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# Physical, nutrient, and biological measurements of coastal waters off Central California in October 2008

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Physical, Nutrient, and Biological Measurements of  
Coastal Waters off Central California in October 2008

by

Thomas A. Rago, Reiko Michisaki, Baldo Marinovic, Marguerite Blum, and  
Katherine Whitaker

May 2009

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Prepared for: Marine Sciences Institute,  
University of California, Santa Cruz

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## **Introduction**

Following in a long tradition of hydrographic studies of the California Current system-- see, for example, Steger *et al.* (2000) and Collins *et al.* (2003)-- the data in this report were collected during the 14-18 October 2008 cruise of the Pacific Coast Ocean Observing System (PaCOOS) program aboard the *R/V Point Sur*. The PaCOOS program was organized in 2003/2004 as the NOAA west coast contribution to the national Integrated Ocean Observing System (IOOS), and is charged with “providing ocean information for the sustained use of the California Current Large Marine Ecosystem under a changing climate.”<sup>1</sup> PaCOOS cruises generally subsample the standard California Cooperative Oceanic Fisheries Investigations (CalCOFI) grid of hydrographic stations (Figure 1). With slight exceptions, this cruise did exactly that, sampling along CalCOFI line 67 from Moss Landing, California, to station 90 (CTD casts 1-21), transiting northwest to CalCOFI line 60/station 75, then sampling shoreward to Drake’s Bay, California, along CalCOFI line 60 (CTD casts 22-30) (Figure 2). The exceptions were that 1) three stations (CTD casts 31-33) were added along the coast on the return to Moss Landing from Drake’s Bay and 2), to increase the resolution of the hydrographic data and to maintain the convention of similar recent PaCOOS cruises (Rago *et al.*, 2006, 2007a, 2007b, 2007c, 2008a, 2008b), eight CTD casts were inserted between the standard CalCOFI sites along line 67. Primary productivity and zooplankton analyses were not performed at these added CalCOFI sites. Zooplankton analyses were not performed at the added three coastal sites. Participants on the cruise came from the Naval Postgraduate School (Physical Oceanography, Marine Mammal Observations, Zooplankton Analysis), the Monterey Bay Aquarium Research Institute (Nutrient Analysis and Primary Productivity), the University of California at Santa Cruz (Zooplankton Analysis), Moss Landing Marine Laboratories (Physical Oceanography, Nutrient Analysis and Primary Productivity), and the Marine Advanced Technology Education (MATE) Internship Program<sup>2</sup> (Nutrient Analysis and Primary Productivity).

## **Standard Procedures**

### *CTD/Rosette Data:*

At each site a Seabird Electronics, Inc., Conductivity-Temperature-Depth (CTD) instrument fitted with a 12-place rosette was deployed. The rosette was equipped with 12 10-liter PVC Niskin bottles for collection of water samples. The CTD was lowered to 1000 meters or the bottom (whichever came first), except at CTD casts 20 and 23, where the instrument was lowered to the bottom (4411 and 3438 dbars, respectively). Where primary productivity sampling was performed, water samples were taken at depths designed to maximize resolution of the variables sampled throughout the thermocline. Where only nutrient sampling was performed<sup>3</sup>, water samples were more or less evenly spaced throughout the water column. A water sample was always obtained at or near the bottom of each CTD cast for later conductivity/salinity calibration of the CTD conductivity sensors.

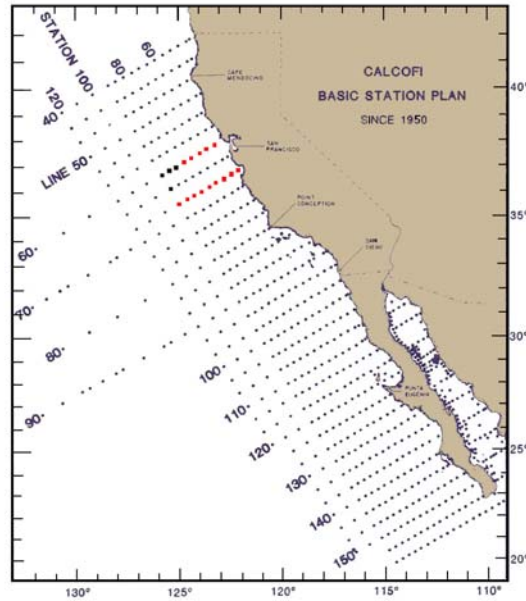
Besides temperature (dual sensors), conductivity (dual sensors), and pressure, the CTD also measured fluorescence, transmissivity, dissolved oxygen content, and photosynthetically available radiation (PAR) in the water column. Except for PAR and the secondary of the dual sensors, all these parameters are reported here.

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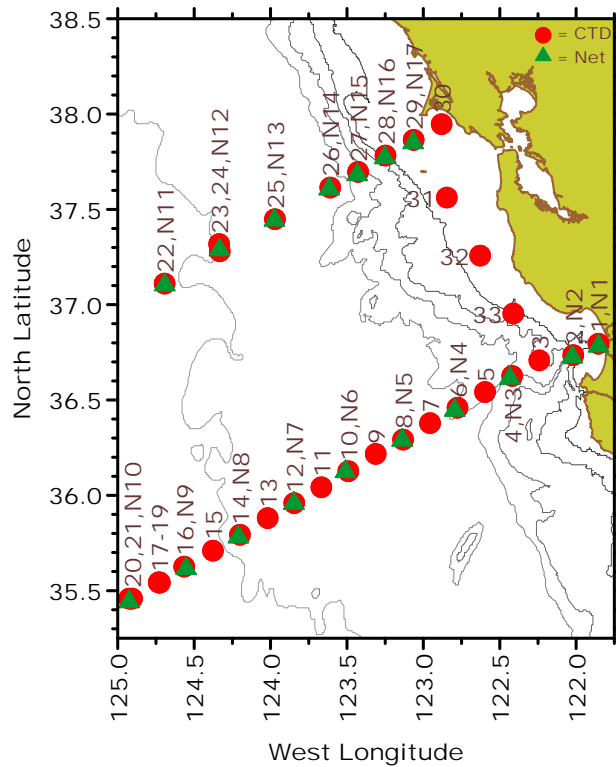
<sup>1</sup> <http://www.pacoos.org>

<sup>2</sup> <http://www.marinetech.org>

<sup>3</sup> CTD stations 3, 5, 7, 9, 11, 13, 15, 19, 20, and 23.



**Figure 1:** Full CalCOFI hydrographic station grid. Stations occupied during the PaCOOS cruise of October 2008 are highlighted in red.



**Figure 2:** Hydrographic stations occupied during the PaCOOS cruise of October 2008. 200, 1000, 2000, 3000, and 4000 m isobaths are shown. Net tows were completed at the sites marked by green triangles.

Generally, a minimum of two salinity samples (including the bottom-of-cast sample) were collected from each CTD cast. These samples were analyzed after the cruise at the Naval Postgraduate School (NPS) using a Guildline model 8400B Autosal salinometer. A regression between the salinometer results and the conductivities measured by the CTD at the times the Niskin bottles were tripped was made, from which a correction to the CTD salinities was determined and then applied. The salinometer was standardized using IAPSO Standard Seawater (batch P148) before and after each set of water samples was analyzed. Salinity values were calculated using the algorithms for the Practical Salinity Scale, 1978 (UNESCO, 1981).

Dissolved oxygen (Winkler) samples were collected at CTD stations 5, 10, 11, 20, and 23. These were analyzed after the cruise at the Monterey Bay Aquarium Research Institute (MBARI). The CTD for this cruise was outfitted with a Sea-Bird Electronics, Inc., SBE 43 oxygen sensor. This sensor is a polarographic membrane that outputs a voltage proportional to the temperature-compensated current flow occurring when oxygen is reacted inside the membrane. Dissolved oxygen concentration is then calculated from a modified version of the algorithm by Owens and Millard (1985). The results of the analysis of the Winkler oxygen samples were compared to the corresponding oxygen values recorded by the CTD. Using the method described in SBE Application Note #64-2<sup>4</sup>, we calculated new SBE 43 sensor coefficients. Corrected CTD oxygen values were then recalculated with the modified version of the Owens and Millard (1985) algorithm using the new sensor coefficients.

For this cruise, the CTD was fitted with a Seatech<sup>5</sup> 25-cm. transmissometer. This instrument is designed to measure beam transmission over a 25 centimeter water path using a modulated Light Emitting Diode (660 nm, in this case) and a synchronous detector. The temperature compensated transmissometer is not sensitive to ambient light. (For further details concerning the Seatech transmissometer, the introduction from its operating manual is reprinted in Appendix C.)

Nutrient samples were collected in 45-ml polypropylene screw-capped containers which were rinsed three times prior to filling. Samples were frozen and returned to MBARI for later analysis on an AlpChem autoanalyzer, as in Sakamoto *et al.* (1990).

Chlorophyll-*a* and phaeopigments were collected in 280-ml polyethylene bottles and filtered onto 25-mm Whatmann GF/F filters. Chlorophyll-*a* was assayed with the standard fluorometric procedure of Holm-Hansen *et al.* (1965), modified such that phaeopigments are extracted in acetone in a freezer over at least 24 hours (Venrick and Hayward, 1984; Chavez *et al.*, 1991). Analysis was performed as possible during the cruise or at MBARI immediately following the cruise.

Primary productivity was estimated for the 100, 50, 30, 15, 5, 1, and 0.1% light penetration depths as determined by secchi, and followed the general method of Parsons *et al.* (1984). Water samples from the appropriate depths were collected in 280-ml polycarbonate bottles, spiked with <sup>14</sup>C, and incubated on deck for 24 hours under running seawater in plexiglass tubes wrapped with nickel-cadmium screens of differing pore size. (See Pennington and Chavez, 2000, for methodology details.)

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<sup>4</sup>See **Application notes** under the **Support** tab at <http://www.seabird.com>.

<sup>5</sup> Seatech, Inc. was acquired by Wet Labs, Inc., in late 1998.

## Zooplankton Net Tows:

Seventeen stations<sup>6</sup> (Figure 2 and Table 1) were sampled for zooplankton during the cruise. All sampling was conducted with 0.7-m diameter paired bongo nets fitted with 505-mm mesh, which were towed obliquely to a depth of 210 m (or within 10 m of the bottom, whichever came first). Samples were preserved at sea according to standard protocols (Kramer *et al.*, 1972). Analyses of krill species diversity and abundance have not yet been completed at the University of California at Santa Cruz (UCSC). However, a preliminary analysis of gross biomass distribution of total zooplankton shows the following. Zooplankton displacement volumes during this autumn cruise (October 2008) were comparable to those observed in autumn (November) 2007. Comparisons between years (2007, 2008) and CalCOFI lines (60, 67) showed no significant differences (Table 2). There were differences in the onshore/offshore distribution of biomass along CalCOFI line 67 between 2007 and 2008 (Figure 3), with a higher proportion of the biomass concentrated in the more inshore stations in 2008 (64%) than in 2007 (47%). Given that offshore samples (beyond CalCOFI 60-75) were not collected during 2008, comparable analyses and comparisons for zooplankton biomass along CalCOFI line 60 cannot be made, although a truncated comparison is shown in Figure 4.

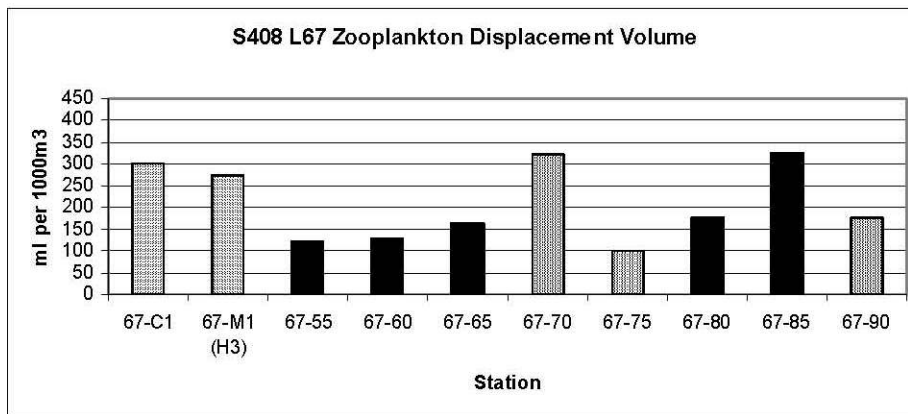
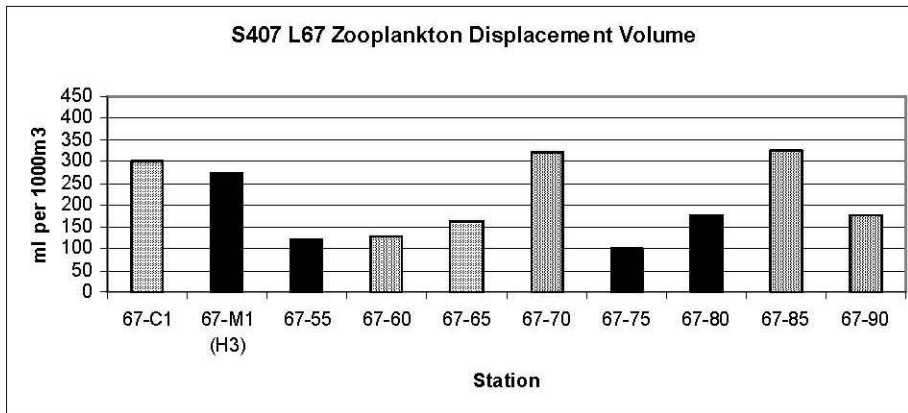
**Table 1:** *Zooplankton data.* This table lists the total biovolume (displacement) abundance measured at the seventeen hydrographic stations sampled by bongo net tows along CalCOFI lines 60 and 67 during the PaCOOS cruise of October 2008. The data are listed by CalCOFI line, onshore to offshore.

Station ( <i>CalCOFI</i> ) Number	Displacement Volume (ml/1000m <sup>3</sup> )	Station ( <i>CalCOFI</i> ) Number	Displacement Volume (ml/1000m <sup>3</sup> )
1 (67-C1)	176	29 (60-52.5)	9
2 (67-M1/H3)	243	28 (60-55)	159
4 (67-55)	273	27 (60-57.5)	279
6 (67-60)	268	26 (60-60)	265
8 (67-65)	120	25 (60-65)	245
10 (67-70)	97	23/24 (60-70)	191
12 (67-75)	74	22 (60-75)	222
14 (67-80)	118		
16 (67-85)	236		
20/21 (67-90)	92		

<sup>6</sup> CTD stations 1, 2, 4, 6, 8, 10, 12, 14, 16, 20, and 22-29.

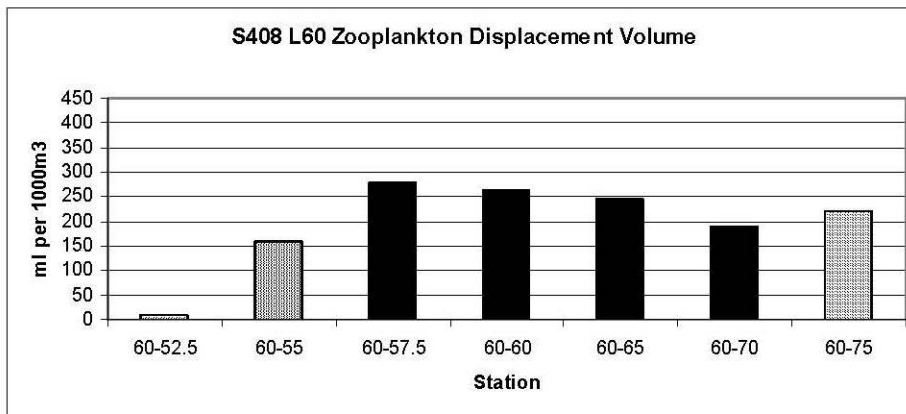
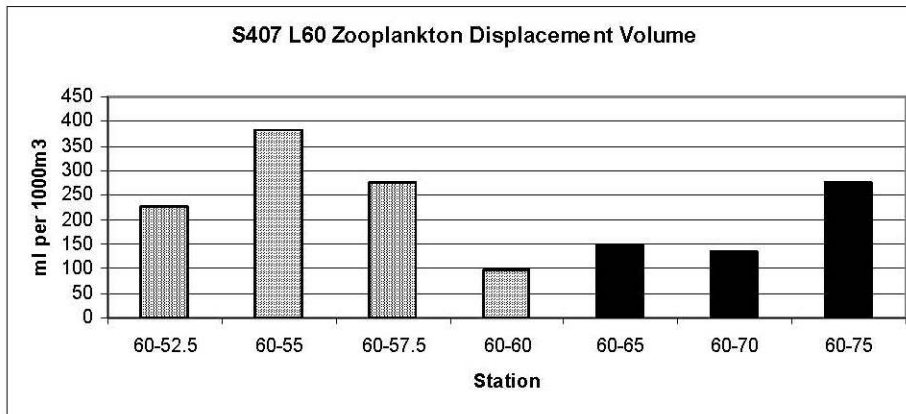
**Table 2:** Comparing zooplankton data. This table compares the total biovolume (displacement) by year and CalCOFI line.

Month	Year	CalCOFI Line	Zooplankton displacement volume (ml/1000m <sup>3</sup> ) [mean ± standard error]
November	2007	L-67	208 (+28)
November	2007	L-60	232 (+27)
October	2008	L-67	170 (+25)
October	2008	L-60	196 (+35)



**Figure 3:** Zooplankton volume displacements for CalCOFI line 67 during the PaCOOS cruises of November 2007 (top) and October 2008 (bottom). Samples are arranged onshore (67-C1) to offshore (67-90), with nighttime sampling shown by black bars.



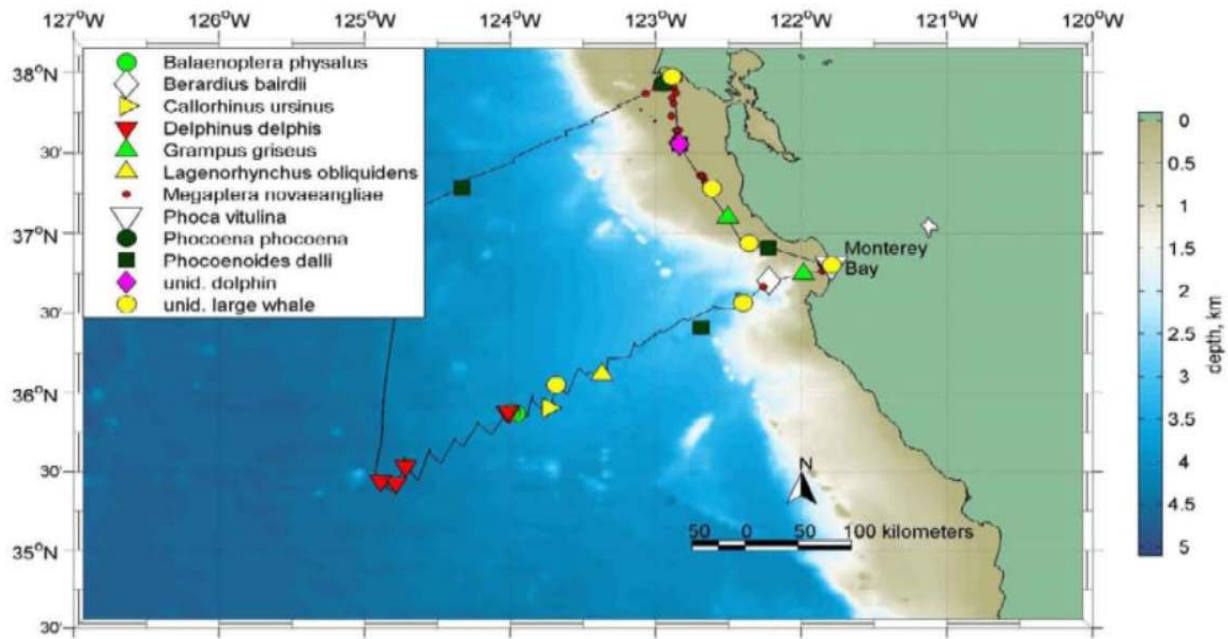


**Figure 4:** Zooplankton volume displacements for CalCOFI line 60 during the PaCOOS cruises of November 2007 (top) and October 2008 (bottom). Samples are arranged onshore (60-52.5) to offshore (60-75), with nighttime sampling shown by black bars.

*Marine Mammal Observations:*

Observations of marine mammals (Figure 5, Tables A4 and A5) were made by a single observer during daylight hours (approximately 1430 to 0130 Coordinated Universal Time [UT]) throughout the cruise, conditions permitting (e.g., clear or high clouds, Beaufort state less than 4, etc.). Observations were made from the 02-deck (outside the Bridge), where eye height was approximately 9 meters above the sea surface, using handheld Fujinon 7 x 50 binoculars with compass for bearing and reticle for distance. Observations were recorded on a laptop computer using the marine mammal and bird mapping program *Seebird* (developed at the Southwest Fisheries Science Center). This program interfaces with handheld global positioning system (GPS) devices, and allows the generation of observation logs containing the observations of the mammals themselves with matching ship’s velocities and positions, observational conditions, etc. Generally, intensive “on effort” observations were made during the last half of each half-hour period, with the other half of the half-hour period devoted to less intensive “off effort” observations. Depending on

the situation, the observer would take short breaks from the observations approximately every two hours.

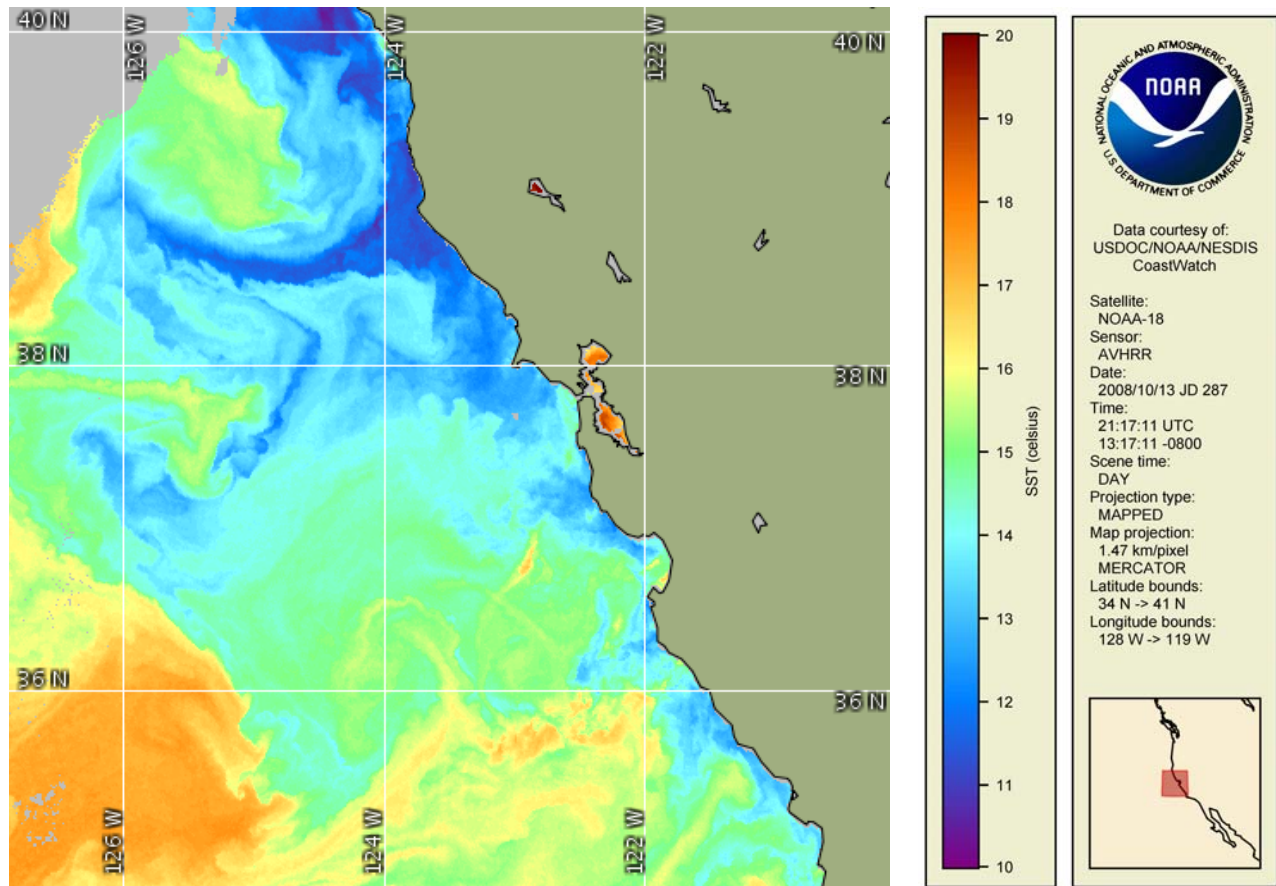


**Figure 5.** Marine mammal sightings during the PaCOOS cruise of October 2008. The black line shows the track of the ship.

*Ancillary Observations:*

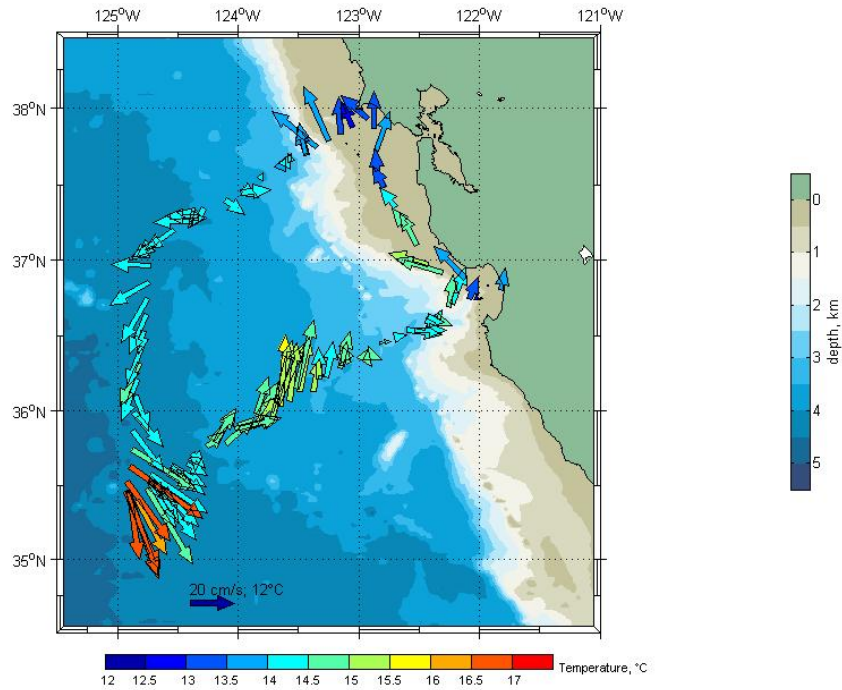
*Underway Data:* Near surface measurements of temperature and salinity were recorded throughout the cruise from water pumped through the ship’s uncontaminated seawater system. These data, along with meteorological data (barometric pressure, wind, etc.) collected from various sensors mounted primarily on the ship’s mast, were recorded at approximately 30-second intervals throughout the cruise. Table A1 lists these data at the start of each hydrographic station.

*Satellite Imagery:* Advanced Very High Resolution Radiometer (AVHRR) satellite imagery of sea surface temperature of the area of operation during the PaCOOS cruise is included as Figure 6.



**Figure 6.** *Advanced Very High Resolution Radiometer (AVHRR) satellite imagery of sea surface temperature ( $^{\circ}$ C) of the area of operation during the PaCOOS cruise of October 2008. This image was taken on 13 October 2008 at 2117 UT.*

*ADCP:* Continuous ocean current measurements were made throughout the cruise using a vessel-mounted RD Instruments 75 kHz broadband Acoustic Doppler Current Profiler (ADCP). Some results from the ADCP are shown in Figure 7.



**Figure 7.** ADCP results from the PaCOOS cruise of October 2008. The arrows are current vectors for currents averaged between 50 and 100 m. The colors of the current vectors reflect the sea surface temperature as measured (nominally at 3 meters) by the ship’s underway data acquisition system.

### Tabulated Data (in Appendix A)

The following tables of data can be found in Appendix A:

1) Table A1: Meteorological and Sea Surface Data

This lists the meteorological and surface oceanographic conditions at the start of each hydrographic station as measured by the underway data acquisition system of the *R/V Point Sur*.

2) Table A2: Hydrographic Data

This is a chronological listing of the hydrographic data collected at each CTD station during the cruise. Data are given for standard pressures, except that the last line of data for each site is the deepest pressure for that CTD cast. The surface pressure, listed as 0 dbar, is actually 1 dbar. Salinities (oxygen) have been adjusted according to the conductivity/salinity (oxygen) calibration correction determined from the collected salinity (oxygen/Winkler) water samples. The time listed for each station is the beginning (UT) of the CTD cast. Units of geopotential anomaly ( $\Delta\Phi$ ), potential density ( $\sigma_\theta$ ), and potential spiciness ( $\pi_\theta$ ) are  $\text{m}^2\text{s}^{-2}$ ,  $\text{kg m}^{-3}$ , and  $\text{kg m}^{-3}$ , respectively.

3) Table A3: Nutrient and Primary Productivity Data

This is a chronological listing of the results of the nutrient and primary productivity analyses of the water samples collected from the 12 Niskin bottles

tripped at each hydrographic station. The time given is the start (UT) for each hydrographic station. Except where primary productivity analyses were not performed (see Introduction), the data for each hydrographic station are separated into three sections (“Physical and Chemical,” “Chlorophyll,” and “Primary Production”).

The physical oceanographic properties listed in the first seven columns of the “Physical and Chemical” section of each station’s data are the uncorrected values measured by the CTD at the times each Niskin bottle was tripped. Because they are uncorrected, these values may differ slightly from those listed in Table A2. The last four columns of this section of each station’s data give the nitrate (NO<sub>3</sub>), nitrite (NO<sub>2</sub>), phosphate (PO<sub>4</sub>), and dissolved silicate (SiO<sub>4</sub>) concentrations (determined as described previously).

The “Chlorophyll” and “Primary Production” sections of each station’s data give the results of the primary productivity analyses. As stated above, primary productivity sampling was not undertaken at every hydrographic station.

4) *Table A4: Marine Mammal Data*

This table lists the results of the marine mammal observations made during the cruise. The data are listed alphabetically by species’ scientific name, then chronologically within each species.

5) *Table A5: Marine Mammal Data Summary*

This table summarizes the (more specific) results from Table A4 of the marine mammal observations made during the cruise. The data are listed alphabetically by species’ scientific name, except that pinnipeds/southern sea otters are listed last.

### **Figures of Results (in Appendix B)**

Graphical representations of the data collected during this cruise follow the tabulated data in Appendix A. Figure 8 is a series of four diagrams contouring (a) the temperature (°C), (b) the salinity, (c) the density anomaly (kg m<sup>-3</sup>), and (d) the oxygen (μmol kg<sup>-1</sup>) fields along the line of hydrographic stations from Moss Landing, California, to CalCOFI line 67/station 67-90 and thence along CalCOFI line 60 from station 60-75 to Drake’s Bay, California.

Figure 9 contours the fluorescence and transmissivity in the upper 100 meters of the water column along the same lines of hydrographic stations as in Figure 8 from Moss Landing to Drake’s Bay, California.

Figure 10 is a series of four diagrams contouring (a) the nitrate (μM), (b) nitrite (μM), (c) phosphate (μM), and (d) silicate (μM) fields along the lines of hydrographic stations from Moss Landing to Drake’s Bay, California.

Figure 11 contours the chlorophyll-*a* and phaeophytin concentrations in the upper 65 meters of the water column along the lines of hydrographic stations from Moss Landing to Drake’s Bay, California.

Finally, Figure 12 contours the primary productivity and the primary productivity index along the lines of hydrographic stations from Moss Landing to Drake’s Bay, California. These properties were estimated for the 100, 50, 30, 15, 5, 1, and 0.1% light penetration depths as determined by secchi. These light penetration depths are indicated in the figure.

**Cruise Participants**

<b>Personnel</b>	<b>Duties</b>	<b>Affiliation</b>
Tim Pennington <i>Marguerite Blum</i>	Nutrients, Primary Productivity <i>Nutrients, Primary Productivity, Oxygens</i>	Monterey Bay Aquarium Research Institute
Curt Collins (Chief Scientist) <i>Tetyana Margolina</i> Katherine Whitaker <i>Keith Wyckoff</i>	Physical Oceanography <i>Physical Oceanography,</i> Marine Mammal Observer <i>Phytoplankton Net Tows</i>	Naval Postgraduate School
Jen Aragon	Phytoplankton Net Tows	University of California, Santa Cruz
Jennifer Broughton <i>Julie Ching Kuo</i>	Nutrients <i>Nutrients</i>	MATE Program
Ben Jokinen (ship's tech.) <i>Jeff Johnson</i> Rachel Munson	Physical Oceanography <i>Nutrients</i> Nutrients	Moss Landing Marine Laboratories

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## Appendix A

**Table A1:** *Meteorological and sea surface data collected during the PaCOOS cruise of October 2008.* Listed here are the meteorological and surface oceanographic conditions as measured by the underway data acquisition system (UDAS) of the *R/V Point Sur* at the beginning of each hydrographic station. Continuous measurements of the water being pumped through the ship's uncontaminated seawater system ("sea chest") from approximately 3 meters below the surface supplied the oceanographic data, while instrumentation mostly atop the ship's mast supplied the meteorological data. (\*UDAS data for yearday 288 were accidentally deleted. Wind, SST, and SSS data are from the written log sheets of the UDAS data at these CTD stations.)

Station	Yearday, 2008 (UTC)	Barometric Pressure (mb)	Wind Speed (kts)	Wind Direction (°T)	Air Temp. (°C)	SST (°C)	SSS
1*	288.6924	----	13.00	090.00	---	12.810	33.510
2*	288.7847	----	8.60	041.00	---	12.200	33.500
3*	288.8951	----	14.30	314.00	---	13.990	33.330
4*	288.9993	----	10.20	335.80	---	14.130	33.400
5	289.1236	1016.51	19.50	337.37	13.8	13.500	33.356
6	289.2125	1016.49	18.39	337.57	13.8	14.030	33.248
7	289.3194	1016.44	17.28	338.40	14.2	14.241	33.247
8	289.4132	1016.56	25.68	344.20	14.0	14.412	33.233
9	289.5333	1015.74	22.41	350.23	13.8	13.933	32.955
10	289.6403	1017.05	16.90	350.97	14.2	14.691	32.880
11	289.7771	1017.80	28.86	347.38	14.3	15.041	32.889
12	289.9326	1016.58	23.17	348.63	14.7	14.385	33.362
13	290.0750	1017.39	20.30	349.32	14.8	14.494	33.409
14	290.1889	1018.13	20.41	345.81	14.9	14.360	33.301
15	290.3313	1018.17	25.19	348.54	14.6	13.896	33.313
16	290.4722	1017.56	26.59	347.06	14.8	13.913	33.301
17	290.6556	1019.03	23.13	351.82	14.5	13.822	33.212
18	290.8014	1018.89	20.92	356.82	14.3	13.993	33.009
19	290.8389	1017.92	24.64	356.36	14.3	13.959	32.951
20	290.9799	1017.31	27.20	358.65	14.8	16.411	32.799
21	291.1361	1017.80	25.52	359.48	14.5	16.447	32.830
22	291.7882	1017.37	19.02	009.53	12.8	13.535	33.265
23	291.9556	1015.95	14.70	009.25	11.4	13.716	33.201
24	292.0778	1016.01	10.12	000.04	11.0	13.752	33.246
25	292.1792	1016.26	7.11	006.08	10.2	13.573	33.218
26	292.3229	1016.18	8.23	329.42	10.6	13.547	33.373
27	292.4306	1016.70	1.87	357.93	9.9	13.285	33.429
28	292.5535	1016.42	1.17	093.58	10.0	13.030	33.471
29	292.6285	1017.23	5.88	250.90	9.3	11.757	33.602
30	292.7035	1018.66	13.13	155.45	10.7	12.953	33.447
31	292.8264	1017.57	6.60	165.78	12.3	12.217	33.684
32	292.9264	1016.81	5.87	190.88	12.4	14.131	33.342
33	293.0257	1017.11	5.21	288.12	12.5	14.355	33.339

**Table A2:** *List at standard pressures of hydrographic data collected during the PaCOOS cruise of October 2008. Stations are in chronological order. There is no CTD cast 17 or 18. For each cast, the surface pressure (listed as 0 dbar) is actually 1 dbar, while the last pressure is the deepest pressure of the cast. Salinities and oxygens have been adjusted according to the calibration corrections determined from the collected salinity and oxygen water samples. The time listed for each station is the beginning (<mm/dd/yyyy, hhmm> UTC) of the CTD cast. Units of geopotential anomaly ( $\Delta\Phi$ ), potential density ( $\sigma_\theta$ ), and potential spiciness ( $\pi_\theta$ ) are  $\text{m}^2 \text{s}^{-2}$ ,  $\text{kg m}^{-3}$ , and  $\text{kg m}^{-3}$ , respectively.*

**Station:** 1 **Date:** 10/14/2008, 1637 **Lat.:** 36° 47.72 N **Long.:** 121° 51.20 W

P(dbar)	T(°C)	S	O <sub>2</sub> ( $\mu\text{m/kg}$ )	Xmiss(%)	$\Delta\Phi$	$\sigma_\theta$	$\pi_\theta$
0	12.793	33.510	274.9	74.3	0.027	25.280	0.481
10	12.497	33.516	248.6	78.9	0.267	25.342	0.426
20	11.028	33.617	162.1	83.5	0.506	25.694	0.227
30	10.871	33.647	154.8	85.2	0.733	25.745	0.221
50	10.445	33.746	137.9	83.6	1.165	25.898	0.224
75	10.294	33.783	121.7	81.1	1.685	25.953	0.226
100	10.019	33.837	114.5	82.9	2.189	26.043	0.221
125	9.930	33.843	121.1	87.4	2.682	26.063	0.210
150	9.797	33.885	108.3	84.5	3.166	26.118	0.220
200	9.730	33.902	100.5	83.0	4.122	26.143	0.221
241	9.468	33.949	89.2	81.1	4.893	26.224	0.214

**Station:** 2 **Date:** 10/14/2008, 1850 **Lat.:** 36° 44.14 N **Long.:** 122° 01.16 W

P(dbar)	T(°C)	S	O <sub>2</sub> ( $\mu\text{m/kg}$ )	Xmiss(%)	$\Delta\Phi$	$\sigma_\theta$	$\pi_\theta$
0	12.088	33.380	260.4	86.0	0.026	25.314	0.238
10	12.039	33.382	253.1	85.7	0.264	25.325	0.230
20	12.028	33.379	249.8	85.9	0.529	25.326	0.226
30	11.969	33.382	246.6	86.6	0.793	25.339	0.225
50	10.399	33.567	186.5	89.8	1.271	25.766	0.222
75	10.241	33.788	135.2	89.3	1.798	25.966	0.221
100	10.003	33.841	122.9	89.4	2.300	26.048	0.221
125	9.849	33.878	114.0	89.5	2.788	26.104	0.224
150	9.650	33.933	101.5	89.6	3.259	26.180	0.234
200	9.367	34.003	84.9	89.6	4.168	26.282	0.241
250	8.657	34.132	59.3	89.8	5.002	26.496	0.228
300	8.048	34.151	54.7	90.0	5.766	26.605	0.150
400	7.171	34.200	35.9	90.1	7.162	26.770	0.061
500	6.160	34.241	21.4	90.1	8.411	26.938	-0.042
600	5.616	34.290	16.4	88.3	9.546	27.046	-0.072
700	4.774	34.356	11.9	88.7	10.550	27.197	-0.118
800	4.464	34.389	13.1	88.5	11.458	27.258	-0.127
900	3.996	34.442	20.7	86.7	12.303	27.350	-0.134
1000	3.541	34.486	28.4	87.1	13.050	27.431	-0.145
1009	3.499	34.490	29.4	86.5	13.115	27.438	-0.146

Station: 3 Date: 10/14/2008, 2129 Lat.: 36° 42.48 N Long.: 122° 14.50 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	13.969	33.386	263.4	86.2	0.030	24.947	0.626
10	13.772	33.385	264.3	85.3	0.298	24.986	0.583
20	12.787	33.419	248.1	85.5	0.580	25.210	0.407
30	12.303	33.444	246.5	88.1	0.852	25.324	0.330
50	11.988	33.470	239.1	88.8	1.370	25.404	0.289
75	10.356	33.599	183.0	90.2	1.977	25.799	0.091
100	10.038	33.757	149.0	90.1	2.505	25.977	0.160
125	9.229	33.798	145.3	90.4	2.994	26.143	0.058
150	8.780	33.927	126.6	90.5	3.442	26.315	0.087
200	8.328	34.015	105.1	90.5	4.270	26.454	0.086
250	8.025	34.105	79.8	90.6	5.047	26.571	0.110
300	7.154	34.043	81.0	90.7	5.781	26.648	-0.064
400	6.548	34.122	49.1	90.7	7.152	26.793	-0.085
500	5.836	34.185	27.4	90.8	8.386	26.935	-0.127
600	5.481	34.290	13.9	89.9	9.510	27.062	-0.088
700	4.941	34.332	9.3	90.4	10.529	27.159	-0.119
800	4.585	34.371	9.4	90.1	11.483	27.230	-0.128
900	4.135	34.420	11.3	90.4	12.363	27.318	-0.137
1000	3.903	34.455	17.9	89.8	13.170	27.370	-0.134
1010	3.846	34.459	18.4	89.8	13.249	27.380	-0.136

Station: 4 Date: 10/14/2008, 2359 Lat.: 36° 37.58 N Long.: 122° 25.17 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	14.078	33.407	273.5	82.2	0.030	24.940	0.665
10	13.227	33.339	294.8	79.2	0.293	25.061	0.433
20	13.085	33.325	275.4	81.2	0.581	25.080	0.393
30	12.887	33.306	263.9	83.7	0.868	25.104	0.338
50	10.155	33.161	230.8	90.2	1.410	25.491	-0.293
75	9.804	33.538	190.1	90.6	1.992	25.845	-0.053
100	9.406	33.798	152.6	90.5	2.496	26.114	0.087
125	8.939	33.917	130.0	90.5	2.952	26.282	0.105
150	8.470	33.975	118.8	90.6	3.373	26.400	0.077
200	7.906	34.033	90.6	90.7	4.166	26.531	0.037
250	7.589	34.104	65.5	90.8	4.906	26.634	0.047
300	7.167	34.134	52.1	90.9	5.607	26.718	0.010
400	6.140	34.137	39.2	90.9	6.906	26.857	-0.126
500	5.518	34.190	24.8	91.0	8.091	26.977	-0.162
600	5.314	34.297	11.5	90.9	9.176	27.087	-0.102
700	4.910	34.356	8.2	90.9	10.174	27.182	-0.103
800	4.535	34.391	8.9	90.9	11.102	27.251	-0.118
900	4.194	34.412	10.5	91.0	11.975	27.305	-0.138
1000	3.835	34.446	14.1	90.9	12.793	27.370	-0.148
1009	3.786	34.449	14.7	90.9	12.864	27.377	-0.151

Station: 5 Date: 10/15/2008, 0258 Lat.: 36° 32.54 N Long.: 122° 35.82 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	13.467	33.294	273.0	85.1	0.030	24.978	0.447
10	13.445	33.295	272.3	85.1	0.297	24.983	0.443
20	13.295	33.308	270.5	86.0	0.592	25.024	0.422
30	12.941	33.316	263.5	87.2	0.882	25.100	0.356
50	11.119	33.121	251.0	89.3	1.441	25.292	-0.152
75	10.082	33.319	217.3	90.6	2.067	25.627	-0.180
100	9.413	33.682	171.1	90.7	2.603	26.021	-0.004
125	8.860	33.816	147.7	90.7	3.078	26.215	0.012
150	8.604	33.900	136.8	90.7	3.520	26.321	0.038
200	8.284	34.033	95.4	90.7	4.341	26.475	0.094
250	7.605	34.073	74.9	90.9	5.101	26.607	0.024
300	6.965	34.080	63.7	91.0	5.812	26.703	-0.061
400	6.139	34.124	42.0	91.0	7.122	26.847	-0.136
500	5.595	34.206	21.9	91.0	8.308	26.981	-0.139
600	5.383	34.311	11.1	91.0	9.392	27.090	-0.083
700	5.024	34.367	8.3	91.0	10.390	27.177	-0.081
800	4.579	34.396	9.2	91.0	11.318	27.251	-0.109
900	4.225	34.411	11.2	91.0	12.195	27.301	-0.135
1000	3.955	34.444	14.8	91.1	13.024	27.356	-0.138
1009	3.921	34.449	15.8	91.1	13.096	27.364	-0.137

Station: 6 Date: 10/15/2008, 0506 Lat.: 36° 27.55 N Long.: 122° 46.66 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	14.025	33.282	264.4	86.9	0.031	24.855	0.556
10	14.026	33.282	264.6	86.9	0.309	24.855	0.556
20	13.963	33.285	263.7	86.9	0.617	24.870	0.544
30	13.892	33.287	262.1	87.1	0.924	24.887	0.531
50	10.915	33.319	223.9	90.0	1.497	25.483	-0.031
75	10.035	33.451	200.4	90.6	2.092	25.738	-0.083
100	9.650	33.652	175.1	90.7	2.633	25.959	0.011
125	9.409	33.928	117.0	90.5	3.113	26.215	0.190
150	9.031	34.028	93.5	90.5	3.550	26.355	0.207
200	8.260	34.057	93.3	90.8	4.361	26.497	0.109
250	7.452	34.029	90.8	90.9	5.117	26.594	-0.032
300	6.941	34.067	68.7	91.1	5.833	26.696	-0.074
400	5.973	34.117	41.5	91.1	7.138	26.863	-0.163
500	5.540	34.205	22.2	91.1	8.317	26.986	-0.147
600	5.336	34.316	10.0	91.1	9.393	27.099	-0.085
700	4.966	34.355	8.5	91.1	10.386	27.175	-0.097
800	4.535	34.390	9.5	91.1	11.317	27.251	-0.118
900	4.252	34.428	12.1	91.1	12.185	27.312	-0.119
1000	4.012	34.450	15.3	91.1	13.008	27.355	-0.128
1008	3.969	34.453	16.0	91.1	13.072	27.362	-0.129

Station: 7 Date: 10/15/2008, 0740 Lat.: 36° 22.72 N Long.: 122° 57.40 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	14.229	33.281	261.0	87.4	0.031	24.811	0.599
10	14.234	33.282	262.6	87.4	0.313	24.812	0.600
20	14.235	33.286	262.9	87.4	0.626	24.814	0.603
30	13.926	33.362	263.2	86.7	0.935	24.938	0.597
50	13.356	33.304	258.1	88.6	1.529	25.010	0.431
75	9.801	33.171	240.1	90.6	2.210	25.558	-0.346
100	9.618	33.648	180.0	90.8	2.767	25.961	0.003
125	9.328	33.826	149.8	90.8	3.259	26.148	0.096
150	8.839	33.924	130.3	90.9	3.712	26.303	0.094
200	8.009	33.987	118.6	91.0	4.539	26.480	0.016
250	8.084	34.174	51.6	90.9	5.295	26.616	0.174
300	7.471	34.174	48.2	91.0	6.003	26.706	0.084
400	6.592	34.219	29.1	91.1	7.301	26.863	-0.003
500	5.731	34.227	20.0	91.2	8.482	26.981	-0.107
600	5.518	34.316	10.8	91.1	9.571	27.078	-0.063
700	5.025	34.358	8.4	91.1	10.577	27.170	-0.089
800	4.552	34.381	8.9	91.2	11.513	27.242	-0.123
900	4.289	34.425	11.6	91.2	12.393	27.305	-0.118
1000	4.010	34.453	15.7	91.2	13.221	27.358	-0.125
1008	3.993	34.455	16.2	91.2	13.285	27.361	-0.125

Station: 8 Date: 10/15/2008, 0955 Lat.: 36° 17.54 N Long.: 123° 08.01 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	14.407	33.266	261.0	88.9	0.032	24.762	0.625
10	14.410	33.266	261.1	88.9	0.318	24.762	0.626
20	14.403	33.266	261.1	88.9	0.635	24.764	0.624
30	14.307	33.279	261.3	89.0	0.953	24.794	0.613
50	9.773	32.841	256.0	90.8	1.544	25.305	-0.615
75	9.700	33.186	227.0	90.9	2.177	25.587	-0.351
100	9.205	33.562	188.6	90.9	2.731	25.962	-0.133
125	8.918	33.758	158.6	91.0	3.218	26.160	-0.025
150	8.838	33.927	127.8	90.9	3.667	26.306	0.097
200	8.207	34.003	109.2	91.0	4.495	26.463	0.058
250	7.455	34.021	94.2	91.1	5.265	26.587	-0.038
300	7.044	34.087	63.8	91.2	5.980	26.697	-0.045
400	6.671	34.218	29.8	91.2	7.285	26.852	0.007
500	6.047	34.269	17.3	91.2	8.487	26.974	-0.035
600	5.525	34.330	9.7	91.2	9.578	27.088	-0.051
700	5.048	34.362	8.2	91.2	10.581	27.171	-0.083
800	4.614	34.396	9.1	91.3	11.517	27.247	-0.105
900	4.251	34.421	11.8	91.3	12.393	27.307	-0.125
1000	3.971	34.454	16.0	91.2	13.215	27.362	-0.128
1009	3.958	34.458	16.8	91.2	13.286	27.367	-0.127

Station: 9 Date: 10/15/2008, 1248 Lat.: 36° 13.04 N Long.: 123° 18.76 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	13.933	33.120	263.0	88.4	0.032	24.748	0.407
10	13.937	33.120	264.4	88.5	0.319	24.748	0.408
20	13.936	33.120	264.9	88.5	0.638	24.748	0.407
30	13.917	33.113	264.6	88.5	0.958	24.747	0.398
50	11.062	32.748	266.6	90.0	1.579	25.012	-0.462
75	9.988	32.990	248.0	91.0	2.273	25.386	-0.459
100	9.362	33.374	207.0	91.0	2.867	25.789	-0.258
125	8.915	33.704	169.1	91.0	3.378	26.119	-0.068
150	8.621	33.881	142.9	91.0	3.829	26.303	0.026
200	8.081	34.010	110.4	91.0	4.653	26.487	0.045
250	7.520	34.056	77.8	91.1	5.413	26.606	-0.001
300	6.793	34.061	67.6	91.2	6.120	26.711	-0.100
400	5.995	34.113	42.1	91.3	7.421	26.857	-0.163
500	5.353	34.192	22.7	91.3	8.600	26.998	-0.180
600	5.028	34.255	12.9	91.3	9.670	27.086	-0.169
700	4.780	34.340	8.9	91.3	10.659	27.183	-0.130
800	4.399	34.381	8.6	91.3	11.578	27.258	-0.140
900	4.125	34.424	12.2	91.3	12.434	27.322	-0.136
1000	3.866	34.460	17.6	91.3	13.241	27.378	-0.134
1010	3.847	34.462	18.0	91.3	13.319	27.381	-0.135

Station: 10 Date: 10/15/2008, 1522 Lat.: 36° 07.58 N Long.: 123° 29.48 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	14.679	32.902	267.2	88.6	0.035	24.423	0.396
10	14.635	32.906	263.9	88.6	0.349	24.437	0.389
20	14.524	32.918	264.1	88.6	0.696	24.470	0.375
30	13.850	32.916	268.4	88.4	1.036	24.608	0.226
50	13.038	32.984	263.0	89.5	1.690	24.826	0.112
75	9.463	32.761	270.9	91.0	2.405	25.294	-0.732
100	9.613	33.275	223.6	91.1	3.026	25.671	-0.295
125	8.752	33.614	170.8	91.1	3.559	26.074	-0.165
150	8.693	33.830	149.4	91.0	4.025	26.252	-0.004
200	7.960	33.934	152.6	91.1	4.859	26.445	-0.034
250	7.234	33.965	134.5	91.2	5.631	26.574	-0.114
300	6.744	34.036	85.6	91.2	6.349	26.698	-0.126
400	6.165	34.148	35.9	91.3	7.646	26.863	-0.114
500	5.502	34.202	22.1	91.3	8.822	26.989	-0.154
600	4.962	34.268	11.7	91.3	9.890	27.104	-0.166
700	4.716	34.352	8.6	91.3	10.868	27.200	-0.128
800	4.473	34.402	9.8	91.3	11.773	27.267	-0.115
900	4.151	34.436	13.4	91.3	12.625	27.329	-0.123
1000	3.820	34.462	17.9	91.3	13.424	27.385	-0.136
1008	3.813	34.465	18.5	91.3	13.486	27.387	-0.136

Station: 11 Date: 10/15/2008, 1839 Lat.: 36° 02.54 N Long.: 123° 40.08 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	15.033	32.906	264.9	88.7	0.036	24.351	0.478
10	13.682	33.141	271.1	88.2	0.345	24.817	0.371
20	13.549	33.139	270.4	88.2	0.656	24.842	0.341
30	13.635	33.179	267.6	88.9	0.966	24.856	0.390
50	10.110	32.734	266.6	90.5	1.568	25.166	-0.643
75	9.642	33.176	237.3	91.2	2.224	25.589	-0.369
100	9.306	33.476	205.6	91.1	2.787	25.878	-0.186
125	8.664	33.664	161.0	91.1	3.289	26.127	-0.139
150	8.558	33.890	132.7	91.0	3.737	26.320	0.023
200	7.642	33.951	141.5	91.2	4.548	26.505	-0.066
250	6.950	33.964	128.7	91.3	5.298	26.613	-0.154
300	6.448	33.995	93.6	91.3	6.005	26.705	-0.197
400	5.825	34.097	44.7	91.4	7.301	26.865	-0.197
500	5.355	34.211	19.7	91.4	8.460	27.013	-0.165
600	4.972	34.284	10.7	91.4	9.508	27.116	-0.152
700	4.432	34.319	7.8	91.4	10.470	27.205	-0.184
800	4.361	34.384	8.6	91.4	11.368	27.264	-0.142
900	3.962	34.430	12.7	91.4	12.210	27.344	-0.147
1000	3.750	34.465	18.9	91.4	12.995	27.394	-0.141
1010	3.727	34.468	19.6	91.4	13.071	27.398	-0.142

Station: 12 Date: 10/15/2008, 2223 Lat.: 35° 57.58 N Long.: 123° 50.71 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	14.359	33.425	259.3	87.8	0.030	24.895	0.740
10	14.360	33.425	259.5	87.9	0.305	24.895	0.740
20	14.288	33.417	259.4	87.7	0.610	24.904	0.718
30	14.250	33.413	259.0	87.7	0.914	24.910	0.707
50	14.150	33.432	248.9	89.4	1.521	24.946	0.700
75	9.700	33.296	232.5	90.7	2.159	25.673	-0.263
100	9.008	33.567	177.8	91.0	2.701	25.997	-0.161
125	8.485	33.832	142.5	91.1	3.169	26.285	-0.034
150	8.210	33.946	128.3	91.1	3.589	26.417	0.015
200	7.541	33.953	147.3	91.2	4.379	26.521	-0.079
250	6.946	33.966	123.7	91.3	5.125	26.614	-0.154
300	6.287	33.996	87.8	91.3	5.823	26.726	-0.217
400	5.678	34.102	42.5	91.4	7.097	26.887	-0.211
500	5.063	34.172	23.4	91.4	8.245	27.016	-0.229
600	4.920	34.274	11.1	91.4	9.294	27.114	-0.165
700	4.428	34.312	8.0	91.4	10.263	27.200	-0.190
800	4.130	34.371	8.0	91.4	11.157	27.278	-0.176
900	3.912	34.428	12.4	91.4	11.989	27.347	-0.153
1000	3.696	34.470	19.7	91.4	12.767	27.403	-0.142
1008	3.641	34.471	20.1	91.4	12.827	27.409	-0.147

Station: 13 Date: 10/16/2008, 0148 Lat.: 35° 52.84 N Long.: 124° 01.15 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	14.478	33.443	255.4	87.6	0.031	24.884	0.781
10	14.484	33.444	257.3	87.7	0.306	24.883	0.782
20	14.486	33.444	257.4	87.7	0.612	24.883	0.782
30	14.447	33.445	258.2	87.6	0.919	24.893	0.775
50	13.870	33.471	254.1	88.8	1.513	25.034	0.671
75	9.556	33.562	189.8	90.8	2.109	25.904	-0.075
100	9.184	33.828	146.0	90.9	2.599	26.173	0.074
125	8.979	33.943	118.5	90.9	3.046	26.296	0.132
150	8.407	33.953	115.8	90.9	3.471	26.392	0.050
200	7.827	34.015	87.4	91.0	4.264	26.529	0.011
250	7.481	34.082	68.7	91.0	5.006	26.632	0.013
300	7.196	34.127	51.5	91.2	5.708	26.708	0.008
400	5.799	34.100	47.1	91.4	7.002	26.871	-0.197
500	5.194	34.168	25.9	91.4	8.170	26.998	-0.217
600	4.971	34.273	11.3	91.3	9.234	27.108	-0.161
700	4.693	34.336	8.4	91.4	10.213	27.190	-0.143
800	4.177	34.355	7.5	91.4	11.124	27.261	-0.183
900	3.932	34.398	9.1	91.4	11.975	27.321	-0.176
1000	3.642	34.442	13.5	91.4	12.771	27.386	-0.170
1009	3.616	34.445	14.2	91.4	12.841	27.391	-0.170

Station: 14 Date: 10/16/2008, 0432 Lat.: 35° 47.58 N Long.: 124° 12.06 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	14.345	33.336	263.2	87.2	0.031	24.829	0.667
10	14.348	33.336	263.7	87.2	0.311	24.829	0.667
20	14.351	33.336	264.0	87.2	0.623	24.828	0.668
30	14.165	33.349	263.7	87.1	0.933	24.878	0.638
50	13.983	33.391	259.9	89.1	1.538	24.949	0.631
75	9.006	33.182	232.3	90.9	2.199	25.695	-0.469
100	9.508	33.676	190.2	90.9	2.735	26.001	0.007
125	9.036	33.817	150.8	91.0	3.213	26.188	0.041
150	8.611	33.938	123.1	91.0	3.655	26.349	0.069
200	8.088	34.006	93.3	91.0	4.469	26.483	0.043
250	7.567	34.080	67.6	91.2	5.219	26.618	0.024
300	6.859	34.065	63.9	91.3	5.924	26.705	-0.087
400	6.290	34.180	32.4	91.4	7.219	26.872	-0.073
500	5.313	34.181	24.0	91.4	8.392	26.994	-0.193
600	4.904	34.282	10.9	91.4	9.449	27.123	-0.161
700	4.648	34.352	8.9	91.3	10.412	27.207	-0.135
800	4.409	34.391	9.8	91.3	11.318	27.265	-0.131
900	3.955	34.398	10.4	91.4	12.172	27.319	-0.173
1000	3.697	34.439	13.4	91.5	12.972	27.378	-0.167
1011	3.641	34.444	14.5	91.5	13.057	27.388	-0.168



Station: 15 Date: 10/16/2008, 0757 Lat.: 35° 42.59 N Long.: 124° 22.63 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	13.888	33.366	262.6	88.3	0.030	24.948	0.593
10	13.892	33.365	263.2	88.3	0.300	24.947	0.593
20	13.902	33.367	263.6	88.3	0.600	24.946	0.596
30	13.904	33.369	263.9	88.3	0.901	24.947	0.598
50	13.907	33.368	264.0	88.2	1.503	24.947	0.597
75	10.326	33.261	235.9	90.9	2.188	25.540	-0.184
100	9.358	33.571	187.4	91.0	2.745	25.943	-0.102
125	9.235	33.844	146.9	91.0	3.233	26.177	0.095
150	8.696	33.943	122.0	91.0	3.677	26.340	0.087
200	8.113	34.042	80.7	91.0	4.486	26.508	0.075
250	7.670	34.099	63.3	91.2	5.237	26.618	0.054
300	7.078	34.097	55.4	91.3	5.944	26.701	-0.032
400	6.375	34.156	37.3	91.4	7.258	26.843	-0.080
500	5.633	34.207	21.6	91.4	8.451	26.977	-0.134
600	4.854	34.244	14.1	91.4	9.527	27.097	-0.197
700	4.676	34.341	8.5	91.4	10.503	27.195	-0.141
800	4.380	34.395	9.6	91.4	11.410	27.271	-0.131
900	4.070	34.430	12.9	91.4	12.255	27.333	-0.136
1000	3.687	34.447	15.0	91.5	13.047	27.385	-0.161
1010	3.653	34.448	15.0	91.5	13.124	27.389	-0.164

Station: 16 Date: 10/16/2008, 1120 Lat.: 35° 37.54 N Long.: 124° 33.30 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	13.899	33.308	261.8	88.3	0.030	24.901	0.549
10	13.900	33.309	263.1	88.3	0.304	24.901	0.550
20	13.900	33.309	263.8	88.3	0.609	24.902	0.550
30	13.903	33.309	263.8	88.3	0.914	24.901	0.550
50	13.864	33.306	263.1	88.7	1.524	24.908	0.539
75	10.792	33.300	249.8	90.5	2.220	25.490	-0.069
100	9.164	33.525	196.2	91.2	2.789	25.939	-0.170
125	9.304	33.887	133.0	90.9	3.273	26.200	0.140
150	8.755	33.943	121.4	91.0	3.714	26.332	0.096
200	8.186	34.042	80.6	91.0	4.525	26.496	0.086
250	7.534	34.046	72.6	91.0	5.283	26.596	-0.008
300	7.098	34.093	61.5	91.2	5.995	26.695	-0.033
400	6.470	34.186	33.3	91.4	7.302	26.854	-0.044
500	5.514	34.180	26.3	91.4	8.499	26.970	-0.170
600	5.059	34.255	13.6	91.4	9.583	27.083	-0.165
700	4.783	34.335	8.9	91.4	10.575	27.179	-0.134
800	4.401	34.377	9.1	91.4	11.494	27.255	-0.143
900	4.144	34.421	12.0	91.4	12.354	27.317	-0.136
1000	3.890	34.453	16.5	91.4	13.166	27.370	-0.137
1012	3.865	34.457	17.2	91.4	13.260	27.376	-0.136

Station: 19 Date: 10/16/2008, 2008 Lat.: 35° 32.48 N Long.: 124° 43.46 W

P(dbar)	T(°C)	S	O <sub>2</sub> ( $\mu\text{m}/\text{kg}$ )	Xmiss(%)	$\Delta\Phi$	$\sigma_{\theta}$	$\pi_{\theta}$
0	13.941	32.962	269.4	88.3	0.033	24.625	0.284
10	13.945	32.978	268.6	88.3	0.330	24.636	0.297
20	13.967	33.024	268.1	88.1	0.659	24.668	0.338
30	13.827	33.153	266.8	88.2	0.978	24.797	0.410
50	11.788	32.751	277.3	89.8	1.602	24.883	-0.323
75	10.218	32.699	271.5	90.6	2.336	25.121	-0.653
100	9.600	33.163	237.2	91.2	3.004	25.586	-0.387
125	9.123	33.426	210.0	91.2	3.568	25.869	-0.255
150	8.755	33.765	167.4	91.2	4.060	26.192	-0.045
200	8.282	33.968	112.7	91.0	4.919	26.424	0.042
250	7.550	33.991	112.7	91.2	5.706	26.550	-0.049
300	7.112	34.031	73.2	91.3	6.440	26.644	-0.080
400	5.730	34.012	71.7	91.4	7.794	26.802	-0.258
500	5.260	34.120	37.3	91.4	9.010	26.952	-0.248
600	4.859	34.222	15.6	91.5	10.105	27.080	-0.213
700	4.474	34.297	9.0	91.5	11.098	27.183	-0.197
800	4.193	34.361	8.1	91.5	12.009	27.264	-0.177
900	3.962	34.409	10.8	91.5	12.860	27.327	-0.164
1000	3.726	34.447	15.3	91.5	13.657	27.381	-0.158
1010	3.701	34.450	16.0	91.5	13.734	27.386	-0.158

Station: 20 Date: 10/16/2008, 2331 Lat.: 35° 27.48 N Long.: 124° 54.41 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	16.414	32.839	250.6	89.5	0.039	23.992	0.743
10	16.416	32.840	251.6	89.9	0.391	23.993	0.744
20	16.417	32.840	252.4	89.8	0.782	23.993	0.744
30	16.414	32.840	252.4	89.8	1.174	23.994	0.743
50	15.758	32.988	254.5	90.2	1.951	24.256	0.706
75	11.618	32.873	274.8	90.6	2.737	25.010	-0.258
100	10.169	32.731	272.6	91.2	3.458	25.154	-0.637
125	9.880	32.941	253.5	91.3	4.131	25.366	-0.518
150	9.165	33.313	219.1	91.3	4.740	25.773	-0.340
200	8.855	33.913	151.1	91.3	5.716	26.293	0.087
250	7.846	33.947	176.5	91.3	6.547	26.473	-0.041
300	7.378	34.003	110.0	91.4	7.316	26.585	-0.064
400	6.224	34.048	62.5	91.4	8.710	26.776	-0.186
500	5.436	34.123	37.9	91.4	9.953	26.934	-0.224
600	4.818	34.194	20.0	91.5	11.065	27.063	-0.240
700	4.620	34.296	9.5	91.5	12.073	27.166	-0.182
800	4.246	34.345	8.3	91.5	12.998	27.246	-0.184
900	4.014	34.397	9.8	91.5	13.863	27.312	-0.168
1000	3.779	34.439	14.1	91.5	14.675	27.370	-0.159
1100	3.523	34.477	22.1	91.5	15.433	27.426	-0.154
1200	3.282	34.506	29.1	91.6	16.148	27.473	-0.155
1300	3.083	34.517	31.0	91.5	16.830	27.500	-0.165
1400	2.948	34.544	40.8	91.5	17.484	27.535	-0.156
1500	2.761	34.560	47.5	91.6	18.110	27.564	-0.161
1750	2.355	34.592	63.5	91.6	19.563	27.626	-0.170
2000	2.050	34.611	74.2	91.6	20.901	27.667	-0.180
2500	1.784	34.645	100.7	91.6	23.356	27.717	-0.177
3000	1.625	34.664	122.0	91.6	25.674	27.748	-0.176
3456	1.535	34.677	136.9	91.6	27.742	27.767	-0.175

Station: 21 Date: 10/17/2008, 0316 Lat.: 35° 27.44 N Long.: 124° 55.54 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	16.445	32.871	250.4	90.0	0.039	24.010	0.776
10	16.448	32.871	251.6	90.1	0.389	24.009	0.776
20	16.451	32.872	251.4	90.1	0.779	24.010	0.778
30	16.465	32.876	251.5	90.1	1.169	24.010	0.784
50	16.615	33.056	248.8	90.2	1.947	24.114	0.961
75	11.468	32.861	272.8	90.8	2.736	25.028	-0.296
100	10.266	32.826	269.9	91.3	3.451	25.212	-0.543
125	9.487	33.263	231.9	91.3	4.094	25.683	-0.326
150	9.400	33.695	191.2	91.3	4.632	26.035	0.003
200	8.614	33.933	192.3	91.3	5.541	26.346	0.065
203	8.551	33.938	192.2	91.3	5.592	26.360	0.059

Station: 22 Date: 10/17/2008, 1855 Lat.: 37° 06.81 N Long.: 124° 41.61 W

P(dbar)	T(°C)	S	O <sub>2</sub> ( $\mu\text{m}/\text{kg}$ )	Xmiss(%)	$\Delta\Phi$	$\sigma_{\theta}$	$\pi_{\theta}$
0	13.521	33.299	269.6	88.0	0.030	24.971	0.462
10	13.518	33.299	267.1	88.0	0.298	24.972	0.462
20	13.520	33.299	267.2	88.1	0.595	24.972	0.462
30	13.517	33.299	267.2	88.1	0.894	24.973	0.461
50	12.967	33.321	263.4	89.7	1.478	25.100	0.365
75	9.606	33.664	187.5	90.7	2.068	25.976	0.014
100	9.010	33.828	145.1	90.9	2.547	26.200	0.046
125	8.662	33.928	118.6	90.9	2.987	26.333	0.070
150	8.282	33.977	98.9	90.9	3.401	26.430	0.050
200	7.646	34.014	83.6	91.0	4.180	26.554	-0.016
250	7.232	34.066	65.0	91.1	4.910	26.654	-0.035
300	7.107	34.157	43.5	91.3	5.596	26.744	0.020
400	6.060	34.154	33.6	91.4	6.869	26.881	-0.123
500	5.544	34.213	19.8	91.5	8.039	26.992	-0.140
600	4.771	34.213	15.1	91.4	9.115	27.082	-0.230
700	4.352	34.278	9.0	91.5	10.102	27.181	-0.225
800	4.214	34.354	7.1	91.4	11.015	27.256	-0.180
900	3.949	34.390	8.5	91.4	11.875	27.313	-0.180
1000	3.727	34.430	11.4	91.5	12.687	27.367	-0.171
1009	3.707	34.431	11.8	91.4	12.758	27.371	-0.172

Station: 23 Date: 10/17/2008, 2256 Lat.: 37° 16.81 N Long.: 124° 19.95 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	13.708	33.252	264.1	88.4	0.030	24.897	0.465
10	13.698	33.252	264.5	88.5	0.305	24.899	0.462
20	13.657	33.251	264.6	88.7	0.609	24.907	0.453
30	13.616	33.252	264.2	88.8	0.913	24.916	0.444
50	11.172	33.402	240.4	90.0	1.499	25.502	0.082
75	9.651	33.532	197.7	90.9	2.063	25.865	-0.083
100	8.423	33.673	162.3	91.1	2.555	26.170	-0.169
125	8.807	33.930	125.8	91.0	3.000	26.312	0.094
150	8.480	33.989	111.2	91.0	3.420	26.410	0.090
200	8.028	34.039	88.4	91.1	4.215	26.518	0.060
250	7.336	34.046	73.3	91.2	4.961	26.624	-0.036
300	6.802	34.070	61.4	91.3	5.663	26.717	-0.091
400	6.120	34.116	44.3	91.5	6.974	26.843	-0.145
500	5.312	34.152	27.7	91.5	8.166	26.971	-0.216
600	4.805	34.208	15.3	91.5	9.250	27.075	-0.230
700	4.620	34.297	9.0	91.5	10.256	27.167	-0.181
800	4.311	34.370	8.0	91.5	11.180	27.258	-0.158
900	4.092	34.416	10.9	91.5	12.035	27.319	-0.145
1000	3.754	34.444	14.2	91.5	12.839	27.377	-0.157
1100	3.508	34.474	19.6	91.5	13.596	27.425	-0.158
1200	3.330	34.507	27.1	91.5	14.315	27.469	-0.150
1300	3.127	34.521	31.9	91.5	15.000	27.500	-0.158
1400	2.929	34.534	36.2	91.5	15.659	27.528	-0.166
1500	2.767	34.553	43.7	91.5	16.293	27.559	-0.165
1750	2.313	34.581	56.0	91.6	17.760	27.620	-0.183
2000	2.050	34.609	72.3	91.6	19.096	27.666	-0.182
2500	1.769	34.648	103.2	91.6	21.548	27.721	-0.176
3000	1.633	34.666	123.7	91.6	23.860	27.749	-0.174
3452	1.547	34.676	136.2	91.6	25.911	27.766	-0.175

Station: 24 Date: 10/18/2008, 0152 Lat.: 37° 19.13 N Long.: 124° 20.21 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	13.741	33.283	265.6	87.7	0.030	24.914	0.497
10	13.741	33.284	266.1	87.8	0.303	24.915	0.496
20	13.724	33.283	266.7	87.8	0.606	24.918	0.492
30	13.641	33.294	266.2	88.2	0.908	24.944	0.484
50	13.494	33.334	263.7	89.2	1.505	25.005	0.483
75	10.110	33.516	199.0	90.6	2.138	25.776	-0.018
100	8.878	33.605	181.9	91.1	2.662	26.046	-0.152
125	8.938	33.877	138.8	91.1	3.131	26.251	0.073
150	8.458	33.965	117.3	91.1	3.559	26.395	0.067
200	8.108	34.032	89.4	91.0	4.360	26.501	0.067
202	8.094	34.035	84.1	91.0	4.391	26.505	0.066

Station: 25 Date: 10/18/2008, 0418 Lat.: 37° 26.90 N Long.: 123° 58.29 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	13.568	33.263	265.9	89.1	0.030	24.934	0.444
10	13.568	33.267	266.8	89.1	0.301	24.937	0.447
20	13.567	33.268	267.1	89.1	0.602	24.938	0.447
30	13.512	33.273	267.1	89.0	0.903	24.953	0.439
50	11.875	33.335	245.5	89.9	1.489	25.321	0.160
75	9.742	33.711	185.2	90.9	2.037	25.990	0.074
100	9.094	33.860	142.5	91.1	2.514	26.212	0.085
125	8.574	33.945	124.8	91.1	2.946	26.361	0.070
150	8.722	34.074	88.0	91.0	3.357	26.439	0.195
200	8.030	34.057	75.4	91.0	4.145	26.532	0.075
250	7.579	34.094	61.0	91.2	4.887	26.628	0.037
300	7.136	34.125	53.2	91.4	5.589	26.715	-0.002
400	6.032	34.101	45.0	91.5	6.900	26.842	-0.168
500	5.447	34.174	26.3	91.6	8.095	26.973	-0.183
600	5.021	34.258	12.6	91.5	9.178	27.090	-0.167
700	4.750	34.329	9.1	91.5	10.172	27.177	-0.142
800	4.326	34.364	8.6	91.5	11.096	27.252	-0.161
900	3.996	34.399	9.4	91.5	11.954	27.315	-0.168
1000	3.707	34.436	13.3	91.5	12.763	27.375	-0.168
1010	3.708	34.443	14.5	91.5	12.840	27.380	-0.163

Station: 26 Date: 10/18/2008, 0745 Lat.: 37° 36.87 N Long.: 123° 36.60 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	13.534	33.416	271.4	85.1	0.029	25.059	0.558
10	13.540	33.417	270.3	85.2	0.289	25.059	0.560
20	13.369	33.415	270.0	86.0	0.578	25.092	0.522
30	13.317	33.414	266.4	87.2	0.864	25.102	0.510
50	12.739	33.382	259.4	88.5	1.433	25.192	0.367
75	10.036	33.687	204.7	90.9	2.001	25.922	0.105
100	9.085	33.802	157.1	91.1	2.497	26.168	0.037
125	8.728	33.894	137.4	91.2	2.944	26.296	0.053
150	8.274	33.942	131.6	91.3	3.366	26.404	0.021
200	7.755	34.000	103.7	91.3	4.158	26.528	-0.011
250	7.355	34.048	77.9	91.4	4.899	26.623	-0.031
300	6.765	34.066	64.5	91.5	5.599	26.718	-0.099
400	5.991	34.136	39.1	91.5	6.895	26.876	-0.145
500	5.819	34.255	18.1	91.5	8.065	26.992	-0.074
600	5.201	34.285	12.0	91.5	9.138	27.091	-0.125
700	4.947	34.363	9.0	91.5	10.130	27.182	-0.094
800	4.320	34.366	8.2	91.5	11.053	27.255	-0.160
900	3.965	34.401	9.7	91.5	11.911	27.320	-0.169
1000	3.595	34.437	12.8	91.6	12.712	27.386	-0.178
1009	3.582	34.443	13.8	91.6	12.781	27.392	-0.175

Station: 27 Date: 10/18/2008, 1020 Lat.: 37° 41.81 N Long.: 123° 25.68 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	13.267	33.416	268.0	87.2	0.028	25.113	0.503
10	13.187	33.420	269.3	87.2	0.284	25.132	0.489
20	13.132	33.422	267.2	87.8	0.566	25.144	0.479
30	12.161	33.432	252.4	89.5	0.836	25.341	0.293
50	10.667	33.462	214.5	90.4	1.335	25.637	0.037
75	9.715	33.685	168.5	90.8	1.883	25.975	0.050
100	9.192	33.891	128.9	90.9	2.359	26.221	0.126
125	8.914	33.947	114.9	90.9	2.799	26.309	0.125
150	8.524	33.990	111.4	91.0	3.219	26.404	0.097
200	8.195	34.092	77.0	90.8	4.008	26.535	0.127
250	7.736	34.096	66.5	91.0	4.755	26.607	0.062
300	7.177	34.104	60.0	91.3	5.466	26.692	-0.013
400	6.262	34.151	38.1	91.5	6.770	26.853	-0.099
500	5.648	34.192	24.3	91.6	7.967	26.963	-0.144
600	5.409	34.277	13.2	91.5	9.066	27.060	-0.107
700	4.712	34.288	10.0	91.5	10.087	27.150	-0.178
800	4.404	34.355	8.1	91.5	11.041	27.237	-0.160
900	3.889	34.393	8.8	91.6	11.902	27.322	-0.183
1000	3.604	34.434	12.1	91.6	12.700	27.383	-0.179
1010	3.584	34.436	12.7	91.6	12.777	27.386	-0.181

Station: 28 Date: 10/18/2008, 1317 Lat.: 37° 46.97 N Long.: 123° 14.89 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	13.006	33.501	281.3	84.7	0.027	25.230	0.516
10	12.920	33.503	290.7	83.3	0.272	25.249	0.500
20	12.697	33.508	265.8	87.1	0.541	25.297	0.459
30	12.127	33.554	250.0	88.9	0.805	25.443	0.383
50	10.674	33.613	185.0	89.9	1.283	25.754	0.159
75	9.632	33.873	114.9	87.5	1.784	26.135	0.184
100	9.624	33.875	111.6	87.3	2.256	26.138	0.184
117	9.580	33.885	109.2	87.3	2.576	26.153	0.184

Station: 29 Date: 10/18/2008, 1505 Lat.: 37° 51.87 N Long.: 123° 03.84 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	11.730	33.591	313.4	73.1	0.024	25.546	0.338
10	11.498	33.593	279.3	79.7	0.240	25.590	0.294
20	11.414	33.597	265.3	82.2	0.479	25.608	0.282
30	11.157	33.630	227.7	86.6	0.713	25.681	0.260
50	10.386	33.736	162.5	89.4	1.154	25.900	0.205
75	9.865	33.819	128.2	87.2	1.658	26.054	0.181
86	9.829	33.829	120.5	84.4	1.873	26.068	0.183

Station: 30 Date: 10/18/2008, 1653 Lat.: 37° 56.82 N Long.: 122° 52.83 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	12.947	33.566	339.0	62.7	0.027	25.292	0.556
10	12.317	33.577	286.4	79.0	0.263	25.424	0.439
20	11.280	33.613	200.3	80.9	0.506	25.646	0.270
30	10.970	33.630	164.1	85.0	0.736	25.715	0.226
41	10.619	33.631	124.4	86.7	0.976	25.778	0.164

Station: 31 Date: 10/18/2008, 1950 Lat.: 37° 33.90 N Long.: 122° 50.82 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	12.229	33.570	278.1	74.0	0.025	25.435	0.417
10	11.727	33.569	253.9	80.8	0.250	25.529	0.319
20	11.597	33.572	234.8	83.1	0.493	25.556	0.297
30	11.159	33.565	213.5	85.7	0.732	25.630	0.209
50	10.597	33.650	175.4	87.9	1.186	25.797	0.175
75	9.991	33.799	125.6	86.2	1.698	26.017	0.186
83	9.990	33.799	123.6	86.0	1.857	26.017	0.186

Station: 32 Date: 10/18/2008, 2214 Lat.: 37° 15.43 N Long.: 122° 37.65 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	14.108	33.384	276.4	84.2	0.030	24.916	0.654
10	13.411	33.412	272.2	84.0	0.298	25.081	0.529
20	11.465	33.357	246.1	88.2	0.569	25.413	0.101
30	11.536	33.496	234.4	85.7	0.820	25.508	0.225
50	11.123	33.653	196.3	85.1	1.301	25.706	0.272
75	10.018	33.794	143.2	88.1	1.835	26.008	0.187
92	10.017	33.805	127.5	86.2	2.175	26.018	0.195

Station: 33 Date: 10/19/2008, 0037 Lat.: 36° 57.21 N Long.: 122° 24.70 W

P(dbar)	T(°C)	S	O <sub>2</sub> (µm/kg)	Xmiss(%)	ΔΦ	σ <sub>θ</sub>	π <sub>θ</sub>
0	14.170	33.379	276.2	82.6	0.030	24.899	0.664
10	13.415	33.392	272.1	82.6	0.295	25.064	0.514
20	12.432	33.456	240.1	88.0	0.571	25.309	0.366
30	12.158	33.478	229.6	89.4	0.833	25.378	0.329
50	10.691	33.600	190.2	90.6	1.321	25.741	0.152
75	10.330	33.771	145.6	90.3	1.859	25.938	0.223
100	10.112	33.812	132.1	90.2	2.370	26.007	0.217
125	10.052	33.824	127.3	90.2	2.871	26.027	0.216
150	9.927	33.862	119.1	90.5	3.365	26.078	0.224
200	8.953	34.028	88.1	90.8	4.272	26.368	0.194
250	8.322	34.149	58.8	90.9	5.065	26.561	0.190
251	8.340	34.147	57.9	90.9	5.081	26.557	0.191



**Table A3:** Results of nutrient and primary productivity analyses of water samples collected at each hydrographic station during the PaCOOS cruise of October 2008. Stations are in chronological (and numerical) order. (There are no stations 17 and 18.) The time listed (<Mon. dd, yyyy hh:mm> UT) for each station is the beginning of the CTD cast. 12 Niskin bottles were tripped at each station, although some bottles sampled duplicate pressures. Except where primary productivity analyses were not performed (see Introduction), the data for each station are separated into three sections (“Physical and Chemical,” “Chlorophyll,” and “Primary Production”).

The physical oceanographic properties listed in the first seven columns of the “Physical and Chemical” section for each station are the uncorrected values measured by the CTD at the times each Niskin bottle was tripped. Because they are uncorrected, these values may differ slightly from those listed in Table A2. The last four columns of this section give the nitrate (NO<sub>3</sub>), nitrite (NO<sub>2</sub>), phosphate (PO<sub>4</sub>), and dissolved silicate (SiO<sub>4</sub>) concentrations.

The “Chlorophyll” and “Primary Production” sections for each station give the results (where sampled) of the primary productivity analyses.

**Cruise:** S408                      **Date UT:** Oct 14, 2008 16:55                      **Latitude:** 36.798                      **Year:** 2008  
**Station:** C1                      **Project:** PACOOS                      **Longitude:** -121.854                      **Day of Year:** 288  
**Cast:** 1                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.7	12	12.881	33.500	25.254	72	5.020	0.229	0.855	11.795
5	4.9	11	12.842	33.497	25.260	73	9.343	0.272	0.982	13.508
10	10.2	10	12.079	33.520	25.425	81	15.215	0.151	1.211	17.495
20	20.2	9	10.985	33.617	25.702	84	20.927	0.179	1.635	25.027
30	29.9	8	10.670	33.680	25.806	87	---	---	---	---
40	40.2	7	10.537	33.708	25.852	88	23.585	0.276	1.857	28.889
60	60.9	6	10.352	33.762	25.927	81	23.822	0.234	1.940	31.416
80	80.5	5	10.275	33.777	25.952	81	24.749	0.237	1.727	31.928
100	100.7	4	10.045	33.825	26.029	83	25.246	0.176	1.845	31.819
150	152.2	3	9.821	33.868	26.101	86	22.232	0.115	1.844	26.211
150	152.0	2	9.817	33.869	26.103	86	25.530	0.246	2.075	30.613
150	152.1	1	9.814	33.871	26.104	85	28.044	0.180	2.445	38.356

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	10.086	1.251
5	11	5.737	0.927
10	10	1.647	0.543
20	9	0.245	0.358
40	7	0.128	0.286
60	6	0.080	0.310
80	5	0.072	0.276
100	4	0.055	0.270
150	3	0.030	0.172
150	2	0.030	0.163
150	1	0.055	0.255

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	467.699	46.369	0
50	12	467.699	46.369	2
30	11	263.521	45.932	4
15	11	189.844	33.090	7
5	10	21.292	12.927	12
1	10	5.741	3.486	26
0.1	9	0.397	1.620	52

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll a: 93.86 mg m-2 day -1      Carbon Fixation: 3025.1 mg m-2 day-1  
Phaeophytin: 18.53 mg m-2 day -1      Productivity Index: 32.23 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 14, 2008 18:50      **Latitude:** 36.736      **Year:** 2008  
**Station:** H3      **Project:** PACOOS      **Longitude:** -122.019      **Day of Year:** 288  
**Cast:** 2      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.6	12	12.339	33.368	25.257	86	11.073	0.392	0.824	10.816
5	5.3	11	12.133	33.369	25.297	85	---	---	---	---
10	10.1	10	12.093	33.367	25.304	85	10.816	0.229	0.938	10.485
20	19.7	9	12.074	33.378	25.316	86	11.036	0.261	0.895	10.837
30	29.8	8	12.103	33.393	25.322	86	12.290	0.140	1.019	11.918
40	40.5	7	10.899	33.381	25.534	89	20.128	0.136	1.678	19.506
60	60.3	6	10.321	33.628	25.827	90	22.773	0.030	1.842	24.050
80	80.1	5	10.274	33.771	25.947	89	24.225	0.069	1.586	27.001
100	100.4	4	10.064	33.816	26.018	89	25.010	0.099	2.138	28.782
150	152.5	3	9.643	33.926	26.176	90	27.639	0.027	2.087	32.690
200	202.2	2	9.385	33.992	26.270	90	28.731	0.024	2.182	34.595
1000	1008.5	1	3.500	34.480	27.430	87	43.126	0.125	3.340	145.09

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	1.221	0.267
5	11	1.258	0.308
10	10	1.166	0.323
20	9	1.277	0.359
30	8	1.009	0.350
40	7	0.153	0.110
60	6	0.037	0.101
80	5	0.026	0.130
100	4	0.022	0.121
150	3	0.014	0.118
200	2	0.011	0.117
1000	1	0.013	0.118

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	84.588	69.251	0
50	11	89.162	70.849	5
30	10	77.050	66.083	8
15	10	64.821	55.595	13
5	9	24.181	18.936	21
1	8	4.699	4.659	32
0.1	7	0.063	0.413	64

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 38.30 mg m-2 day -1      Carbon Fixation: 1548.1 mg m-2 day-1  
Phaeophytin: 10.73 mg m-2 day -1      Productivity Index: 40.42 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 14, 2008 21:30                      **Latitude:** 36.708                      **Year:** 2008  
**Station:** NPS1                      **Project:** PACOOS                      **Longitude:** -122.242                      **Day of Year:** 288  
**Cast:** 3                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.5	12	14.029	33.376	24.926	86	5.792	0.247	0.733	4.534
50	50.9	11	11.933	33.473	25.417	89	15.060	0.425	1.285	13.732
100	100.6	10	9.882	33.767	26.011	90	20.612	0.074	1.730	21.349
200	200.6	9	8.246	34.009	26.462	91	30.227	0.059	1.953	41.368
300	301.2	8	7.155	34.036	26.642	91	33.685	0.050	2.362	52.480
400	402.2	7	6.548	34.111	26.784	91	32.482	0.058	2.585	58.859
500	504.3	6	5.798	34.173	26.930	91	37.213	0.060	2.908	77.623
600	604.5	5	5.467	34.282	27.057	90	41.019	0.000	3.086	96.820
700	705.0	4	4.947	34.322	27.150	90	41.185	0.042	3.372	104.44
800	805.9	3	4.571	34.364	27.226	90	42.834	0.087	3.237	116.25
900	908.2	2	4.129	34.419	27.318	90	42.107	0.075	3.631	124.96
1000	1008.8	1	3.868	34.449	27.369	90	43.854	0.072	3.675	134.65

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 14, 2008 23:58      **Latitude:** 36.626      **Year:** 2008  
**Station:** 67-55      **Project:** PACOOS      **Longitude:** -122.419      **Day of Year:** 288  
**Cast:** 4      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '-' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.9	12	13.775	33.327	24.941	78	2.002	0.092	0.418	1.302
5	5.5	11	13.498	33.353	25.018	80	3.474	0.109	0.758	2.416
10	13.2	10	13.308	33.392	25.087	84	5.043	0.175	0.781	3.488
20	20.0	9	13.177	33.406	25.124	85	5.256	0.180	0.554	3.635
30	30.3	8	12.986	33.408	25.163	83	5.813	0.136	0.744	4.439
40	39.9	7	12.804	33.381	25.179	84	6.853	0.389	0.821	4.855
60	60.4	6	10.045	33.229	25.563	90	17.056	0.079	1.439	14.371
80	80.9	5	9.771	33.605	25.903	91	23.204	0.005	1.738	20.926
100	100.6	4	9.410	33.752	26.077	90	26.553	0.008	2.087	26.311
150	152.9	3	8.437	33.975	26.406	91	29.129	0.009	2.254	33.338
200	201.5	2	7.866	34.036	26.539	91	32.487	0.038	2.566	42.120
1000	1007.4	1	3.792	34.438	27.368	91	41.636	0.007	3.440	119.62

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	5.201	0.321
5	11	4.840	1.106
10	10	4.007	0.528
20	9	3.674	0.706
30	8	3.128	0.577
40	7	3.091	0.596
60	6	0.111	0.221
80	5	0.027	0.058
100	4	0.018	0.060
150	3	0.004	0.036
200	2	0.003	0.025
1000	1	0.008	0.030

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	398.151	76.560	0
50	12	391.588	75.298	3
30	11	245.568	50.741	5
15	11	189.007	39.054	8
5	10	50.480	12.599	13
1	10	11.923	2.976	21
0.1	9	0.723	0.197	30

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 93.32 mg m-2 day -1      Carbon Fixation: 3330.6 mg m-2 day-1  
Phaeophytin: 14.03 mg m-2 day -1      Productivity Index: 35.69 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 15, 2008 02:57                      **Latitude:** 36.542                      **Year:** 2008  
**Station:** NPS2                      **Project:** PACOOS                      **Longitude:** -122.597                      **Day of Year:** 289  
**Cast:** 5                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.2	12	13.498	33.268	24.952	86	4.255	0.209	0.530	2.584
50	51.6	11	12.595	33.340	25.188	85	7.384	0.072	0.839	5.887
100	100.4	10	9.517	33.662	25.989	91	21.267	0.076	1.843	20.358
200	201.2	9	8.128	34.030	26.496	91	27.501	0.089	2.102	32.426
300	301.3	8	6.947	34.066	26.694	91	30.808	0.139	2.403	43.690
400	403.1	7	6.117	34.121	26.848	91	33.469	0.168	2.760	56.221
500	504.3	6	5.537	34.198	26.981	91	35.735	0.183	2.923	72.513
600	603.9	5	5.348	34.308	27.092	91	---	---	---	---
700	704.3	4	4.973	34.352	27.171	91	40.991	0.085	3.300	95.319
800	807.4	3	4.565	34.388	27.246	91	42.313	0.199	3.271	102.14
900	906.4	2	4.178	34.405	27.301	91	44.721	0.214	3.481	114.20
1000	1008.3	1	3.924	34.439	27.355	91	44.722	0.000	3.370	119.19

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 15, 2008 05:06      **Latitude:** 36.459      **Year:** 2008  
**Station:** 67-55      **Project:** PACOOS      **Longitude:** -122.778      **Day of Year:** 289  
**Cast:** 6      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '-' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.1	12	14.031	33.274	24.847	87	3.539	0.217	0.701	2.636
5	5.5	11	14.037	33.274	24.846	87	3.568	0.130	0.711	2.359
10	10.3	10	14.035	33.274	24.847	87	3.306	0.258	0.607	2.252
20	20.6	9	13.997	33.279	24.859	87	3.748	0.270	0.797	2.807
30	30.8	8	13.909	33.283	24.880	87	3.927	0.368	0.543	3.057
40	40.0	7	13.873	33.282	24.887	88	5.936	0.285	0.759	4.566
60	60.4	6	10.519	33.353	25.579	90	17.861	0.114	1.339	14.864
80	81.2	5	9.883	33.586	25.869	91	21.454	0.114	1.529	19.427
100	101.5	4	9.810	33.785	26.037	91	23.562	0.117	1.829	23.440
150	151.9	3	8.973	34.043	26.375	91	25.602	0.183	2.154	28.228
200	202.2	2	8.151	34.056	26.513	91	29.114	0.048	2.193	35.945
1000	1007.5	1	3.973	34.444	27.354	91	39.246	0.008	3.222	105.48

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	0.562	0.116
5	11	0.483	0.086
10	10	0.560	0.111
20	9	0.676	0.190
30	8	0.676	0.207
40	7	0.532	0.208
60	6	0.213	0.145
80	5	0.044	0.043
100	4	0.015	0.059
150	3	0.005	0.059
200	2	0.003	0.031
1000	1	0.002	0.009

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	33.062	58.861	0
50	11	43.530	90.117	7
30	10	44.625	79.710	12
15	10	34.542	61.700	18
5	9	14.993	22.194	28
1	8	3.324	4.921	43
0.1	7	0.196	0.368	71

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 25.95 mg m-2 day -1      Carbon Fixation: 1119.7 mg m-2 day-1  
Phaeophytin: 6.34 mg m-2 day -1      Productivity Index: 43.14 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 15, 2008 07:41                      **Latitude:** 36.379                      **Year:** 2008  
**Station:** NPS3                      **Project:** PACOOS                      **Longitude:** -122.957                      **Day of Year:** 289  
**Cast:** 7                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.9	12	14.248	33.267	24.796	88	3.985	0.150	0.381	2.935
50	60.4	11	12.959	33.247	25.045	89	10.414	0.199	0.958	8.988
100	99.4	10	9.544	33.731	26.039	91	26.462	0.034	1.985	26.337
200	200.1	9	7.996	33.984	26.479	91	30.609	0.038	2.196	37.807
300	301.4	8	7.336	34.153	26.709	91	36.256	0.037	2.968	54.457
400	401.2	7	6.597	34.218	26.862	91	34.429	0.027	2.853	58.256
500	504.0	6	5.711	34.228	26.984	91	41.118	0.011	3.323	80.324
600	604.2	5	5.486	34.321	27.086	91	42.436	0.048	3.330	87.099
700	705.2	4	5.008	34.349	27.165	91	43.016	0.017	3.370	97.625
800	806.4	3	4.557	34.376	27.237	91	44.485	0.009	3.489	104.43
900	905.6	2	4.264	34.414	27.300	91	43.811	0.010	3.407	111.91
1000	1007.3	1	3.996	34.445	27.353	91	43.553	0.056	3.494	114.55

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 15, 2008 09:55      **Latitude:** 36.292      **Year:** 2008  
**Station:** 67-65      **Project:** PACOOS      **Longitude:** -123.133      **Day of Year:** 289  
**Cast:** 8      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '-' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.4	12	14.409	33.267	24.762	89	4.171	0.101	0.331	2.605
5	5.5	11	14.414	33.267	24.761	89	4.094	0.140	0.580	2.352
10	10.3	10	14.418	33.266	24.760	89	4.056	0.138	0.498	2.198
20	20.2	9	14.419	33.266	24.761	89	4.158	0.116	0.487	2.240
30	30.5	8	14.382	33.271	24.773	89	4.076	0.080	0.506	2.289
40	40.6	7	14.321	33.267	24.782	89	4.009	0.084	0.538	2.310
60	58.9	6	9.703	32.859	25.331	91	13.027	0.013	1.189	11.288
80	80.5	5	9.620	33.186	25.600	91	19.791	0.079	1.810	18.284
100	99.3	4	9.352	33.494	25.885	91	23.299	0.049	1.528	22.587
150	151.6	3	8.851	33.919	26.298	91	28.891	0.017	2.110	31.166
200	200.1	2	8.211	33.996	26.457	91	30.541	0.000	2.106	36.363
1000	1007.5	1	3.959	34.448	27.359	91	44.907	0.000	3.419	118.37

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	0.348	0.081
5	11	0.341	0.100
10	10	0.348	0.101
20	9	0.362	0.105
30	8	0.384	0.140
40	7	0.415	0.167
60	6	0.107	0.052
80	5	0.068	0.053
100	4	0.020	0.035
150	3	0.006	0.045
200	2	0.003	0.029
1000	1	0.002	0.014

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	11.703	33.636	0
50	11	21.661	63.609	8
30	10	19.126	54.971	14
15	10	15.262	43.866	22
5	9	5.160	14.260	34
1	8	2.168	5.646	53
0.1	7	0.434	1.048	97

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 19.06 mg m-2 day -1      Carbon Fixation: 586.89 mg m-2 day-1  
Phaeophytin: 5.73 mg m-2 day -1      Productivity Index: 30.79 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1



**Cruise:** S408                      **Date UT:** Oct 15, 2008 12:48                      **Latitude:** 36.217                      **Year:** 2008  
**Station:** NPS4                      **Project:** PACOOS                      **Longitude:** -123.312                      **Day of Year:** 289  
**Cast:** 9                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.9	12	13.947	33.125	24.750	88	4.756	0.168	0.650	3.139
50	51.3	11	10.830	32.755	25.059	90	8.378	0.194	1.005	6.919
100	101.1	10	9.230	33.446	25.866	91	23.451	0.009	1.745	23.184
200	201.2	9	8.060	34.016	26.495	91	32.351	0.068	2.318	39.546
300	302.7	8	6.765	34.051	26.707	91	36.860	0.029	2.717	55.755
400	404.1	7	5.914	34.112	26.866	91	40.335	0.010	3.029	70.698
500	504.2	6	5.323	34.189	27.000	91	42.077	0.009	3.217	81.552
600	605.0	5	4.991	34.256	27.092	91	43.089	0.022	3.296	90.647
700	704.5	4	4.727	34.335	27.185	91	44.243	0.053	3.415	99.563
800	806.0	3	4.365	34.376	27.258	91	45.043	0.015	3.433	108.98
900	906.1	2	4.112	34.415	27.316	91	45.432	0.036	3.481	109.14
1000	1008.5	1	3.847	34.452	27.373	91	42.079	0.016	3.151	112.63

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 15, 2008 15:22      **Latitude:** 36.126      **Year:** 2008  
**Station:** 67-70      **Project:** PACOOS      **Longitude:** -123.492      **Day of Year:** 289  
**Cast:** 10      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '-' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.8	12	14.345	32.916	24.505	88	2.508	0.078	0.438	2.306
5	4.4	11	14.353	32.916	24.503	88	2.500	0.075	0.565	1.880
10	10.3	10	14.348	32.917	24.505	88	2.482	0.078	0.575	1.894
20	20.4	9	14.348	32.917	24.506	88	2.727	0.063	0.500	1.765
30	29.4	8	14.173	32.924	24.548	89	3.294	0.096	0.576	2.508
40	41.2	7	12.949	32.933	24.803	90	5.750	0.126	0.738	4.103
60	61.9	6	10.024	32.722	25.170	91	7.949	0.054	0.881	6.639
80	80.9	5	9.807	32.987	25.414	91	12.519	0.054	1.044	10.653
100	101.2	4	9.398	33.348	25.763	91	20.896	0.026	1.527	19.053
150	152.5	3	8.544	33.875	26.311	91	27.228	0.022	1.963	30.795
200	204.4	2	7.922	33.948	26.462	91	27.557	0.004	1.981	33.366
1000	1005.7	1	3.813	34.454	27.379	91	45.313	0.015	3.456	119.09

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	0.359	0.080
5	11	0.359	0.080
10	10	0.359	0.080
20	9	0.379	0.149
30	8	0.404	0.143
40	7	0.324	0.131
60	6	0.091	0.117
80	5	0.015	0.020
100	4	0.019	0.003
150	3	0.005	0.023
200	2	0.007	0.020
1000	1	0.003	0.008

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	8.025	22.351	0
50	11	21.864	60.896	8
30	11	30.955	86.218	14
15	10	11.874	33.071	22
5	9	5.958	15.704	34
1	8	1.661	4.107	54
0.1	7	0.267	0.825	113

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 20.10 mg m-2 day -1      Carbon Fixation: 624.86 mg m-2 day-1  
Phaeophytin: 6.03 mg m-2 day -1      Productivity Index: 31.09 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 15, 2008 18:40                      **Latitude:** 36.042                      **Year:** 2008  
**Station:** NPS5                      **Project:** PACOOS                      **Longitude:** -123.668                      **Day of Year:** 289  
**Cast:** 11                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.2	12	15.015	32.910	24.358	89	1.369	0.085	0.489	1.514
50	50.3	11	11.077	32.861	25.098	90	8.808	0.237	0.892	6.953
100	101.6	10	9.235	33.506	25.913	91	23.429	0.051	1.761	23.069
200	200.0	9	7.562	33.946	26.512	91	28.964	0.024	1.961	38.139
300	303.4	8	6.376	33.996	26.714	91	36.704	0.046	2.678	57.181
400	402.0	7	5.804	34.095	26.866	91	41.010	0.030	3.052	72.212
500	502.7	6	5.366	34.209	27.010	91	42.622	0.044	3.247	80.588
600	602.2	5	4.876	34.270	27.116	91	44.196	0.022	3.334	92.153
700	704.5	4	4.478	34.331	27.210	91	44.607	0.045	3.488	102.72
800	805.5	3	4.297	34.371	27.261	91	41.799	0.054	3.276	107.22
900	907.4	2	3.956	34.422	27.338	91	41.115	0.201	3.259	104.89
1000	1007.4	1	3.724	34.457	27.390	91	---	---	---	---

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 15, 2008 22:23      **Latitude:** 35.959      **Year:** 2008  
**Station:** 67-75      **Project:** PACOOS      **Longitude:** -123.845      **Day of Year:** 289  
**Cast:** 12      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.4	12	14.433	33.431	24.884	88	6.529	0.343	0.682	3.456
5	5.0	11	14.439	33.431	24.883	88	6.452	0.227	0.623	3.272
10	10.3	10	14.432	33.431	24.885	88	6.498	0.216	0.681	3.164
20	19.3	9	14.396	33.429	24.891	88	6.451	0.208	0.885	3.175
30	29.2	8	14.343	33.426	24.900	88	6.454	0.212	0.825	3.158
40	40.2	7	14.313	33.416	24.899	88	8.661	0.209	0.827	5.671
60	60.1	6	9.379	33.057	25.538	91	---	---	---	---
80	80.6	5	10.231	33.616	25.834	91	23.303	0.074	1.723	21.056
100	99.3	4	8.868	33.674	26.102	91	25.836	0.057	1.823	26.626
150	151.3	3	8.130	33.952	26.434	91	30.127	0.083	2.140	35.608
200	202.3	2	7.318	33.949	26.550	91	29.384	0.071	2.073	40.011
1000	1007.2	1	3.642	34.461	27.401	91	44.831	0.005	3.311	124.71

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	0.478	0.104
5	11	0.458	0.109
10	10	0.466	0.101
20	9	0.485	0.117
30	8	0.522	0.141
40	7	0.462	0.145
60	6	0.265	0.131
80	5	0.111	0.085
100	4	0.019	0.029
150	3	0.005	0.025
200	2	0.005	0.012
1000	1	0.002	0.004

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	20.324	42.483	0
50	11	33.429	72.982	7
30	10	34.845	74.714	13
15	10	25.864	55.457	20
5	9	12.908	26.621	31
1	7	2.944	6.376	48
0.1	6	0.323	1.221	77

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 22.49 mg m-2 day -1      Carbon Fixation: 944.92 mg m-2 day-1  
Phaeophytin: 5.49 mg m-2 day -1      Productivity Index: 42.01 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 16, 2008 01:48                      **Latitude:** 35.881                      **Year:** 2008  
**Station:** NPS6                      **Project:** PACOOS                      **Longitude:** -124.019                      **Day of Year:** 290  
**Cast:** 13                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.5	12	14.499	33.432	24.871	87	6.973	0.203	0.638	3.847
50	51.6	11	12.711	33.407	25.217	89	12.113	0.182	0.995	8.983
100	101.1	10	9.060	33.839	26.201	91	28.096	0.058	2.036	29.813
200	202.0	9	7.650	34.006	26.548	91	36.409	0.024	2.825	56.277
300	301.6	8	7.071	34.126	26.725	91	36.775	0.027	2.756	56.008
400	402.4	7	5.787	34.093	26.867	91	40.020	0.003	3.098	70.517
500	502.3	6	5.060	34.146	26.996	91	37.544	0.001	2.960	76.974
600	605.9	5	4.909	34.270	27.112	91	42.862	0.056	3.377	93.693
700	705.7	4	4.669	34.334	27.191	91	42.091	0.045	3.389	99.282
800	806.3	3	4.158	34.350	27.259	91	44.708	0.016	3.425	111.85
900	908.0	2	3.886	34.393	27.321	91	43.977	0.082	3.473	117.74
1000	1007.9	1	3.621	34.435	27.382	91	44.874	0.022	3.507	126.15

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 16, 2008 04:32                      **Latitude:** 35.793                      **Year:** 2008  
**Station:** 67-80                      **Project:** PACOOS                      **Longitude:** -124.201                      **Day of Year:** 290  
**Cast:** 14                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '-' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.5	12	14.354	33.321	24.816	87	6.307	0.159	0.498	3.456
5	5.0	11	14.357	33.321	24.815	87	6.298	0.156	0.550	3.317
10	10.1	10	14.358	33.321	24.816	87	5.475	0.205	0.752	2.693
20	20.3	9	14.360	33.321	24.815	87	6.502	0.154	0.736	3.424
30	29.8	8	14.126	33.351	24.888	87	7.007	0.184	0.690	3.742
40	39.4	7	13.968	33.359	24.927	89	6.860	0.274	0.703	3.224
60	60.4	6	10.919	33.323	25.486	90	16.904	0.180	1.370	13.536
80	80.1	5	9.119	33.334	25.796	91	22.442	0.106	1.641	21.291
100	100.4	4	9.485	33.729	26.047	91	27.086	0.072	2.169	27.040
150	150.3	3	8.589	33.938	26.353	91	29.991	0.062	2.233	31.987
200	201.9	2	7.936	34.028	26.523	91	33.399	0.081	2.512	41.223
1000	1009.1	1	3.648	34.434	27.379	91	44.946	0.049	3.417	123.94

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	0.460	0.123
5	11	0.476	0.127
10	10	0.490	0.117
20	9	0.541	0.147
30	8	0.561	0.170
40	7	0.416	0.146
60	6	0.268	0.151
80	5	0.048	0.068
100	4	0.042	0.068
150	3	0.007	0.052
200	2	0.004	0.045
1000	1	0.004	0.004

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	25.132	54.647	0
50	11	29.666	62.371	7
30	10	33.702	68.847	12
15	10	29.275	59.804	19
5	9	12.066	22.289	30
1	7	2.278	5.472	47
0.1	6	0.000	0.000	76

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 22.67 mg m-2 day -1                      Carbon Fixation: 914.97 mg m-2 day-1  
 Phaeophytin: 6.17 mg m-2 day -1                      Productivity Index: 40.36 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 16, 2008 07:57                      **Latitude:** 35.710                      **Year:** 2008  
**Station:** NPS7                      **Project:** PACOOS                      **Longitude:** -124.377                      **Day of Year:** 290  
**Cast:** 15                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.3	12	13.922	33.364	24.939	88	7.179	0.269	0.761	4.046
50	64.8	11	10.288	33.186	25.488	91	17.061	0.083	1.354	14.264
100	100.7	10	9.005	33.600	26.023	91	25.682	0.055	1.926	26.072
200	201.3	9	7.929	34.021	26.519	91	33.570	0.118	2.493	40.790
300	302.6	8	6.880	34.068	26.705	91	36.814	0.026	2.853	54.974
400	402.9	7	6.411	34.161	26.842	91	38.995	0.024	2.990	65.519
500	503.9	6	5.634	34.199	26.970	91	41.655	0.068	3.234	77.501
600	602.8	5	4.848	34.225	27.084	91	43.447	0.123	3.369	92.855
700	703.6	4	4.666	34.327	27.185	91	44.059	0.092	3.431	95.801
800	805.1	3	4.384	34.385	27.263	91	44.516	0.074	3.504	106.09
900	906.9	2	4.064	34.424	27.328	91	44.548	0.162	3.435	112.62
1000	1008.1	1	3.654	34.437	27.381	91	45.183	0.102	3.378	123.02

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 16, 2008 11:20      **Latitude:** 35.626      **Year:** 2008  
**Station:** 67-85      **Project:** PACOOS      **Longitude:** -124.555      **Day of Year:** 290  
**Cast:** 16      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.2	11	13.867	33.308	24.907	88	6.650	0.406	0.737	6.297
5	5.7	10	13.869	33.308	24.907	88	---	---	---	---
10	10.4	9	13.872	33.308	24.907	88	6.983	0.319	0.791	4.029
20	19.4	8	13.874	33.308	24.907	88	6.350	0.326	0.669	4.167
30	30.6	7	13.872	33.308	24.907	88	6.371	0.329	0.673	4.049
40	40.2	6	13.873	33.308	24.907	89	6.329	0.359	0.705	3.875
60	60.4	5	12.851	33.193	25.024	90	6.352	0.319	0.706	3.778
80	80.5	4	10.722	33.305	25.506	91	9.442	0.394	1.065	7.084
100	101.1	3	9.227	33.457	25.876	91	18.029	0.113	1.338	16.119
150	152.2	2	8.826	33.933	26.313	91	---	---	---	---
200	199.2	1	8.185	34.022	26.481	91	30.173	0.076	2.062	33.311
1000	1010.5	1	3.869	34.447	27.368	91	45.438	0.298	3.317	114.51

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
1000	1	0.001	0.007

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
50	11	21.548	---	7
30	10	16.644	---	12
15	10	15.496	---	19
5	9	7.401	---	30
1	7	2.535	---	46
0.1	6	0.000	---	70

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 22.22 mg m-2 day -1      Carbon Fixation: 656.88 mg m-2 day-1  
Phaeophytin: 7.11 mg m-2 day -1      Productivity Index: 29.57 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1



**Cruise:** S408                      **Date UT:** Oct 16, 2008 20:08                      **Latitude:** 35.541                      **Year:** 2008  
**Station:** NPS8                      **Project:** PACOOS                      **Longitude:** -124.724                      **Day of Year:** 290  
**Cast:** 19                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.7	12	14.033	32.951	24.597	88	4.207	0.278	0.516	2.978
50	81.1	11	9.709	32.671	25.183	91	12.041	0.187	0.966	9.868
100	99.6	10	9.598	33.088	25.527	91	15.654	0.168	1.204	12.809
200	201.3	9	8.363	33.974	26.417	91	---	---	---	---
300	300.4	8	6.966	34.017	26.653	91	35.780	0.083	2.461	52.076
400	402.5	7	5.836	34.015	26.799	91	34.796	0.064	2.464	58.908
500	502.3	6	5.252	34.114	26.948	91	42.465	0.064	3.040	78.900
600	603.7	5	4.877	34.211	27.069	91	44.164	0.049	3.273	85.224
700	705.0	4	4.491	34.289	27.174	91	45.500	0.028	3.484	99.017
800	806.6	3	4.165	34.351	27.259	91	45.948	0.057	3.469	111.85
900	907.8	2	3.951	34.403	27.323	91	45.893	0.074	3.496	114.98
1000	1009.0	1	3.702	34.440	27.378	92	46.182	0.066	3.568	101.22

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 16, 2008 23:31                      **Latitude:** 35.458                      **Year:** 2008  
**Station:** 67-90                      **Project:** PACOOS                      **Longitude:** -124.907                      **Day of Year:** 290  
**Cast:** 20                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	2.0	12	16.437	32.856	24.000	90	0.237	0.049	0.268	1.727
100	98.0	11	10.222	32.734	25.148	91	4.696	0.053	0.521	3.832
200	200.8	10	8.704	33.915	26.318	91	21.917	0.103	1.639	24.193
750	755.8	9	4.376	34.331	27.221	91	45.297	0.051	3.365	103.92
1000	1007.9	8	3.696	34.440	27.379	92	45.564	0.038	3.495	121.41
1500	1515.5	7	2.758	34.550	27.557	92	---	---	---	---
2000	2019.1	6	2.034	34.605	27.663	92	42.719	0.080	3.075	166.42
2500	2527.9	5	1.777	34.637	27.711	92	41.718	0.081	3.103	169.36
3000	3036.5	4	1.616	34.644	27.732	92	40.590	0.070	3.077	170.58
3500	3551.3	3	1.520	34.664	27.758	92	---	---	---	---
4000	4061.8	2	1.488	34.676	27.774	92	34.094	0.102	2.712	155.66
4335	4409.9	1	1.518	34.681	27.779	91	37.997	0.099	2.854	159.73

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 17, 2008 03:15                      **Latitude:** 35.457                      **Year:** 2008  
**Station:** 67-90                      **Project:** PACOOS                      **Longitude:** -124.926                      **Day of Year:** 291  
**Cast:** 21                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.5	12	16.449	32.864	24.003	86	0.193	0.110	0.403	1.412
5	5.9	11	16.460	32.865	24.002	90	0.193	0.204	0.522	1.044
10	11.1	10	16.453	32.865	24.003	90	0.199	0.091	0.420	1.610
10	10.4	9	16.452	32.865	24.003	90	0.169	0.071	0.484	1.421
20	20.0	8	16.468	32.870	24.004	90	0.172	0.077	0.427	1.419
30	32.2	7	16.481	32.875	24.005	90	0.197	0.036	0.383	1.529
40	39.9	6	16.527	32.900	24.014	90	0.430	0.164	0.559	1.675
80	81.6	5	11.116	32.817	25.057	91	2.927	0.125	0.759	2.781
100	100.7	4	10.240	32.788	25.187	91	5.726	0.076	0.881	4.440
150	151.6	3	9.432	33.715	26.046	91	22.969	0.071	1.661	22.014
200	201.2	2	8.578	33.927	26.347	91	22.379	0.151	1.771	24.652
200	201.5	1	8.564	33.928	26.350	91	21.297	0.101	1.548	23.085

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	0.167	0.038
5	11	0.161	0.040
10	10	0.156	0.041
10	9	0.197	0.042
20	8	0.167	0.036
30	7	0.151	0.038
40	6	0.158	0.051
80	5	0.173	0.090
100	4	0.055	0.037
150	3	0.004	0.014
200	2	0.003	0.012
200	1	0.004	0.034

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	9.137	54.858	0
50	11	9.235	57.357	11
30	10	5.222	33.389	20
15	10	5.208	33.302	31
5	8	1.077	6.464	49
1	7	0.298	1.977	73
0.1	6	0.097	0.610	120

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 11.70 mg m-2 day -1                      Carbon Fixation: 295.27 mg m-2 day-1  
 Phaeophytin: 2.83 mg m-2 day -1                      Productivity Index: 25.24 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 17, 2008 18:55      **Latitude:** 37.113      **Year:** 2008  
**Station:** 60-75      **Project:** PACOOS      **Longitude:** -124.694      **Day of Year:** 291  
**Cast:** 22      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.2	12	13.501	33.291	24.969	88	6.315	0.295	0.714	5.064
5	5.3	11	13.500	33.291	24.969	88	6.533	0.299	0.830	5.069
10	9.9	10	13.499	33.291	24.970	88	6.512	0.243	0.968	5.070
20	20.2	9	13.497	33.291	24.971	88	6.495	0.238	0.803	5.002
30	30.1	8	13.501	33.291	24.970	88	6.542	0.239	0.851	5.078
40	39.4	7	13.491	33.289	24.970	88	7.531	0.286	0.782	6.282
60	61.2	6	12.639	33.314	25.160	90	---	---	---	---
80	80.2	5	9.595	33.649	25.966	91	---	---	---	---
100	100.2	4	9.055	33.788	26.162	91	24.690	0.335	1.881	25.040
150	150.8	3	8.323	33.961	26.412	91	31.943	0.113	2.268	36.895
200	200.5	2	7.680	34.001	26.539	91	34.143	0.085	2.488	42.112
1000	1008.8	1	3.707	34.422	27.364	91	46.539	0.098	3.527	124.73

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	0.787	0.174
5	11	0.833	0.154
10	10	0.805	0.173
20	9	0.787	0.174
30	8	0.777	0.157
40	7	0.624	0.212
60	6	0.306	0.161
80	5	0.067	0.119
100	4	0.025	0.062
150	3	0.005	0.059
200	2	0.004	0.045
1000	1	0.001	0.006

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	30.762	39.110	0
50	11	27.819	33.404	6
30	10	25.006	31.061	10
15	10	16.726	20.777	16
5	9	4.851	6.168	25
1	8	3.517	4.525	39
0.1	7	1.152	1.847	62

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 31.05 mg m-2 day -1      Carbon Fixation: 560.96 mg m-2 day-1  
Phaeophytin: 6.55 mg m-2 day -1      Productivity Index: 18.07 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 17, 2008 22:56                      **Latitude:** 37.280                      **Year:** 2008  
**Station:** 60-70                      **Project:** PACOOS                      **Longitude:** -124.332                      **Day of Year:** 291  
**Cast:** 23                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.4	12	13.787	33.259	24.886	88	6.539	0.322	0.614	4.362
5	4.7	11	13.790	33.260	24.886	88	6.249	0.262	0.703	4.080
10	9.8	10	13.791	33.261	24.886	88	6.549	0.302	0.726	4.147
250	251.2	9	7.606	34.065	26.601	91	34.733	0.084	2.595	47.698
500	505.2	8	5.376	34.146	26.960	92	41.170	0.112	3.228	80.248
750	759.1	7	4.595	34.351	27.213	91	43.716	0.093	3.387	98.572
1000	1007.8	6	3.748	34.436	27.370	91	44.544	0.151	3.291	120.01
1500	1513.6	5	2.761	34.545	27.553	92	40.790	0.102	3.290	144.40
2000	2019.9	4	2.032	34.602	27.661	92	41.858	0.147	3.245	166.88
2500	2527.9	3	1.756	34.639	27.715	92	41.910	0.093	3.382	---
3000	3036.9	2	1.625	34.658	27.743	92	39.191	0.123	3.217	169.09
3430	3482.0	1	1.544	34.668	27.760	92	38.200	0.163	2.951	169.35

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 18, 2008 01:52      **Latitude:** 37.319      **Year:** 2008  
**Station:** 60-70      **Project:** PACOOS      **Longitude:** -124.337      **Day of Year:** 292  
**Cast:** 24      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.6	12	13.739	33.276	24.909	88	6.602	0.325	0.626	4.521
5	4.9	11	13.741	33.276	24.908	88	5.666	0.225	0.814	3.568
10	10.1	10	13.743	33.276	24.908	88	6.398	0.300	0.537	4.211
20	20.5	9	13.678	33.289	24.932	88	6.754	0.237	0.732	4.548
30	30.5	8	13.645	33.311	24.956	88	6.691	0.265	0.722	4.626
40	40.7	7	13.526	33.323	24.990	89	6.958	0.304	0.775	5.137
60	61.1	6	11.227	33.372	25.469	90	16.368	0.288	1.329	14.031
80	80.9	5	9.832	33.511	25.819	91	20.292	0.064	1.606	19.386
100	101.2	4	8.906	33.630	26.062	91	23.200	0.027	1.816	24.044
150	150.8	3	8.493	33.962	26.387	91	24.284	0.142	1.752	27.283
200	201.6	2	8.097	34.025	26.497	91	32.056	0.083	2.377	39.794
200	201.7	1	8.102	34.025	26.496	91	---	---	---	---

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	0.577	0.086
5	11	0.584	0.099
10	10	0.587	0.094
20	9	0.656	0.115
30	8	0.671	0.130
40	7	0.560	0.146
60	6	0.397	0.166
80	5	0.102	0.112
100	4	0.022	0.059
150	3	0.006	0.050
200	2	0.005	0.051

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	29.739	51.502	0
50	11	32.950	56.431	7
30	10	27.986	47.702	12
15	9	20.969	31.962	18
5	8	8.541	12.731	28
1	7	1.567	2.799	44
0.1	6	0.000	0.000	68

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 27.00 mg m-2 day -1      Carbon Fixation: 749.85 mg m-2 day-1  
Phaeophytin: 5.12 mg m-2 day -1      Productivity Index: 27.77 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 18, 2008 04:19      **Latitude:** 37.449      **Year:** 2008  
**Station:** 60-65      **Project:** PACOOS      **Longitude:** -123.971      **Day of Year:** 292  
**Cast:** 25      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '-' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.3	12	13.510	33.261	24.944	89	6.515	0.345	0.575	5.005
5	4.8	11	13.513	33.261	24.944	89	6.338	0.289	0.667	4.847
10	10.8	10	13.512	33.261	24.944	89	6.512	0.337	0.665	4.821
20	20.7	9	13.505	33.265	24.948	89	6.530	0.270	0.664	4.855
30	30.5	8	13.430	33.277	24.973	89	6.719	0.268	0.696	5.062
40	41.2	7	12.611	33.335	25.180	90	14.074	0.264	1.166	12.598
60	60.4	6	10.214	33.571	25.801	91	23.675	0.089	1.780	22.581
80	80.8	5	9.292	33.688	26.046	91	25.015	0.043	1.910	25.012
100	101.3	4	8.995	33.833	26.207	91	28.687	0.089	2.140	31.433
150	151.7	3	8.749	34.080	26.440	91	32.216	0.036	2.461	38.328
200	202.3	2	7.960	34.054	26.540	91	33.947	0.027	2.598	42.973
1000	1008.8	1	3.712	34.431	27.370	92	45.007	0.020	3.511	121.27

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	0.420	0.087
5	11	0.387	0.076
10	10	0.409	0.083
20	9	0.437	0.098
30	8	0.546	0.129
40	7	0.422	0.170
60	6	0.202	0.127
80	5	0.039	0.055
100	4	0.028	0.061
150	3	0.010	0.050
200	2	0.005	0.049
1000	1	0.003	0.008

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	23.601	56.179	0
50	11	26.662	68.930	8
30	10	24.813	60.667	14
15	9	14.458	33.102	21
5	8	7.178	13.148	32
1	7	1.671	3.960	50
0.1	6	0.332	1.644	84

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 22.54 mg m-2 day -1      Carbon Fixation: 689.42 mg m-2 day-1  
Phaeophytin: 5.65 mg m-2 day -1      Productivity Index: 30.58 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 18, 2008 07:45      **Latitude:** 37.614      **Year:** 2008  
**Station:** 60-60      **Project:** PACOOS      **Longitude:** -123.610      **Day of Year:** 292  
**Cast:** 26      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '-' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.4	12	13.502	33.407	25.059	85	6.072	0.280	0.561	4.687
5	4.9	11	13.503	33.408	25.059	85	6.061	0.272	0.656	4.660
10	10.1	10	13.501	33.407	25.059	85	6.241	0.281	0.574	4.618
20	20.1	9	13.321	33.404	25.093	87	3.260	0.294	0.753	4.928
30	29.8	8	13.288	33.403	25.099	87	3.972	0.258	0.763	4.889
40	41.0	7	13.247	33.396	25.102	88	8.746	0.355	0.851	6.602
60	59.9	6	10.289	33.523	25.751	91	23.058	0.150	1.634	21.350
80	80.3	5	10.058	33.682	25.915	91	25.261	0.074	1.948	24.171
100	100.2	4	9.189	33.757	26.116	91	26.692	0.100	1.962	26.974
150	150.7	3	8.220	33.955	26.423	91	29.710	0.159	2.362	34.462
200	200.2	2	7.647	34.017	26.556	91	33.313	0.065	2.403	43.066
1000	1007.8	1	3.586	34.432	27.383	92	45.421	0.072	3.407	127.03

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	1.360	0.284
5	11	1.379	0.300
10	10	1.434	0.288
20	9	1.471	0.424
30	8	1.323	0.399
40	7	1.083	0.363
60	6	0.200	0.171
80	5	0.063	0.179
100	4	0.016	0.067
150	3	0.010	0.034
200	2	0.003	0.026
1000	1	0.002	0.010

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	70.668	51.951	0
50	11	87.915	63.763	5
30	10	65.625	45.754	8
15	9	46.578	31.657	12
5	8	19.290	14.577	20
1	7	2.937	2.713	30
0.1	6	1.679	8.402	47

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 39.84 mg m-2 day -1      Carbon Fixation: 1223.0 mg m-2 day-1  
Phaeophytin: 10.77 mg m-2 day -1      Productivity Index: 30.70 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll a, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1



**Cruise:** S408      **Date UT:** Oct 18, 2008 10:20      **Latitude:** 37.697      **Year:** 2008  
**Station:** 60-57.5      **Project:** PACOOS      **Longitude:** -123.428      **Day of Year:** 292  
**Cast:** 27      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '-' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.7	12	13.282	33.406	25.102	87	6.622	0.322	0.563	5.528
5	4.7	11	13.274	33.407	25.104	88	6.835	0.323	0.700	5.565
10	10.1	10	13.211	33.409	25.119	87	7.081	0.324	0.710	5.786
20	19.2	9	13.141	33.409	25.133	87	8.231	0.328	0.766	6.891
30	29.1	8	11.960	33.410	25.363	89	13.706	0.269	1.066	12.145
40	40.5	7	11.117	33.402	25.511	90	18.058	0.311	1.393	16.213
60	59.9	6	10.026	33.553	25.819	91	22.727	0.124	1.563	21.159
80	80.4	5	9.543	33.735	26.042	91	26.019	0.125	1.844	25.917
100	100.7	4	9.207	33.881	26.210	91	27.514	0.134	1.924	29.508
150	150.6	3	8.500	33.974	26.395	91	29.115	0.133	2.050	34.060
200	200.6	2	8.148	34.071	26.525	91	32.225	0.135	2.238	41.584
1000	1009.6	1	3.591	34.426	27.378	92	43.005	0.060	3.217	114.55

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	1.184	0.659
5	11	1.175	0.357
10	10	1.323	0.356
20	9	1.277	0.489
30	8	0.731	0.403
40	7	0.360	0.359
60	6	0.122	0.235
80	5	0.083	0.235
100	4	0.056	0.227
150	3	0.033	0.209
200	2	0.028	0.172
1000	1	0.003	0.013

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	69.155	58.385	0
50	11	75.189	63.980	5
30	10	64.760	48.940	8
15	9	38.692	30.299	13
5	8	9.670	13.227	20
1	7	0.854	2.372	31
0.1	6	0.014	0.111	54

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 29.21 mg m-2 day -1      Carbon Fixation: 1043.7 mg m-2 day-1  
Phaeophytin: 13.11 mg m-2 day -1      Productivity Index: 35.73 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 18, 2008 13:17      **Latitude:** 37.783      **Year:** 2008  
**Station:** 60-55      **Project:** PACOOS      **Longitude:** -123.248      **Day of Year:** 292  
**Cast:** 28      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.9	12	12.987	33.492	25.228	84	6.365	0.378	0.563	5.055
5	5.1	11	12.982	33.493	25.229	84	7.012	0.408	0.762	5.455
10	10.1	10	12.910	33.493	25.243	84	7.955	0.386	0.656	6.538
20	20.5	9	12.659	33.499	25.298	88	6.895	0.318	0.667	5.346
30	30.3	8	11.816	33.556	25.503	90	15.922	0.363	1.214	14.467
40	39.9	7	11.050	33.563	25.649	90	20.198	0.289	1.465	18.375
60	60.9	6	9.972	33.779	26.004	90	23.771	0.216	1.809	25.043
80	80.3	5	9.638	33.862	26.125	88	---	---	---	---
100	100.8	4	9.626	33.865	26.130	87	25.291	0.222	2.010	29.307
115	116.7	3	9.580	33.875	26.146	87	26.404	0.289	1.940	30.840
115	116.9	2	9.579	33.875	26.146	87	26.815	0.288	2.077	31.338
115	115.9	1	9.583	33.875	26.145	87	26.764	0.229	1.971	31.454

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	2.156	0.293
5	11	3.979	0.599
10	10	4.312	0.742
20	9	3.822	0.748
30	8	0.787	0.330
40	7	0.390	0.259
60	6	0.133	0.318
80	5	0.108	0.417
100	4	0.107	0.436
115	3	0.099	0.407
115	2	0.111	0.437
115	1	0.093	0.411

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	260.207	120.685	0
50	11	238.498	59.939	3
30	10	160.761	37.281	6
15	9	114.574	29.980	9
5	8	8.395	10.673	13
1	7	1.155	2.964	20
0.1	6	0.738	5.536	33

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 47.03 mg m-2 day -1      Carbon Fixation: 2039.7 mg m-2 day-1  
Phaeophytin: 9.84 mg m-2 day -1      Productivity Index: 43.37 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 18, 2008 15:05      **Latitude:** 37.864      **Year:** 2008  
**Station:** 60-52.5      **Project:** PACOOS      **Longitude:** -123.064      **Day of Year:** 292  
**Cast:** 29      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '-' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.0	12	11.710	33.582	25.542	74	9.297	0.412	0.936	9.676
5	5.0	11	11.566	33.581	25.568	77	12.036	0.364	1.242	11.426
10	10.6	10	11.504	33.584	25.582	80	12.869	0.360	1.143	12.285
20	20.3	9	11.443	33.586	25.595	82	14.983	0.412	1.356	14.063
30	30.0	8	11.307	33.600	25.631	86	16.818	0.412	1.256	16.173
40	40.1	7	11.057	33.634	25.703	88	20.780	0.420	1.718	21.268
60	60.6	6	10.236	33.748	25.935	89	24.766	0.246	1.786	26.945
80	81.2	5	9.848	33.814	26.053	86	25.484	0.296	1.908	29.414
85	85.1	4	9.832	33.819	26.060	85	25.606	0.273	1.886	29.586
85	85.7	3	9.831	33.819	26.060	85	25.505	0.299	1.912	29.498
85	85.2	2	9.831	33.820	26.060	85	25.537	0.286	2.034	29.553
85	84.7	1	9.836	33.818	26.058	85	25.395	0.243	1.868	29.410

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	12.862	1.332
5	11	9.439	0.861
10	10	7.811	0.808
20	9	7.014	0.706
30	8	4.534	0.745
40	7	0.990	0.403
60	6	0.200	0.373
80	5	0.194	0.740
85	4	0.213	0.800
85	3	0.176	0.733
85	2	0.194	0.732
85	1	0.167	0.716

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	836.460	65.031	0
50	12	793.775	61.713	2
30	11	444.494	47.093	3
15	11	362.770	38.435	5
5	10	110.190	14.107	9
1	10	21.915	2.806	14
0.1	9	1.555	0.222	22

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 131.88 mg m-2 day -1      Carbon Fixation: 4474.6 mg m-2 day-1  
Phaeophytin: 13.13 mg m-2 day -1      Productivity Index: 33.93 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408      **Date UT:** Oct 18, 2008 16:53      **Latitude:** 37.947      **Year:** 2008  
**Station:** 60-50      **Project:** PACOOS      **Longitude:** -122.880      **Day of Year:** 292  
**Cast:** 30      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.2	12	12.947	33.554	25.283	63	5.466	0.436	0.799	10.085
5	5.1	11	12.864	33.542	25.290	71	10.659	0.415	1.127	13.521
10	10.3	10	12.402	33.555	25.390	80	13.376	0.481	1.150	14.633
20	20.0	9	11.211	33.614	25.659	84	20.411	0.529	1.740	23.704
30	29.9	8	10.974	33.628	25.712	84	20.906	0.417	1.704	24.966
40	40.1	7	10.667	33.702	25.824	86	20.677	0.371	1.762	25.183
40	40.2	6	10.662	33.708	25.830	86	---	---	---	---
40	40.4	5	10.659	33.714	25.836	86	---	---	---	---
40	40.4	4	10.666	33.715	25.835	86	---	---	---	---
40	40.2	3	10.668	33.720	25.839	86	---	---	---	---
40	40.0	2	10.670	33.723	25.840	86	---	---	---	---
40	40.0	1	10.661	33.729	25.847	86	---	---	---	---

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	13.048	1.666
5	11	7.773	1.142
10	10	5.080	0.900
20	9	2.267	0.650
30	8	1.101	0.587
40	7	1.129	0.550

**PRIMARY PRODUCTION**

*Samples are taken by light level.*

LIGHT LEVEL % S. I.	BTL #	PRIMARY PRODUCTION (mg m-3 d-1)	PROD INDEX carbon/chl (mg m-3 d-1)	LIGHT DEPTH (m)
100	12	597.619	45.803	0
50	12	684.279	52.445	2
30	11	282.903	36.396	3
15	11	244.269	31.425	6
5	10	62.282	12.260	9
1	10	13.155	2.590	16
0.1	9	0.000	0.000	28

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: 117.11 mg m-2 day -1      Carbon Fixation: 3384.7 mg m-2 day-1  
Phaeophytin: 17.87 mg m-2 day -1      Productivity Index: 28.90 mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 18, 2008 19:43                      **Latitude:** 37.562                      **Year:** 2008  
**Station:** 61.75-52.5                      **Project:** PACOOS                      **Longitude:** -122.847                      **Day of Year:** 292  
**Cast:** 31                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.7	12	12.256	33.560	25.422	74	12.270	0.399	1.068	12.638
5	5.3	11	12.136	33.558	25.444	73	12.069	0.331	1.160	12.185
10	10.3	10	11.741	33.559	25.519	81	15.838	0.412	1.408	15.414
20	20.0	9	11.607	33.563	25.546	83	14.681	0.536	1.190	13.491
30	30.7	8	11.222	33.562	25.616	85	18.243	0.453	1.342	17.549
40	40.7	7	11.118	33.601	25.666	87	20.249	0.373	1.457	18.937
60	61.0	6	9.999	33.781	26.002	87	24.665	0.324	1.953	27.302
80	82.6	5	9.991	33.789	26.009	86	24.656	0.315	1.991	28.837
80	82.9	4	9.990	33.789	26.010	86	---	---	---	---
80	82.5	3	9.991	33.789	26.010	86	---	---	---	---
80	81.8	2	9.991	33.789	26.010	86	---	---	---	---
80	81.7	1	9.991	33.789	26.009	86	---	---	---	---

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	6.718	1.019
5	11	5.386	0.829
10	10	4.081	0.930
20	9	2.952	0.770
30	8	2.378	0.807
40	7	1.416	0.601
60	6	0.416	0.674
80	5	0.407	0.701

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*:                      ---                      mg m-2 day -1                      Carbon Fixation:                      ---                      mg m-2 day-1  
 Phaeophytin:                      ---                      mg m-2 day -1                      Productivity Index:                      ---                      mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 18, 2008 22:14                      **Latitude:** 37.257                      **Year:** 2008  
**Station:** 63.5-52.5                      **Project:** PACOOS                      **Longitude:** -122.627                      **Day of Year:** 292  
**Cast:** 32                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	1.8	12	14.093	33.375	24.913	84	4.600	0.343	0.385	2.990
5	4.8	11	13.900	33.372	24.950	83	5.954	0.430	0.627	3.711
10	11.1	10	12.946	33.354	25.129	85	10.566	0.423	0.861	8.584
20	20.0	9	11.348	33.369	25.443	88	14.987	0.401	1.026	13.184
30	30.7	8	11.625	33.561	25.542	84	17.868	0.501	1.404	18.225
40	40.4	7	11.262	33.631	25.663	85	21.019	0.376	1.605	21.241
60	59.9	6	10.145	33.668	25.888	89	22.905	0.087	1.720	21.837
80	80.6	5	10.015	33.793	26.009	87	24.741	0.242	1.774	26.079
90	91.0	4	10.016	33.795	26.010	86	21.822	0.120	1.716	21.834
90	91.0	3	10.016	33.796	26.011	86	---	---	---	---
90	90.8	2	10.016	33.796	26.011	86	---	---	---	---
90	91.0	1	10.016	33.797	26.011	86	---	---	---	---

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	1.444	0.253
5	11	2.665	0.615
10	10	1.656	0.395
20	9	1.721	0.443
30	8	1.434	0.548
40	7	0.907	0.244
60	6	0.189	0.209
80	5	0.084	0.227
90	4	0.119	0.220

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: --- mg m-2 day -1                      Carbon Fixation: --- mg m-2 day-1  
 Phaeophytin: --- mg m-2 day -1                      Productivity Index: --- mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Cruise:** S408                      **Date UT:** Oct 19, 2008 00:37                      **Latitude:** 36.953                      **Year:** 2008  
**Station:** 65.25-52.5                      **Project:** PACOOS                      **Longitude:** -122.412                      **Day of Year:** 293  
**Cast:** 33                      **Platform:** POINT SUR

\* *Note:* Latitude and Longitude are reported in decimal degrees. '---' signifies no data.

**PHYSICAL AND CHEMICAL**

DEP (m)	PRESS (db)	BTL #	TEMP (°C)	SAL (psu)	SIGMA T (kg l-1)	TRANSMISS (%)	NO3 (µM)	NO2 (µM)	PO4 (µM)	SIO4 (µM)
0	0.2	12	14.063	33.374	24.918	83	4.610	0.352	0.313	2.473
5	5.1	11	13.656	33.381	25.007	81	5.975	0.348	0.525	3.638
10	9.7	10	13.470	33.381	25.045	82	8.447	0.449	0.635	6.146
20	20.0	9	12.445	33.428	25.284	88	11.666	0.456	0.875	9.393
30	30.0	8	12.140	33.467	25.373	89	13.890	0.614	1.077	11.643
40	40.3	7	11.719	33.488	25.468	90	15.720	0.435	1.247	13.198
60	60.9	6	10.566	33.676	25.822	90	21.867	0.176	1.590	19.842
80	81.4	5	10.228	33.781	25.963	90	24.043	0.158	1.623	22.543
100	101.6	4	10.093	33.807	26.007	90	24.808	0.164	1.616	23.599
150	150.6	3	9.918	33.851	26.072	90	26.109	0.186	2.028	24.939
200	199.8	2	9.108	34.024	26.340	91	29.858	0.219	2.239	31.508
250	251.2	1	8.344	34.137	26.548	91	32.860	0.145	2.438	39.632

**CHLOROPHYLL**

DEP (m)	BTL #	CHL (mg m-3 d-1)	PHAEO (mg m-3 d-1)
0	12	1.693	0.315
5	11	1.934	0.420
10	10	1.814	0.584
20	9	1.055	0.477
30	8	0.638	0.357
40	7	0.415	0.245
60	6	0.078	0.124
80	5	0.063	0.119
100	4	0.118	0.166
150	3	0.023	0.128
200	2	0.040	0.100
250	1	0.017	0.067

**INTEGRATED VALUES**

*Values are integrated from surface to 1.0% of light penetrating depth.*

Chlorophyll *a*: --- mg m-2 day -1                      Carbon Fixation: --- mg m-2 day-1  
 Phaeophytin: --- mg m-2 day -1                      Productivity Index: --- mg C mg Chl M-2 day-1

\* *Abbreviations:* **DEP** Depth, **PRESS** Pressure, **BTL** Bottle, **TEMP** Temperature, **SAL** Salinity, **TRANSMISS** Transmissivity, **S.I.** Surface Intensity, **CHL** Chlorophyll *a*, **PHAEO** Phaeophytin, **PROD INDEX** Productivity Index mg C/mg Chl m-3 day-1

**Table A4:** *Marine mammal observations.* This table lists the results of the marine mammal observations made during the PaCOOS cruise of October 2008. The data are listed alphabetically by species' scientific name, then chronologically within each species.

Species Code	Scientific Name	Group Size	Sighting Number	Date (m/dd/yyyy)	North Latitude (dd mm.mmm)	West Longitude (ddd mm.mmm)
74	<i>Balaenoptera physalus</i>	3	17a	10/15/2008	35° 52.200	123° 57.660
74	<i>Balaenoptera physalus</i>	1	17b	10/15/2008	35° 52.620	123° 59.880
74	<i>Balaenoptera physalus</i>	3	18	10/15/2008	36° 31.560	124° 43.740
63	<i>Berardius bairdii</i>	30	12	10/14/2008	36° 42.240	122° 13.380
17	<i>Delphinus delphis</i>	40	17c	10/15/2008	35° 52.680	124° 00.300
17	<i>Delphinus delphis</i>	750	17d	10/15/2008	35° 52.860	124° 01.200
17	<i>Delphinus delphis</i>	40	19	10/16/2008	35° 32.280	124° 43.140
17	<i>Delphinus delphis</i>	200	20	10/16/2008	35° 25.620	124° 47.100
17	<i>Delphinus delphis</i>	55	21	10/16/2008	35° 26.520	124° 53.340
21	<i>Grampus griseus</i>	17	10	10/14/2008	36° 44.820	121° 59.040
21	<i>Grampus griseus</i>	35	48	10/18/2008	37° 06.180	122° 30.240
22	<i>Lagenorhynchus obliquidens</i>	260	15	10/15/2008	36° 07.020	123° 22.200
76	<i>Megaptera novaeangliae</i>	2	2	10/14/2008	36° 47.820	121° 48.780
76	<i>Megaptera novaeangliae</i>	2	3	10/14/2008	36° 48.420	121° 49.800
76	<i>Megaptera novaeangliae</i>	4	4	10/14/2008	36° 47.400	121° 50.400
76	<i>Megaptera novaeangliae</i>	4	5	10/14/2008	36° 46.620	121° 50.220
76	<i>Megaptera novaeangliae</i>	3	6	10/14/2008	36° 48.720	121° 51.000
76	<i>Megaptera novaeangliae</i>	2	7	10/14/2008	36° 48.540	121° 51.180
76	<i>Megaptera novaeangliae</i>	3	8	10/14/2008	36° 48.540	121° 51.720
76	<i>Megaptera novaeangliae</i>	4	9	10/14/2008	36° 46.020	121° 51.300
76	<i>Megaptera novaeangliae</i>	2	13	10/14/2008	36° 40.080	122° 15.780
76	<i>Megaptera novaeangliae</i>	1	23	10/18/2008	37° 52.140	123° 04.260
76	<i>Megaptera novaeangliae</i>	2	24	10/18/2008	37° 54.360	122° 59.760



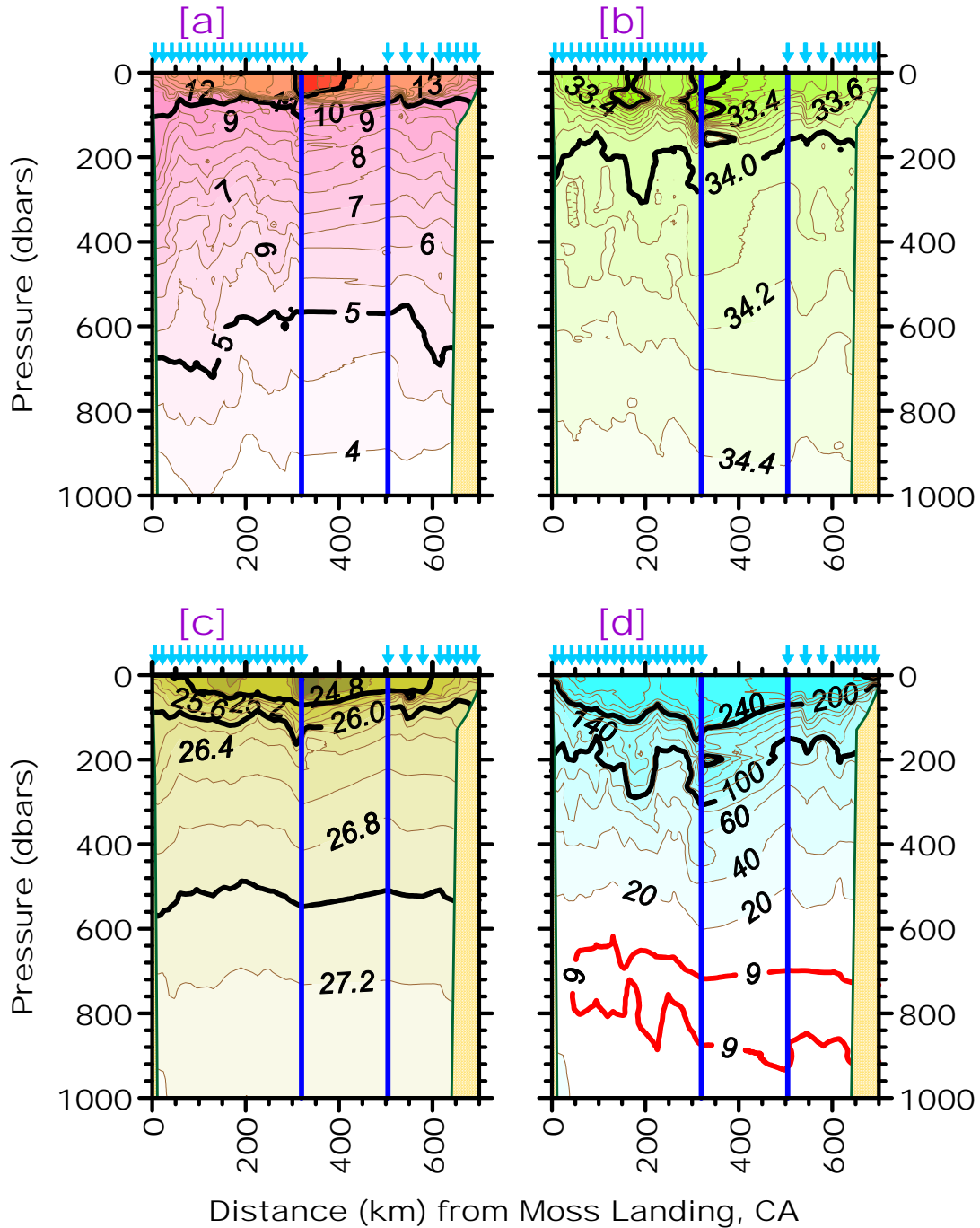
Species Code	Scientific Name	Group Size	Sighting Number	Date (m/dd/yyyy)	North Latitude (dd mm.mmm)	West Longitude (ddd mm.mmm)
76	<i>Megaptera novaeangliae</i>	3	26	10/18/2008	37° 55.74	122° 56.520
76	<i>Megaptera novaeangliae</i>	1	27	10/18/2008	37° 54.480	122° 54.420
76	<i>Megaptera novaeangliae</i>	2	29	10/18/2008	37° 57.480	122° 50.580
76	<i>Megaptera novaeangliae</i>	1	30	10/18/2008	37° 54.180	122° 52.560
76	<i>Megaptera novaeangliae</i>	3	31	10/18/2008	37° 52.200	122° 51.780
76	<i>Megaptera novaeangliae</i>	3	32	10/18/2008	37° 50.580	122° 53.280
76	<i>Megaptera novaeangliae</i>	2	33	10/18/2008	37° 48.480	122° 52.800
76	<i>Megaptera novaeangliae</i>	2	34	10/18/2008	37° 43.800	122° 53.580
76	<i>Megaptera novaeangliae</i>	2	35	10/18/2008	37° 38.640	122° 50.580
76	<i>Megaptera novaeangliae</i>	2	36	10/18/2008	37° 38.340	122° 51.600
76	<i>Megaptera novaeangliae</i>	2	37	10/18/2008	37° 36.300	122° 51.000
76	<i>Megaptera novaeangliae</i>	1	38	10/18/2008	37° 35.400	122° 51.840
76	<i>Megaptera novaeangliae</i>	1	39	10/18/2008	37° 33.780	122° 53.160
76	<i>Megaptera novaeangliae</i>	10	41	10/18/2008	37° 21.480	122° 40.680
76	<i>Megaptera novaeangliae</i>	1	42	10/18/2008	37° 21.600	122° 41.640
76	<i>Megaptera novaeangliae</i>	1	44	10/18/2008	37° 19.440	122° 39.720
76	<i>Megaptera novaeangliae</i>	2	45	10/18/2008	37° 19.140	122° 39.420
76	<i>Megaptera novaeangliae</i>	4	46	10/18/2008	37° 17.820	122° 38.760
76	<i>Megaptera novaeangliae</i>	1	50	10/18/2008	36° 54.720	122° 13.980
40	<i>Phocoena phocoena</i>	6	25	10/18/2008	37° 55.98	122° 56.880
44	<i>Phocoenoides dalli</i>	4	22	10/17/2008	37° 17.040	124° 19.980
44	<i>Phocoenoides dalli</i>	4	40	10/18/2008	37° 33.300	122° 50.160
44	<i>Phocoenoides dalli</i>	1	43	10/18/2008	36° 24.660	122° 41.340
44	<i>Phocoenoides dalli</i>	11	51	10/18/2008	36° 54.480	122° 13.500
77	unidentified dolphin	20	22a	10/18/2008	37° 33.000	122° 50.160
79	unidentified large whale	1	14	10/14/2008	36° 34.080	122° 24.060
79	unidentified large whale	1	16	10/15/2008	36° 03.120	123° 41.100
79	unidentified large whale	1	28	10/18/2008	37° 58.320	122° 53.280
79	unidentified large whale	1	47	10/18/2008	37° 16.920	122° 36.960

Species Code	Scientific Name	Group Size	Sighting Number	Date (m/dd/yyyy)	North Latitude (dd mm.mmm)	West Longitude (ddd mm.mmm)
<b>PINNIPEDS and SOUTHERN SEA OTTERS</b>						
CU	<i>Callorhinus ursinus</i>	1	17	10/15/2008	35° 54.360	123° 44.100
PV	<i>Phoca vitulina</i>	2	0.5	10/14/2008	36° 48.240	121° 47.580
EL	<i>Enhydra lutris</i>	33	1	10/14/2008	36° 48.240	121° 47.580
EL	<i>Enhydra lutris</i>	1	49	10/18/2008	36° 56.400	122° 21.660

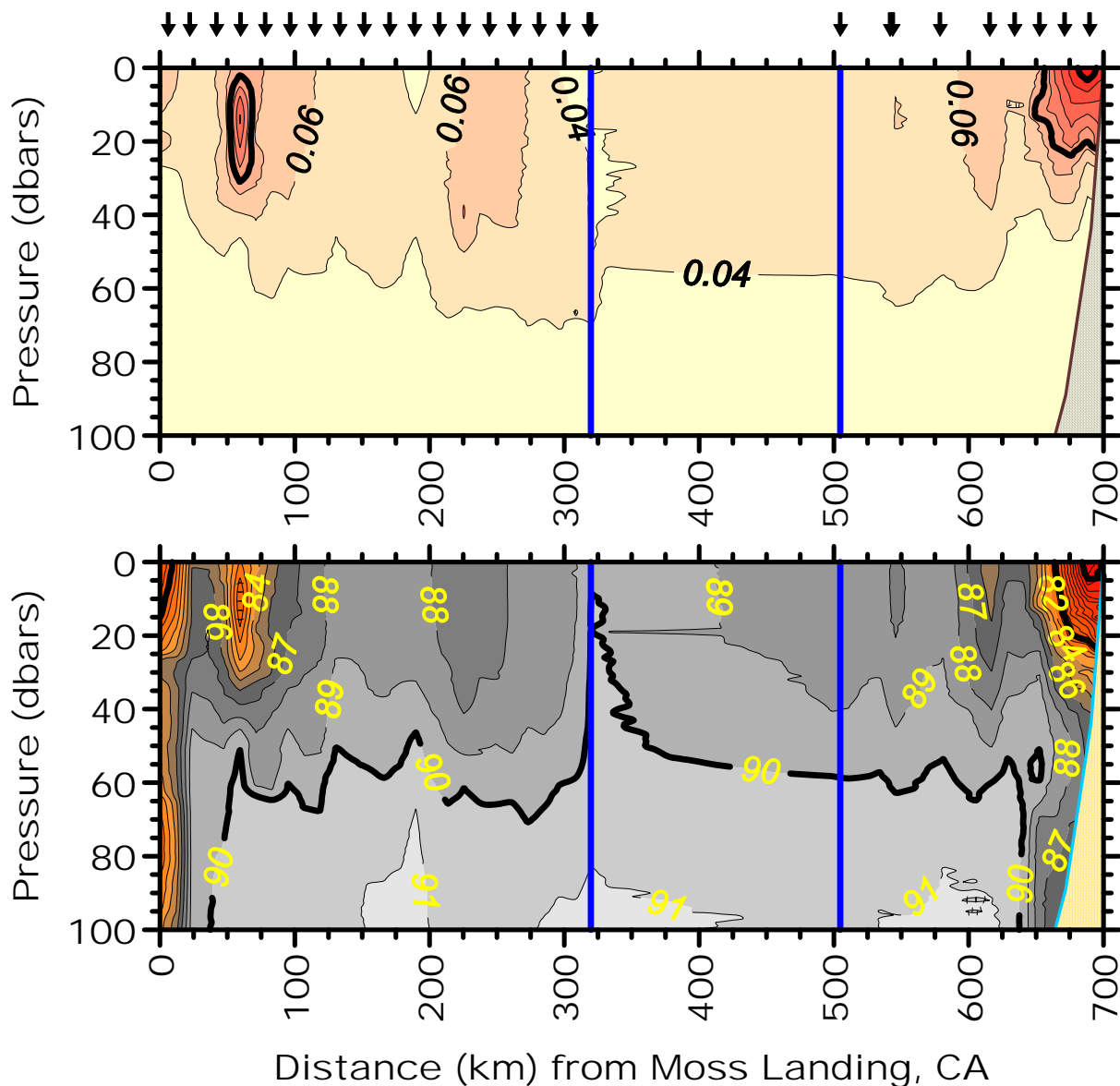
**Table A5:** *Summary of marine mammal observations.* This table summarizes the results of the marine mammal observations made during the PaCOOS cruise of October 2008. The data are listed alphabetically by species' scientific name.

<b>Species Code</b>	<b>Scientific Name</b>	<b>Total sightings</b>	<b>Total animals</b>
74	<i>Balaenoptera physalus</i>	3	7
63	<i>Berardius bairdii</i>	1	30
17	<i>Delphinus delphis</i>	5	1085
21	<i>Grampus griseus</i>	2	52
22	<i>Lagenorhynchus obliquidens</i>	1	260
76	<i>Megaptera novaeangliae</i>	30	73
40	<i>Phocoena phocoena</i>	1	6
44	<i>Phocoenoides dalli</i>	4	20
77	unidentified dolphin	1	20
79	unidentified large whale	4	4
<b>Total number of cetaceans</b>			<b><u>1557</u></b>

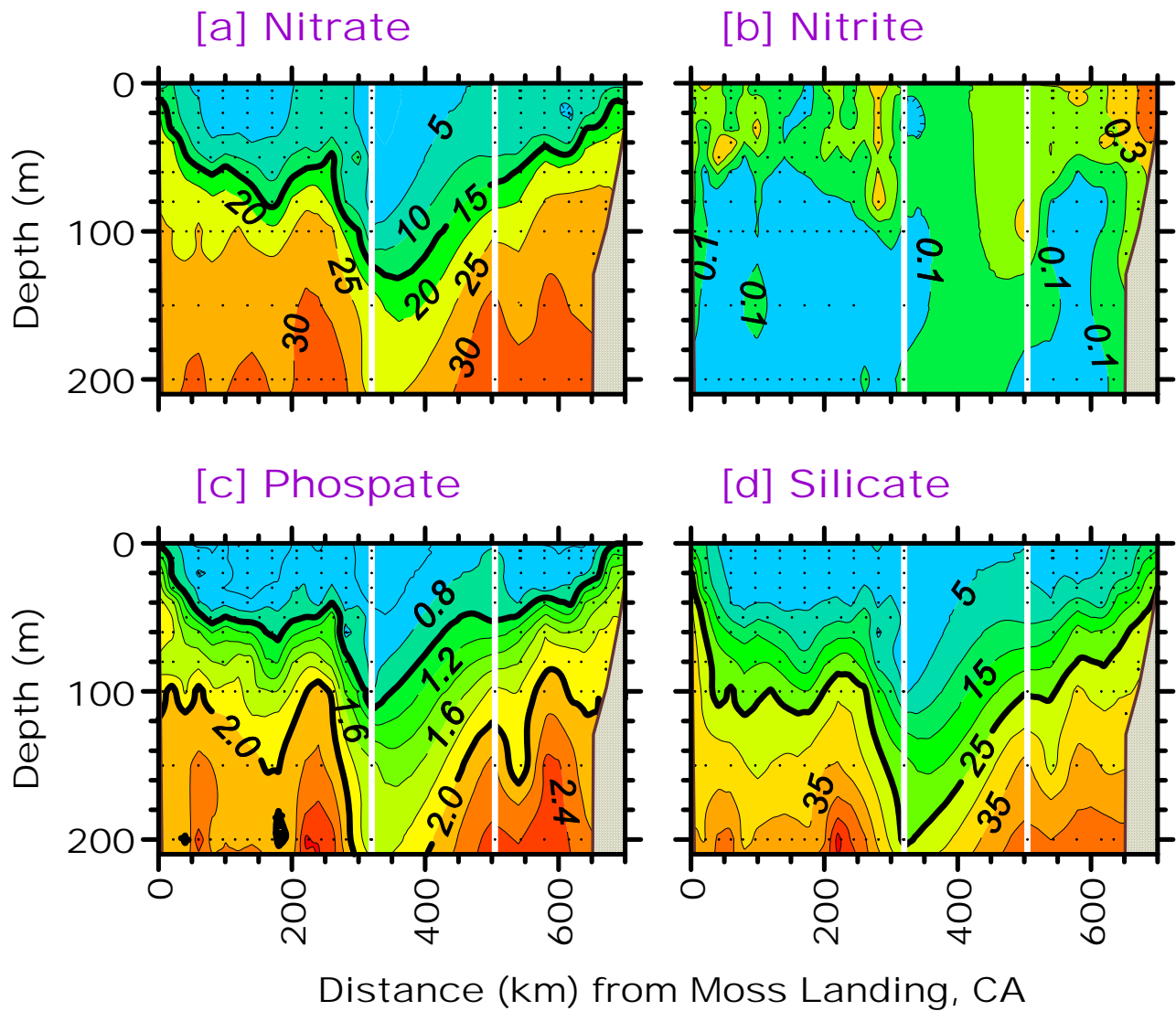
## Appendix B



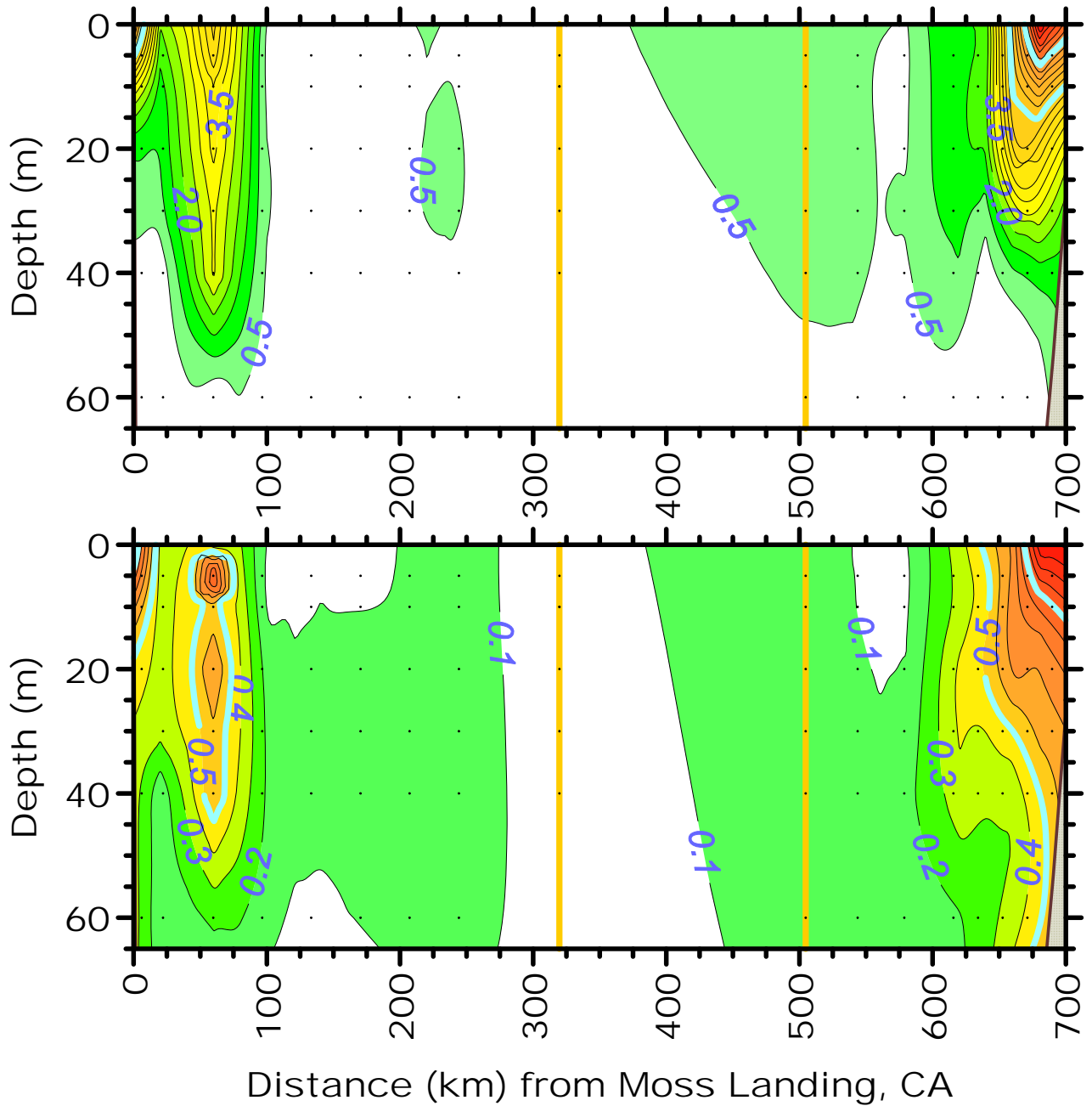
**Figure 8:** Contours of (a) temperature ( $^{\circ}\text{C}$ ), (b) salinity, (c) density anomaly ( $\text{kg m}^{-3}$ ), and (d) oxygen ( $\mu\text{mol kg}^{-1}$ ) fields along the line of hydrographic stations from Moss Landing (on the left) to Drake's Bay, California. Arrows along the top axes indicate the locations of the hydrographic stations; the blue lines show the locations of the corner stations (CTDs 20/21 and 22). Contour intervals for panels a-d are  $0.5^{\circ}\text{C}$ ,  $0.1$ ,  $0.2 \text{ kg m}^{-3}$ , and  $20 \mu\text{mol kg}^{-1}$ , respectively, except that the (nearly) oxygen minimum contour of  $9 \mu\text{mol kg}^{-1}$  is highlighted in red in panel d.



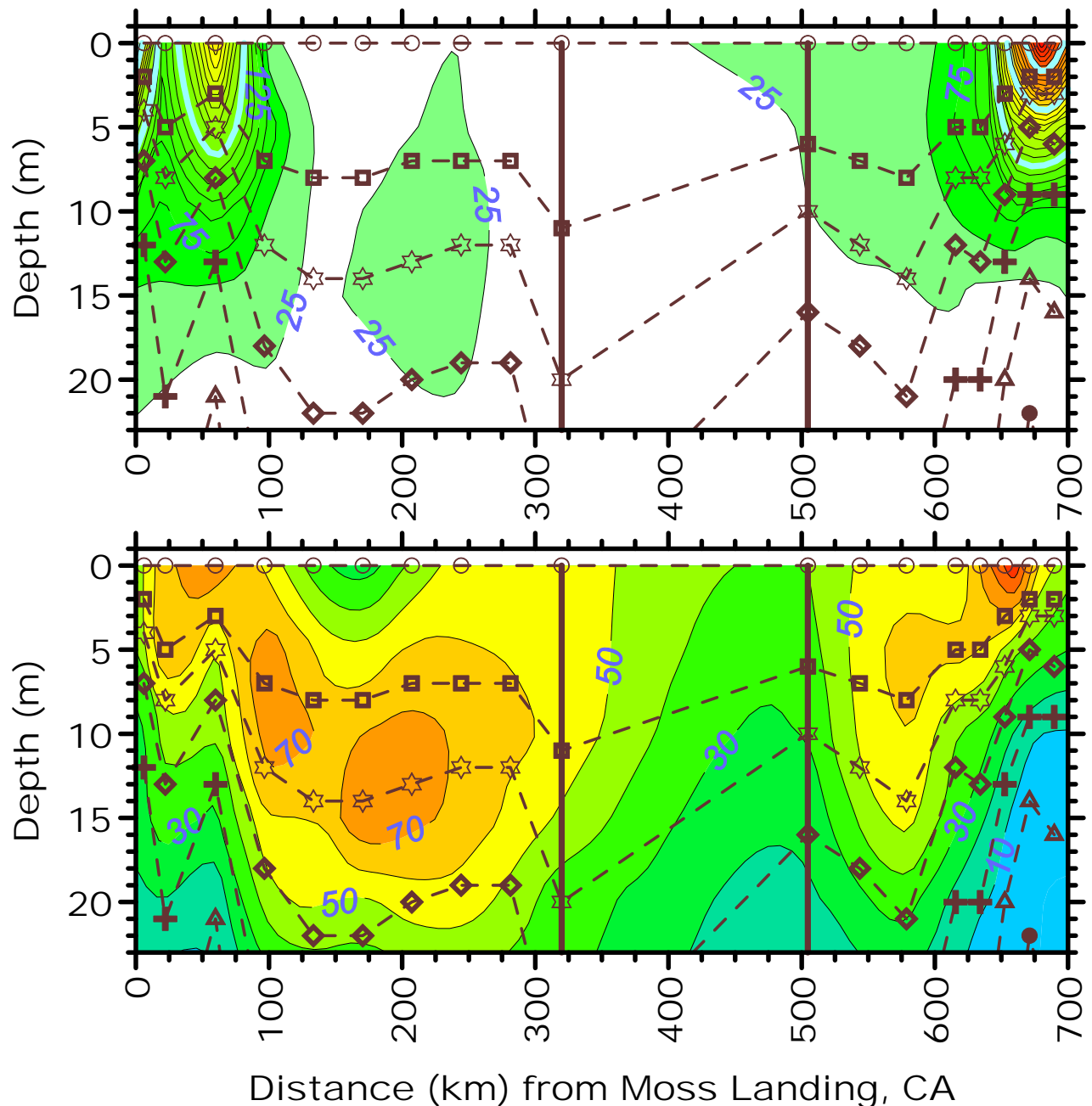
**Figure 9:** Contours of fluorescence (volts) [upper panel] and transmissivity (percentage) [lower panel] in the upper 100 dbars of the water column along the line of hydrographic stations from Moss Landing (on the left) to Drake's Bay, California. Arrows along the upper axis of the upper panel indicate the locations of the hydrographic stations; the blue lines show the locations of the corner stations (CTDs 20/21 and 22). The contour intervals are 0.02 volts and 1 percent, respectively, for the upper and lower panels. 0.10 and 0.20 volts (upper), while 70, 80, and 90 percent (lower), contours are highlighted.



**Figure 10:** Contours of (a) nitrate ( $\mu\text{M}$ ), (b) nitrite ( $\mu\text{M}$ ), (c) phosphate ( $\mu\text{M}$ ), and (d) silicate ( $\mu\text{M}$ ) fields along the line of hydrographic stations from Moss Landing (on the left) to Drake's Bay, California. The dots indicate the water sample locations. Contour intervals for panels a-d are  $5\mu\text{M}$ ,  $0.1\mu\text{M}$ ,  $0.2\mu\text{M}$ , and  $5\mu\text{M}$ , respectively. The white lines indicate the locations of the corner stations (CTDs 20/21 and 22).



**Figure 11:** Contours of chlorophyll-*a* ( $\text{mg m}^{-3} \text{ day}^{-1}$ ) [upper panel] and phaeophytin ( $\text{mg m}^{-3} \text{ day}^{-1}$ ) [lower panel] in the upper 65 m of the water column along the line of hydrographic stations from Moss Landing (on the left) to Drake's Bay, California. Dots indicate the water sample locations; the yellow lines show the locations of the corner stations (CTDs 20/21 and 22). The contour intervals are 0.5 and 0.1  $\text{mg m}^{-3} \text{ day}^{-1}$ , respectively, for the upper and lower panels. 6.0 and 9.0 (upper), while 0.5 and 1.0 (lower),  $\text{mg m}^{-3} \text{ day}^{-1}$  contours are highlighted.



**Figure 12:** Contours of primary production ( $\text{mg m}^{-3} \text{ day}^{-1}$ ) [upper panel] and productivity index (ratio of  $\text{mg Carbon}$  to  $\text{mg Chlorophyll-a m}^{-3} \text{ day}^{-1}$ ) [lower panel] in the upper 23 m of the water column along the line of hydrographic stations from Moss Landing (on the left) to Drake's Bay, California. Samples are taken by the percentage of the surface light intensity level (light penetration depth). (Light penetration) depths of those light intensity levels are shown by the various symbols, with like symbols connected by dashed lines. (100% = open circles, 50% = open squares, 30% = open stars, 15% = open diamonds, 5% = pluses, 1% = open triangles, 0.1% = filled circles.) The brown lines show the locations of the corner stations (CTDs 20/21 and 22). The contour intervals are 25 and 10  $\text{mg m}^{-3} \text{ day}^{-1}$ , respectively, for the upper and lower panels. 200, 400, and 600  $\text{mg m}^{-3} \text{ day}^{-1}$  contours are highlighted in the upper panel.



## Appendix C

The following is the introduction from the manual for the Seatech transmissometer that was mounted on the CTD during the PaCOOS cruise of October 2008.

The Sea Tech 25 cm pathlength transmissometer has been designed to provide accurate in situ measurements of beam transmission and the concentration of suspended matter in relatively clear waters.

The two basic processes that alter the underwater distribution of light are absorption and scattering. Absorption is a change of light energy into other forms of energy whereas scattering entails a change in direction of the light without loss of energy.

In a pure absorbing medium, the loss of light due to absorption in a well-collimated beam of monochromatic light will be given by  $I(z) = I(0)e^{-az}$ , where "a" is the absorption coefficient with units of  $m^{-1}$ . Similarly, in a pure scattering medium, the light redirected from a well-collimated beam of monochromatic light will be given by  $I(z) = I(0)e^{-bz}$ , where "b" is the volume scattering coefficient with units of  $m^{-1}$ . Since attenuation is defined as the sum of absorption and scattering, we get  $a + b = c$ , where "c" is the beam attenuation coefficient.

The light lost from a well-collimated monochromatic beam of light in a scattering and absorbing medium is thus given by  $I(z) = I(0)e^{-cz}$ . This can be rewritten as  $T(z) = I(z)/I(0) = e^{-cz}$ , where  $T(z)$  is the percent light transmitted over a distance, "z". It should be noted that transmission is always over a given distance, whereas the beam attenuation coefficient, "c", is independent of distance. "c" is computed by  $-\ln(T)/z$ , where z is the pathlength of the instrument.

The simple exponential relationship holds only if the light is monochromatic. The Sea Tech transmissometer employs a light emitting diode (LED) light source with a wavelength of 660 nm, which is in the red part of the spectrum. This LED is nearly monochromatic.

A beam attenuation coefficient, "c", can be divided into three parts: 1) That due to water,  $c_w$ ; 2) that due to suspended particulate matter,  $c_p$ ; and 3) that due to dissolved materials (mostly humic acids or "yellow matter"),  $c_y$ . Hence,  $c = c_w + c_p + c_y$ . Each of these components has distinct spectral characteristics. Yellow matter absorbs strongly in the blue part of the spectrum. This absorption decreases exponentially with increasing wavelengths. The beam attenuation coefficient for particulate matter is much less wavelength dependent. It varies approximately as  $\lambda^{-1}$ . The attenuation spectrum of natural waters is a composite of the three components, depending on the relative concentrations. The yellow matter is a by-product of organic decay and can be present in large amounts in lakes, reservoirs, and near-shore waters. At 660 nm, the attenuation of yellow matter is negligible, however, so that the attenuation is due to particulate matter and sea water only.

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