nd	nd	
WE22600.04	TSRB	4	nd	nd	13	8	1145	S	43.03100	-124.51017	63	0	Wingard/Letelier	nd	Near drifter 27356.
WE22600.04	TSRB	4	nd	nd	13	8	1219	E	43.02283	-124.50467	58	nd	nd	nd	

Table 7: SLOWDROP Optical Profiling

Event#	Instr	Cast	Sta	Sta std	Day	Mos	Time	S/E Flag	Lat	Long	Water Depth	Cast Depth	SI	Reg	Comments
WE21700.13	SLOWDROP	1	nd	nd	4	8	2114	S	44.63233	-124.49517	124	90	Wingard/Cowles	nd	Near drifters 269##.
WE21700.13	SLOWDROP	1	nd	nd	4	8	2250	E	44.62333	-124.48600	115	nd	nd	nd	5 casts.
WE21700.14	SLOWDROP	2	nd	nd	4	8	2358	S	44.62117	-124.59950	126	90	Wingard/Cowles	nd	Near drifters 269##.
WE21700.14	SLOWDROP	2	nd	nd	5	8	0026	E	44.61917	-124.59633	117	nd	nd	nd	2 casts.
WE22500.06	SLOWDROP	3	nd	nd	12	8	1900	S	44.36667	-124.70417	124	80	Wingard/Cowles	nd	Near drifters 26912/13.
WE22500.06	SLOWDROP	3	nd	nd	12	8	2049	E	44.35267	-124.69433	114	nd	nd	nd	7 casts
WE22500.08	SLOWDROP	4	nd	nd	12	8	2117	S	44.35983	-124.69800	120	80	Wingard/Cowles	nd	Near drifters 26912/13.
WE22500.08	SLOWDROP	4	nd	nd	12	8	2238	E	44.34400	-124.69250	106	nd	nd	nd	6 casts.
WE22600.03	SLOWDROP	5	nd	nd	13	8	0833	S	43.03517	-124.52800	74	70	Wingard/Cowles	nd	Near drifter 27356.
WE22600.03	SLOWDROP	5	nd	nd	13	8	1101	E	43.01867	-124.51633	66	nd	nd	nd	11 casts.
WE22600.09	SLOWDROP	6	nd	nd	13	8	1736	S	43.21133	-125.22383	2280	80	Wingard/Cowles	nd	Near drifters 26914/27356/7.
WE22600.09	SLOWDROP	6	nd	nd	13	8	1831	E	43.20917	-125.23050	2280	nd	nd	nd	3 casts.

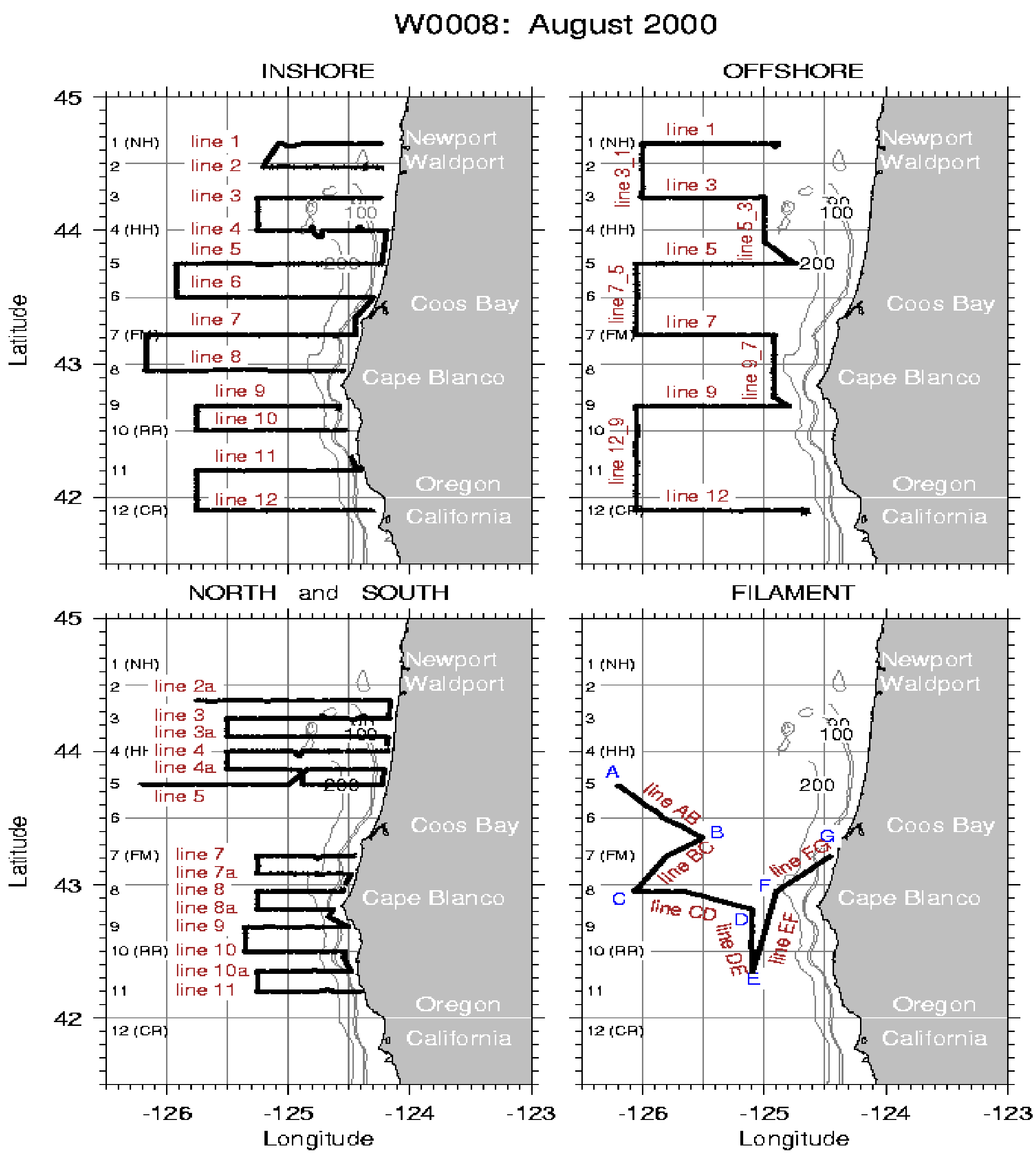

Figure 1. Mapping grids with line numbers.

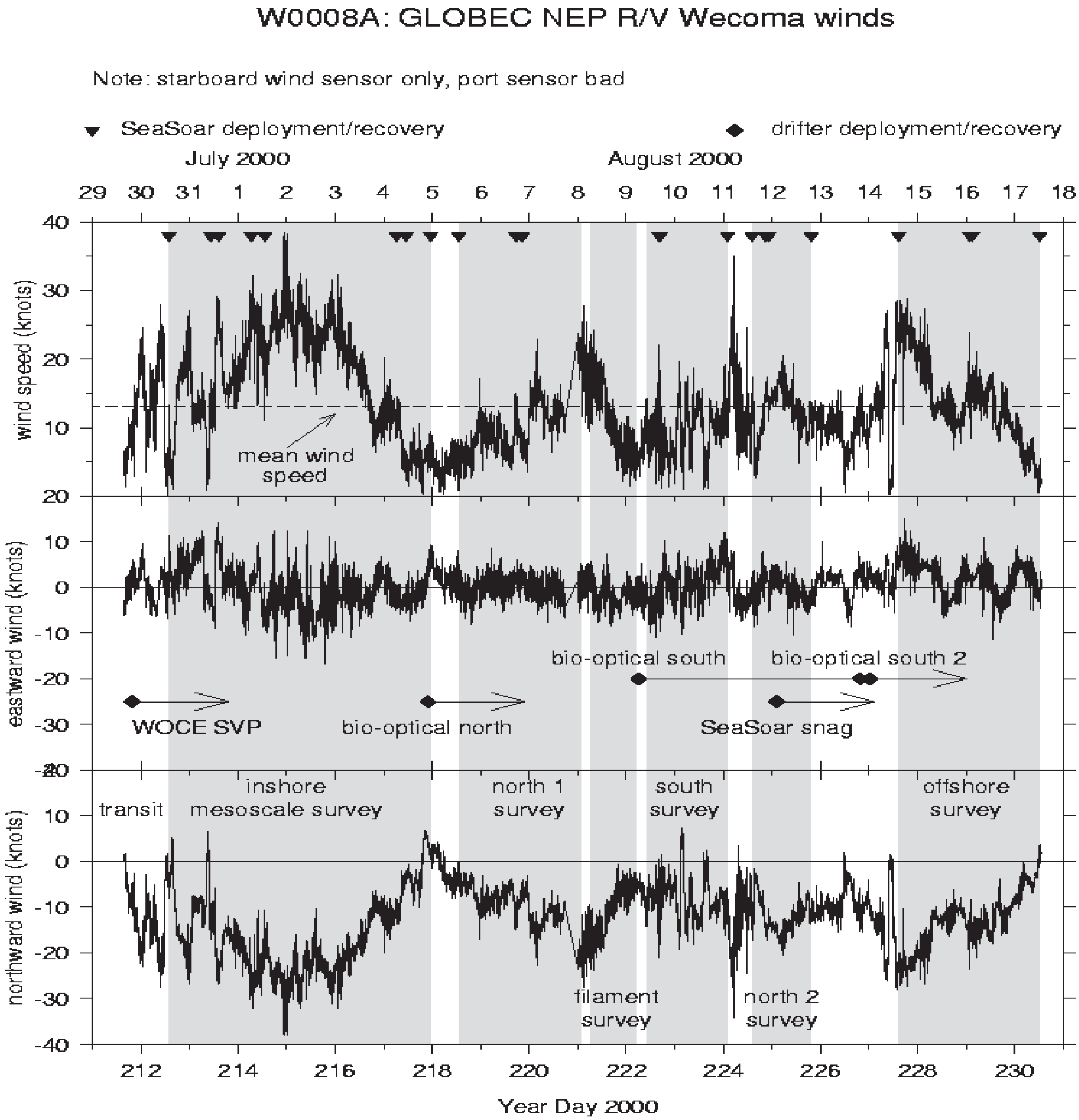

Figure 2. Wind as measured from the R/V *Wecoma* and cruise activities (Time is UTC).

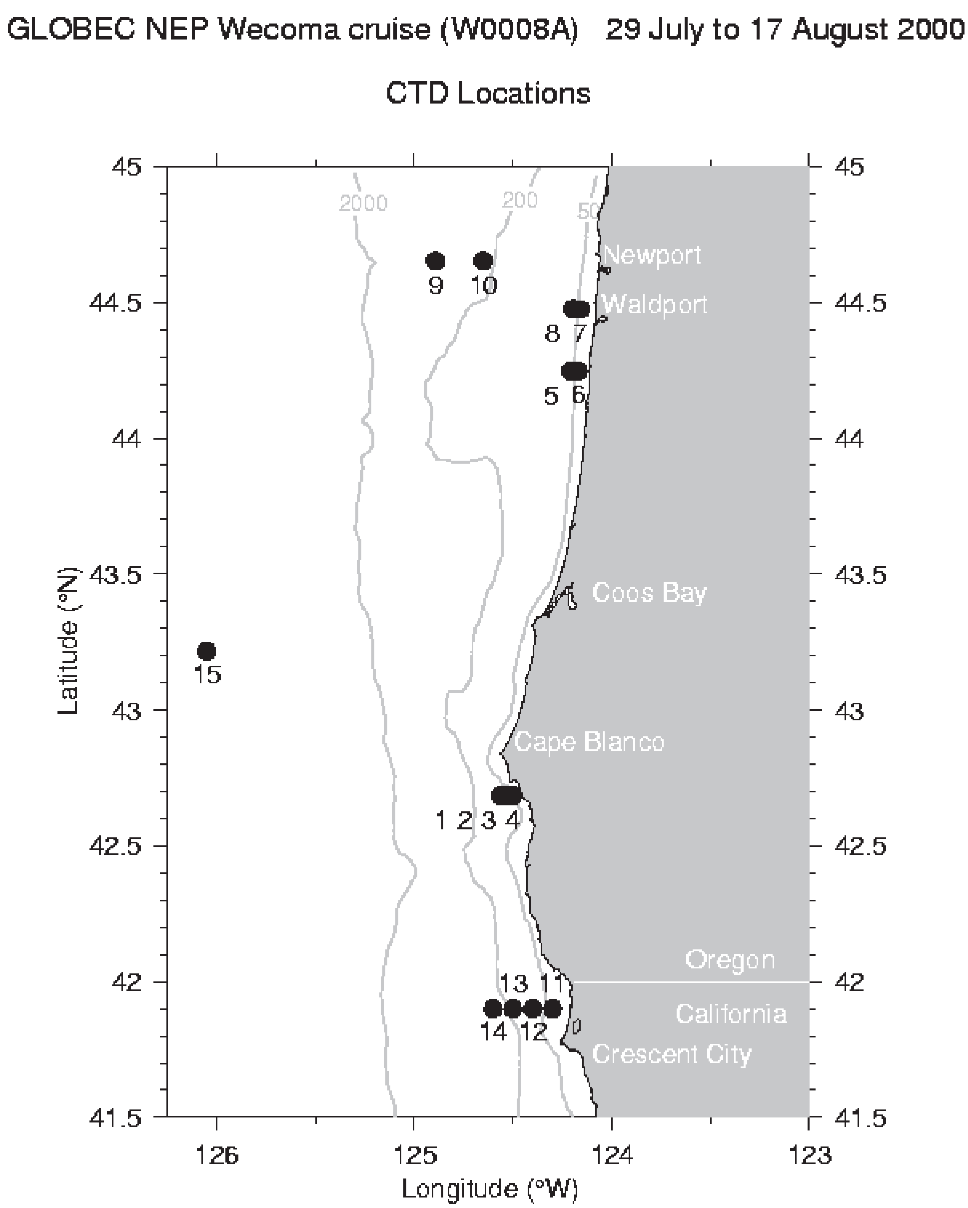

Figure 3. CTD station locations during W0008A (Bottom topography in meters).

APPENDIX I

W0008A EVENT LOG

EVENT LOG CONTENTS

Column Label	Description
Event#	Unique identifier for each line of event log
Instrument (Instr)	CTD: Seabird CTD for conductivity, temperature, depth, fluorescence and other optics; Drifters: Satellite-tracked optical drifter dragged at 30m depth; HTI: Hydroacoustic Technology Inc., Model 244, 4-frequency bioacoustics instruments; SeaSoar: Towed undulator with C, T, depth, fluorescence, ac-9, etc. SLOWDROP: Free fall profiler for C, T, depth, bio-optics; TSRB: Tethered Spectral radiometric Buoy with optics package.
Cast	Sequence # for a particular instrument
Station (Sta)	Consecutively numbered locations sampled
Station Standard (Sta std)	
Day	Local time basis
Month (Mos)	Local time basis
Time	Local time
S/E flag	S=Start of event; E-=End of event
Latitude (Lat)	Decimal degrees; north is positive
Longitude (Long)	Decimal degrees; east is positive
Water Depth	Depth of bottom
Cast Depth	Maximum depth of deployment
Scientific Investigator (SI)	
Region	Region sampled: IMS = inshore mesoscale survey; NFS = northern fine-scale survey; SFS = southern fine-scale survey; OMS = offshore mesoscale survey.
Comments	

APPENDIX 1: Event Log

Event#	Instr	Cast	Sta	Sta std	Day	Mos	Time	S/E Flag	Lat	Long	Water Depth	Cast Depth	SI	Reg	Comments
WE21100.01	Depart Newport	nd	nd	nd	29	7	0900	S	nd	nd	nd	nd	Barth	nd	
WE21100.02	ADCP	nd	nd	nd	29	7	1000	S	nd	nd	nd	nd	Pierce	nd	150kHz shipboard ADCP.
WE21100.03	MET	nd	nd	nd	29	7	1000	S	nd	nd	nd	nd	Barth	nd	Shipboard MET pkg.
WE21100.04	U/W T/S/fl	nd	nd	nd	29	7	1000	S	nd	nd	nd	nd	Barth	nd	Underway 5-m.
WE21100.05	U/W ac-9	nd	nd	nd	29	7	1000	S	nd	nd	nd	nd	Letelier	nd	Underway 5-m.
WE21100.06	U/W FRRF	nd	nd	nd	29	7	1000	S	nd	nd	nd	nd	Letelier	nd	Underway 5-m.
WE21100.07	Drifter 15895	nd	nd	NH-15	29	7	1213	S	44.65167	-124.41133	nd	nd	Barth	nd	WOCE SVP - not recovered.
WE21100.08	Drifter 15900	nd	nd	NH-10	29	7	1307	S	44.65100	-124.29500	nd	nd	Barth	nd	WOCE SVP - not recovered.
WE21200.01	HTI	1	1	12E	30	7	0724	S	41.90050	-124.31300	nd	v	Pierce	IMS	Inshore MS, 12E.
WE21200.01	HTI	1	nd	nd	31	7	0650	E	42.45733	-124.54867	nd	nd	Pierce	nd	
WE21200.02	SeaSoar	1	1	12E	30	7	0749	S	41.89767	-124.29817	36	v	Barth	IMS	Inshore MS, 12E.
WE21200.02	SeaSoar	1	nd	nd	31	7	0325	E	42.32333	-124.50100	94	nd	nd	nd	
WE21300.01	HTI	2	2	nd	31	7	0655	S	42.45733	-124.54867	nd	v	Pierce	IMS	Inshore MS, near 10E.
WE21300.01	HTI	2	nd	nd	31	7	2340	E	42.64000	-124.59633	nd	nd	Pierce	nd	
WE21300.02	SeaSoar	2	2	nd	31	7	0724	S	42.49550	-124.52450	nd	v	Barth	IMS	Inshore MS, near 10E.
WE21200.02	SeaSoar	2	nd	nd	31	7	0325	E	42.32333	-124.50100	94	nd	nd	nd	
WE21400.01	CTD	1	nd	nd	1	8	0042	S	42.68333	-124.56283	95	90	Barth	nd	Inshore end of line 9.
WE21400.01	CTD	1	nd	nd	1	8	0101	E	42.68333	-124.56283	nd	nd	nd	nd	
WE21400.02	CTD	2	nd	nd	1	8	0119	S	42.68333	-124.54217	85	80	Barth	nd	Inshore end of line 9.
WE21400.02	CTD	2	nd	nd	1	8	0137	E	42.68333	-124.54217	nd	nd	nd	nd	
WE21400.03	CTD	3	nd	nd	1	8	0235	S	42.68333	-124.52033	75	65	Barth	nd	Inshore end of line 9.
WE21400.03	CTD	3	nd	nd	1	8	0249	E	42.68333	-124.52033	nd	nd	nd	nd	
WE21400.04	CTD	4	nd	9E	1	8	0309	S	42.68333	-124.50133	62	56	Barth	nd	Inshore end of line 9.
WE21400.04	CTD	4	nd	nd	1	8	0322	E	42.68333	-124.52033	nd	nd	nd	nd	
WE21400.05	HTI	3	3	nd	1	8	0616	S	42.94550	-124.53750	50	v	Pierce	IMS	Inshore MS, near 8E.
WE21400.05	HTI	3	nd	nd	3	8	2338	E	44.23267	-124.23317	67	nd	nd	nd	
WE21400.06	SeaSoar	3	3	nd	1	8	0621	S	42.94550	-124.53750	50	v	Barth	IMS	Inshore MS, near 8E.
WE21400.06	SeaSoar	3	nd	nd	3	8	2327	E	44.23717	-124.23500	67	nd	nd	nd	
WE21700.01	CTD	5	nd	nd	4	8	0004	S	44.24700	-124.20667	58	53	Barth	nd	Inshore end of line 3.
WE21700.01	CTD	5	nd	nd	4	8	0014	E	44.24700	-124.20667	nd	nd	nd	nd	
WE21700.02	CTD	6	nd	3E	4	8	0038	S	44.24800	-124.16933	50	45	Barth	nd	Inshore end of line 3.
WE21700.02	CTD	6	nd	nd	4	8	0050	E	44.24800	-124.16933	nd	nd	nd	nd	
WE21700.03	CTD	7	nd	2E	4	8	0250	S	44.47517	-124.15883	50	43	Barth	nd	Inshore end of line 2.
WE21700.03	CTD	7	nd	nd	4	8	0258	E	44.47517	-124.15883	nd	nd	nd	nd	
WE21700.04	CTD	8	nd	nd	4	8	0324	S	44.47550	-124.19567	60	53	Barth	nd	Inshore end of line 2.
WE21700.04	CTD	8	nd	nd	4	8	0333	E	44.47550	-124.19567	nd	nd	nd	nd	
WE21700.05	HTI	4	4	nd	4	8	0358	S	44.47517	-124.22500	66	v	Pierce	IMS	Near 2E.
WE21700.05	HTI	4	nd	nd	4	8	1630	E	44.64650	-124.23067	70	nd	nd	nd	Near 1E.
WE21700.06	SeaSoar	4	4	nd	4	8	0404	S	44.47500	-124.22800	67	v	Barth	IMS	Near 2E.
WE21700.06	SeaSoar	4	nd	nd	4	8	1619	E	44.64650	-124.23067	70	nd	nd	nd	Near 1E.
WE21700.07	Drifter 26913	nd	nd	nd	4	8	1448	S	44.65083	-124.48417	nd	nd	Abbott/Letelier	NFS	Deployed along line 1.
WE21700.07	Drifter 26913	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE21700.08	Drifter 26912	nd	nd	nd	4	8	1449	S	44.65083	-124.48100	nd	nd	Abbott/Letelier	NFS	Deployed along line 1.
WE21700.08	Drifter 26912	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE21700.09	Drifter 26911	nd	nd	nd	4	8	1450	S	44.65083	-124.47783	nd	nd	Abbott/Letelier	NFS	Deployed along line 1.
WE21700.09	Drifter 26911	nd	nd	nd	13	8	1728	E	44.36717	-124.70250	nd	nd	nd	nd	Did not work.
WE21700.10	Drifter 26910	nd	nd	nd	4	8	1451	S	44.65083	-124.47483	nd	nd	Abbott/Letelier	NFS	Deployed along line 1.
WE21700.10	Drifter 26910	nd	nd	nd	11	8	1835	E	44.24667	-124.70933	nd	nd	nd	nd	Snagged by SeaSoar!!

APPENDIX 1: Event Log (cont'd)

Event#	Instr	Cast	Sta	Sta std	Day	Mos	Time	S/E Flag	Lat	Long	Water Depth	Cast Depth	SI	Reg	Comments
WE21700.11	HTI	5	5	nd	4	8	1813	S	44.63750	-124.47700	113	v	Pierce	nd	Near drifters 269##.
WE21700.11	HTI	5	nd	nd	5	8	0038	E	44.61750	-124.59400	nd	nd	nd	nd	Near drifters 269##.
WE21700.12	TSRB	1	nd	nd	4	8	1817	S	44.63750	-124.47817	124	0	Wingard/Letelier	nd	Near drifters 269##.
WE21700.12	TSRB	1	nd	nd	4	8	1902	E	44.63117	-124.49050	nd	nd	nd	nd	
WE21700.13	SLOWDROP	1	nd	nd	4	8	2114	S	44.63233	-124.49517	124	90	Wingard/Cowles	nd	Near drifters 269##.
WE21700.13	SLOWDROP	1	nd	nd	4	8	2250	E	44.62333	-124.48600	115	nd	nd	nd	5 casts.
WE21700.14	SLOWDROP	2	nd	nd	4	8	2358	S	44.62117	-124.59950	126	90	Wingard/Cowles	nd	Near drifters 269##.
WE21700.14	SLOWDROP	2	nd	nd	5	8	0026	E	44.61917	-124.59633	117	nd	nd	nd	2 casts.
WE21800.01	HTI	6	nd	2AW	5	8	0604	S	44.38083	-125.76183	2956	v	Pierce	NFS	North Fine Scale, 2AW.
WE21800.01	HTI	6	nd	nd	10	8	1915	E	42.19483	-124.40400	44	nd	nd	SFS	South Fine Scale, 11E.
WE21800.02	SeaSoar	5	5	2AW	5	8	0606	S	44.38083	-125.76183	2953	v	Barth	NFS	North Fine Scale, 2AW.
WE21800.02	SeaSoar	5	nd	nd	6	8	1021	E	44.03717	-124.19000	51	nd	nd	nd	Near 3AE.
WE21900.01	SeaSoar	6	6	nd	6	8	1041	S	44.02467	-124.19200	51	v	Barth	NFS	Near 3AE.
WE21900.01	SeaSoar	6	nd	nd	6	8	1317	E	44.00033	-124.54217	148	nd	nd	nd	
WE21900.02	SeaSoar	7	7	nd	6	8	1340	S	43.99933	-124.53433	148	v	Barth	NFS	NFS, filament, SFS.
WE21900.02	SeaSoar	7	nd	nd	9	8	0914	E	43.00233	-124.52900	68	nd	nd	nd	
WE22100.01	Drifter 27355	nd	nd	nd	8	8	2309	S	43.21550	-124.60250	100	nd	Barth/Letelier	nd	Along line 7.
WE22100.01	Drifter 27355	nd	nd	nd	13	8	1342	E	42.98433	-124.53167	nd	nd	nd	nd	Drogue off.
WE22100.02	Drifter 27356	nd	nd	nd	8	8	2311	S	43.21567	-124.60667	100	nd	Barth/Letelier	nd	Along line 7.
WE22100.02	Drifter 27356	nd	nd	nd	13	8	1235	E	43.03067	-124.50733	nd	nd	nd	nd	
WE22100.03	Drifter 27357	nd	nd	nd	8	8	2312	S	43.21583	-124.60867	100	nd	Barth/Letelier	nd	Along line 7.
WE22100.03	Drifter 27357	nd	nd	nd	13	8	1242	E	43.03083	-124.50417	nd	nd	nd	nd	
WE22200.01	SeaSoar	8	8	nd	9	8	0944	S	42.97817	-124.55017	74	v	Barth	SFS	
WE22200.01	SeaSoar	8	nd	nd	10	8	1906	E	42.19633	-124.40167	43	nd	nd	SFS	11E.
WE22400.01	HTI	7	7	4W	11	8	0701	S	43.98883	-125.25183	2100	v	Pierce	NSF2	
WE22400.01	HTI	7	nd	NH-35	11	8	1337	E	44.65133	-124.90033	542	nd	nd	nd	
WE22400.02	SeaSoar	9	9	4W	11	8	0706	S	43.98983	-125.25200	2100	v	Barth	NFS2	
WE22400.02	SeaSoar	9	nd	4E	11	8	1341	E	44.00367	-124.17733	40	nd	nd	nd	
WE22400.03	SeaSoar	10	10	3E	11	8	1532	S	44.23967	-124.16917	50	v	Barth	NFS2	
WE22400.03	SeaSoar	10	nd	1W	12	8	1226	E	44.64767	-124.91500	619	nd	nd	nd	
WE22400.04	Drifter 26910	nd	nd	nd	11	8	1924	S	44.24700	-124.76700	nd	nd	Barth/Letelier	nd	On line 3.
WE22400.04	Drifter 26910	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE22500.01	CTD	9	nd	NH-35	12	8	1257	S	44.65300	-124.89250	486	470	Barth	nd	On NH line.
WE22500.01	CTD	9	nd	nd	12	8	1330	E	44.65150	-124.90000	nd	nd	nd	nd	
WE22500.02	HTI	8	nd	NH-25	12	8	1450	S	44.65200	-124.65000	298	v	Pierce	nd	
WE22500.02	HTI	8	nd	nd	12	8	1632	E	44.65000	-124.85167	nd	nd	nd	nd	
WE22500.03	CTD	10	nd	NH-25	12	8	1459	S	44.65283	-124.65000	298	292	Barth	nd	
WE22500.03	CTD	10	nd	nd	12	8	1527	E	44.65283	-124.65000	nd	nd	nd	nd	
WE22500.04	HTI	9	nd	nd	12	8	1745	S	44.37100	-124.71050	126	v	Pierce	nd	Near drifter 26912/13.
WE22500.04	HTI	9	nd	nd	12	8	2245	E	44.34200	-124.69150	nd	nd	nd	nd	
WE22500.05	TSRB	2	nd	nd	12	8	1748	S	44.37083	-124.71017	126	0	Wingard/Letelier	nd	Near drifter 26912/13.
WE22500.05	TSRB	2	nd	nd	12	8	1820	E	44.36367	-124.70533	123	nd	nd	nd	
WE22500.06	SLOWDROP	3	nd	nd	12	8	1900	S	44.36667	-124.70417	124	80	Wingard/Cowles	nd	Near drifters 26912/13.
WE22500.06	SLOWDROP	3	nd	nd	12	8	2049	E	44.35267	-124.69433	114	nd	nd	nd	7 casts.
WE22500.07	Drifter 27353	nd	nd	nd	12	8	2111	S	44.36200	-124.69900	121	nd	Barth/Letelier	nd	Near drifters 26912/13.
WE22500.07	Drifter 27353	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE22500.08	SLOWDROP	4	nd	nd	12	8	2117	S	44.35983	-124.69800	120	80	Wingard/Cowles	nd	Near drifters 26912/13.
WE22500.08	SLOWDROP	4	nd	nd	12	8	2238	E	44.34400	-124.69250	106	nd	nd	nd	6 casts.

APPENDIX 1: Event Log (cont'd)

Event#	Instr	Cast	Sta	Sta std	Day	Mos	Time	S/E Flag	Lat	Long	Water Depth	Cast Depth	SI	Reg	Comments
WE22600.01	TSRB	3	nd	nd	13	8	0612	S	43.03533	-124.53700	79	0	Wingard/Letelier	nd	Near drifter 27356.
WE22600.01	TSRB	3	nd	nd	13	8	0749	E	43.03767	-124.55033	87	nd	nd	nd	
WE22600.02	HTI	10	nd	nd	13	8	0626	S	43.03600	-124.54050	81	v	Pierce	nd	Near drifter 27356.
WE22600.02	HTI	10	nd	nd	13	8	1220	E	43.02333	-124.50483	58	nd	nd	nd	
WE22600.03	SLOWDROP	5	nd	nd	13	8	0833	S	43.03517	-124.52800	74	70	Wingard/Cowles	nd	Near drifter 27356.
WE22600.03	SLOWDROP	5	nd	nd	13	8	1101	E	43.01867	-124.51633	66	nd	nd	nd	11 casts.
WE22600.04	TSRB	4	nd	nd	13	8	1145	S	43.03100	-124.51017	63	0	Wingard/Letelier	nd	Near drifter 27356.
WE22600.04	TSRB	4	nd	nd	13	8	1219	E	43.02283	-124.50467	58	nd	nd	nd	
WE22600.05	Drifter 26914	nd	nd	nd	13	8	1712	S	43.21317	-125.22517	nd	nd	Barth/Letelier	nd	
WE22600.05	Drifter 26914	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE22600.06	Drifter 27356	nd	nd	nd	13	8	1715	S	43.21383	-125.22400	nd	nd	Barth/Letelier	nd	
WE22600.06	Drifter 27356	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE22600.07	Drifter 27357	nd	nd	nd	13	8	1717	S	43.21450	-125.22267	nd	nd	Barth/Letelier	nd	
WE22600.07	Drifter 27357	nd	nd	nd	nd	nd	nd	E	nd	nd	nd	nd	nd	nd	Not recovered.
WE22600.08	HTI	11	nd	nd	13	8	1727	S	43.21200	-125.22333	2280	v	Pierce	nd	Near drifters 26914/ 27356/ 7.
WE22600.08	HTI	11	nd	nd	13	8	2007	E	43.20067	-125.24450	2280	nd	nd	nd	
WE22600.09	SLOWDROP	6	nd	nd	13	8	1736	S	43.21133	-125.22383	2280	80	Wingard/Cowles	nd	Near drifters 26914/27356/ 7.
WE22600.09	SLOWDROP	6	nd	nd	13	8	1831	E	43.20917	-125.23050	2280	nd	nd	nd	3 casts.
WE22700.01	CTD	11	nd	CR-1	14	8	0401	S	41.90000	-124.30000	41	35	Barth	nd	
WE22700.01	CTD	11	nd	nd	14	8	0415	E	41.90000	-124.30000	nd	nd	nd	nd	
WE22700.02	CTD	12	nd	CR-2	14	8	0446	S	41.90000	-124.39983	67	62	Barth	nd	
WE22700.02	CTD	12	nd	nd	14	8	0456	E	41.90000	-124.39983	nd	nd	nd	nd	
WE22700.03	CTD	13	nd	CR-3	14	8	0529	S	41.89983	-124.50067	136	130	Barth	nd	
WE22700.03	CTD	13	nd	nd	14	8	0553	E	41.89983	-124.50067	nd	nd	nd	nd	
WE22700.04	CTD	14	nd	CR-4	14	8	0625	S	41.89983	-124.59967	508	500	Barth	nd	
WE22700.04	CTD	14	nd	nd	14	8	0709	E	41.89983	-124.59967	nd	nd	nd	nd	
WE22700.05	HTI	12	nd	nd	14	8	0727	S	41.89233	-124.63767	604	v	Pierce	OMS	Offshore mesoscale, 12M.
WE22700.05	HTI	12	nd	nd	16	8	0810	E	43.78033	-124.80617	550	nd	nd	nd	Near 5M.
WE22700.06	SeaSoar	11	nd	nd	14	8	0738	S	41.89283	-124.63800	605	v	Barth	OMS	Offshore mesoscale, 12M.
WE22700.06	SeaSoar	11	nd	nd	15	8	1851	E	43.25717	-126.05333	3070	nd	nd	nd	Sensor cleaning, 7D.
WE22800.01	CTD	15	nd	7D	15	8	1927	S	43.21617	-126.04883	3070	400	Barth	nd	7D.
WE22800.01	CTD	15	nd	nd	15	8	1948	E	43.21683	-126.05000	nd	nd	nd	nd	
WE22800.02	SeaSoar	12	nd	nd	15	8	1956	S	43.21717	-126.05017	3070	v	Barth	nd	Near 7D.
WE22800.02	SeaSoar	12	nd	nd	17	8	0524	E	44.61933	-124.90067	597	nd	nd	nd	
WE22900.01	HTI	13	nd	nd	16	8	0848	S	43.78267	-124.81667	558	v	Pierce	OMS	Near 5M.
WE22900.01	HTI	13	nd	nd	17	8	0526	E	44.61867	-124.90033	596	nd	nd	nd	
WE23000.01	ADCP	nd	nd	nd	17	8	0847	E	44.61867	-124.06183	10	nd	Pierce	nd	150kHz shipboard ADCP.
WE23000.02	MET	nd	nd	nd	17	8	0838	E	44.59550	-124.13467	45	nd	Barth	nd	Shipboard MET pkg.
WE23000.03	U/W T/S/fl	nd	nd	nd	17	8	0838	E	44.59550	-124.13467	45	nd	Barth	nd	underway 5-m
WE23000.04	U/W ac-9	nd	nd	nd	17	8	0819	E	44.59550	-124.13467	45	nd	Wingard/Letelier	nd	Underway 5-m.
WE23000.05	U/W FRRF	nd	nd	nd	17	8	0819	E	44.59550	-124.13467	45	nd	Wingard/Letelier	nd	Underway 5-m.
WE23000.06	Arrive Newport	nd	nd	nd	17	8	0900	E	nd	nd	nd	nd	nd	nd	