Cruise Report S221

Scientific data collected aboard
SSV *Robert C. Seamans*

Papeete, French Polynesia– Nuku Hiva, Fench Polynesia – Honolulu, HI, USA
11 February 2009 – 21 March 2009

Sea Education Association
Woods Hole, Massachusetts

Citation:
Proskurowski, G., 2009. Final report for S.E.A. cruise S221. Sea Education Association, Woods Hole, MA 02543, USA. www.sea.edu.

To obtain unpublished data, contact the SEA data archivist:

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Colleen Allard	2nd Mate
Jay Amster	3rd Mate
Seth Murray	Engineer
Kevin Campion	Assistant Engineer
Tia Leo	Steward

Scientific Staff

Giora Proskurowski	Chief Scientist
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Randy Jones	3rd Assistant Scientist

Students

Ms. Athena Aicher	Dartmouth College
Ms. Amy Beeston	Davidson College
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Ms. Stephanie Floyd	Mount Holyoke College
Mr. Douglas Garrison	Colorado College
Ms. Erin Gilliam	Roger Williams University
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Ms. Allie Ivanowicz	Davidson College
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Ms. Cynthia Landgren	Webb Institute of Naval Architecture
Ms. Ilona Matulaitis	Colgate University
Ms. Erin "Ginger" O'Reilly	College of Charleston
Ms. Brita Stepe	Dartmouth College
Ms. Tracy Sylvester	University of Vermont
Ms. Emma Tobias	University of New England, Biddeford
(Mr. Anise Vance- departed Marquesas)	Dartmouth College

Data Description

An extensive oceanographic investigation of the tropical Pacific was conducted during Sea Education Association's cruise S221, Papeete, French Polynesia to Honolulu, HI (via Nuku Hiva, French Polynesia, see Figure 1, below). Along this cruise track the SSV *Robert C. Seamans* provided a platform for the following chemical, biological, physical and geological sampling efforts:

1. Zooplankton net tows (to depths of 100m+), focusing on pteropod and formanifora distributions: 5 1-meter net tow stations
2. Surface zooplankton net tows, focusing on general zooplankton diversity and distribution: 41 Nueston stations.
3. Surface stations measuring temperature, salinity, chlorophyll a, phosphate: 50 surface stations
4. Deep (600m+) hydrocast/CTD casts measuring temperature, salinity, dissolved oxygen, colored dissolved organic matter, chl-a fluorescence, and discrete sampling for water chemistry (oxygen, chlorophyll a, nitrate, nitrite, phosphate): 62 CTD stations
5. Sediment samples acquired via Shipek: 4 sediment stations
6. Continuous monitoring and recording of ocean currents in the upper 800m via ADCP
7. Continuous monitoring and recording of bottom profile via CHIRP

As part of SEA's educational program, undergraduates conduct student-designed oceanographic research during the cruise. Project topics spanned, and integrated, the four "classic" disciplines of oceanography: chemistry, biology, physics and geology (Table 8). The samples and data collected were analyzed onboard as part of investigations of the following lines of scientific inquiry:

1. Surface and mix layer temperatures in relation to El Niño cycles
2. Heat and salt transport in the Equatorial Undercurrent (EUC).
3. Physical and nutrient effects of flow around island masses
4. A comparison of microbial abundance in the South Pacific Gyre and the Equatorial Pacific.
5. Analysis of the nutrient profiles of the upper 600m and an experimental approach to determining the degree to which primary productivity is nutrient limited
6. Alkalinity, pH and thus DIC variability in relation to the relative abundance of pteropod and foraminifora
7. Current and watermass identification, and comparison of volume transport to previous SEA and NOAA data within the framework of identifying cyclical trends related to El Niño.
8. Zooplankton abundance and diversity in relation to past SEA results, again with a focus on identifying El Niño related trends.

Student research efforts culminated in a written manuscript and poster presentation to the ship's company. These papers are available on request from SEA.

Giora Proskurowski
Chief Scientist S221

Figure 1. Cruise track for the SSV Robert C. Seamans voyage S221.
Plotted from hourly position data. Departed from Papeete, French Polynesia 11Feb09 and arrived Honolulu, HI 20March09, with port stop in Nuku Hiva, Marquesas, French Polynesia.

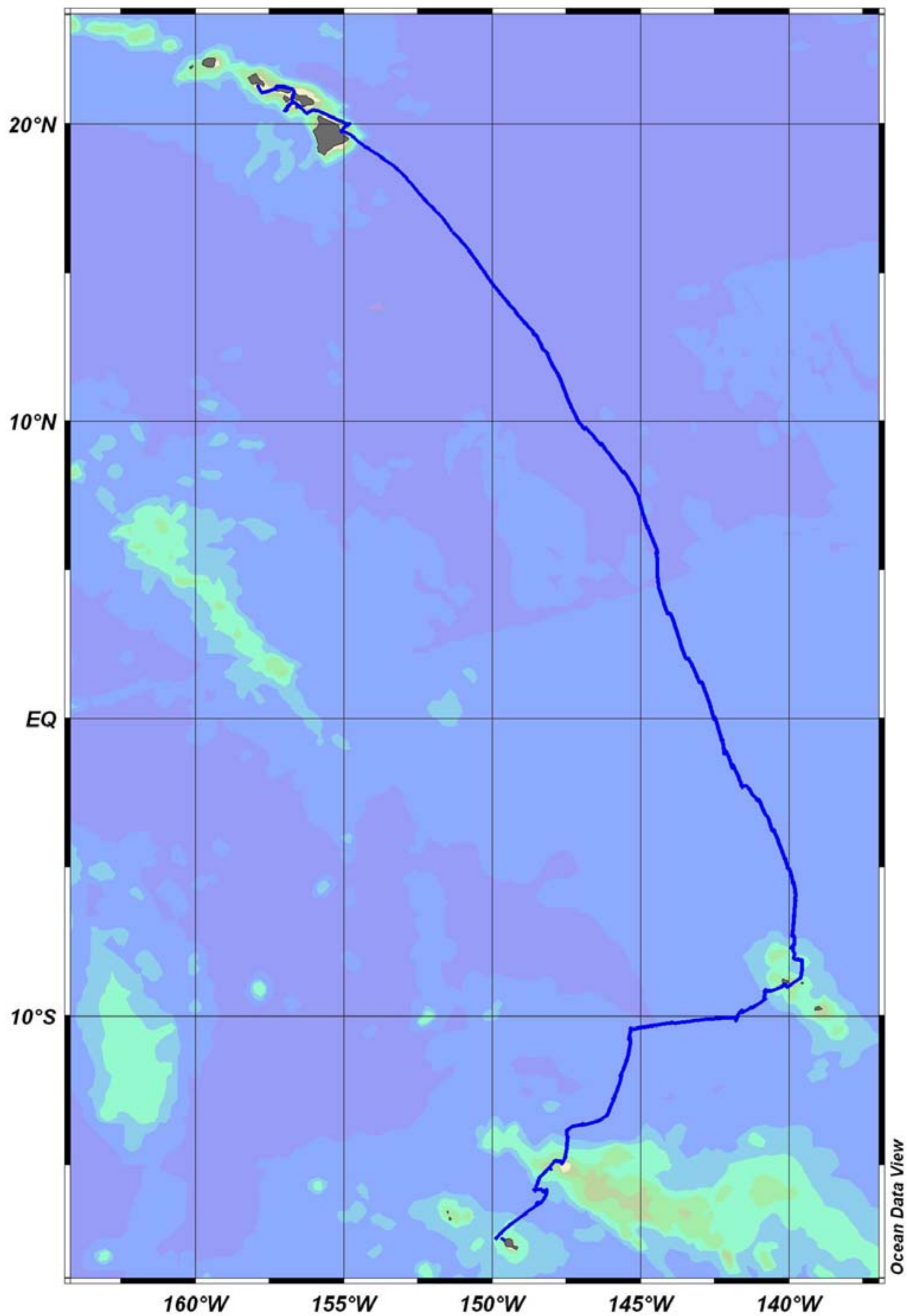


Table 1: Oceanographic Sampling Stations.

HC=hydrocast, CTD= CTD, NT=nueston tow, MN=meter net, SG=Shipek Grab

Station	Type	Date	Time	Latitude	Longitude	Cast Depth	Locale
S221-001	SG	13-Feb-13	1402	17°30.7' S	149°51.2' W	22	Opunohu Bay
S221-002	SG	13-Feb-13	1434	17°29.7' S	149°51.5' W	42	Opunohu Bay channel
S221-003	NT	14-Feb-13	0027	16°46.3' S	149°1.3' W	n/a	South Pacific Gyre
S221-004	CTD/HC	14-Feb-13	0930	16°19.1' S	148°28.6' W	594	South Pacific Gyre
S221-005	CTD/HC	14-Feb-13	1943	15°51.4' S	148°8.6' W	386	South Pacific Gyre-IME1A
S221-006	CTD/HC	14-Feb-13	2231	15°54.4' S	148°15.0' W	414	South Pacific Gyre-IME1B
S221-007	CTD/HC	15-Feb-13	0254	15°50.8' S	148°19.2' W	408	South Pacific Gyre-IME1C
S221-008	CTD/HC	15-Feb-13	0649	15°51.1' S	148°25.7' W	408	South Pacific Gyre-IME1D
S221-009	CTD/HC	15-Feb-13	1001	15°50.9' S	148°31.7' W	413	South Pacific Gyre-IME1E
S221-009	NT	15-Feb-13	1117	15°52.3' S	148°31.7' W	n/a	South Pacific Gyre
S221-010	CTD/HC	16-Feb-13	2103	14°44.1' S	147°30.6' W	622	South Pacific Gyre
S221-010	NT	16-Feb-13	2218	14°45.0' S	147°31.7' W	n/a	South Pacific Gyre
S221-011	CTD/HC	17-Feb-13	0844	14°4.3' S	147°26.0' W	595	South Pacific Gyre
S221-011	NT	17-Feb-13	0844	14°5.9' S	147°27.0' W	n/a	South Pacific Gyre
S221-012	CTD	17-Feb-13	2035	13°38.2' S	146°55.3' W	1755	South Pacific Gyre
S221-012	NT	17-Feb-13	2306	13°39.9' S	146°57.9' W	n/a	South Pacific Gyre
S221-013	CTD/HC	18-Feb-13	0926	13°19.8' S	146°6.5' W	612	South Pacific Gyre
S221-013	NT	18-Feb-13	1038	13°21.3' S	146°7.0' W	n/a	South Pacific Gyre
S221-014	CTD	18-Feb-13	2015	12°43.9' S	145°51.0' W	586	South Pacific Gyre
S221-014	MN	18-Feb-13	2128	12°45.1' S	145°52.6' W	n/a	South Pacific Gyre
S221-014	NT	18-Feb-13	2242	12°47.5' S	145°53.9' W	n/a	South Pacific Gyre
S221-015	CTD/HC	19-Feb-13	0915	11°59.8' S	145°37.2' W	564	South Pacific Gyre
S221-015	NT	19-Feb-13	1025	12°0.8' S	145°38.9' W	n/a	South Pacific Gyre
S221-016	CTD	19-Feb-13	2016	11°28.8' S	145°27.0' W	608	South Pacific Gyre
S221-016	NT	19-Feb-13	2134	11°30.1' S	145°28.1' W	n/a	South Pacific Gyre
S221-017	CTD/HC	20-Feb-13	0900	10°45.8' S	145°20.5' W	584	South Pacific Gyre
S221-017	NT	20-Feb-13	1018	10°46.9' S	145°21.6' W	n/a	South Pacific Gyre
S221-018	CTD	20-Feb-13	2021	10°25.4' S	145°5.1' W	610	South Pacific Gyre
S221-018	NT	20-Feb-13	2126	10°25.4' S	145°5.1' W	n/a	South Pacific Gyre
S221-019	CTD/HC	21-Feb-13	0949	10°13.8' S	143°56.4' W	621	South Pacific Gyre
S221-019	NT	21-Feb-13	1052	10°14.3' S	143°56.9' W	n/a	South Pacific Gyre
S221-020	CTD	21-Feb-13	2017	10°9.0' S	143°3.0' W	613	South Pacific Gyre
S221-020	NT	21-Feb-13	2125	10°9.3' S	143°3.6' W	n/a	South Pacific Gyre
S221-021	CTD	22-Feb-13	0914	10°4.1' S	141°46.4' W	611	South Pacific Gyre
S221-021	NT	22-Feb-13	1026	10°5.4' S	141°46.8' W	n/a	South Pacific Gyre
S221-022	NT	23-Feb-13	0005	9°52.0' S	141°34.7' W	n/a	South Pacific Gyre
S221-022	CTD	22-Feb-13	2127	9°48.6' S	141°34.3' W	606	South Pacific Gyre
S221-022	MN	22-Feb-13	2238	9°49.3' S	141°34.5' W	n/a	South Pacific Gyre
S221-023	CTD/HC	23-Feb-13	0918	9°25.6' S	140°47.2' W	584	South Pacific Gyre
S221-023	NT	23-Feb-13	1018	9°26.2' S	140°48.1' W	n/a	South Pacific Gyre
S221-024	CTD/HC	23-Feb-13	1700	9°10.0' S	140°47.8' W	445	South Pacific Gyre-IME2A
S221-025	CTD/HC	23-Feb-13	1956	9°10.2' S	140°39.9' W	408	South Pacific Gyre-IME2B
S221-026	SG	23-Feb-13	2216	9°10.2' S	140°37.6' W	49	Axel Seamount
S221-026	CTD	23-Feb-13	2248	9°10.44' S	140°37.9' W	132	South Pacific Gyre-IME2C

Station	Type	Date	Time	Latitude	Longitude	Cast Depth	Locale
S221-027	CTD/HC	24-Feb-13	0027	9°10.0' S	140°34.0' W	420	South Pacific Gyre-IME2D
S221-028	CTD/HC	28-Feb-13	0624	8°7.3' S	139°33.7' W	433	South Pacific Gyre-IME3A
S221-029	SG	28-Feb-13	0816	8°7.4' S	139°36.0' W	10	Banc Clark
S221-029	CTD	28-Feb-13	0852	8°7.9' S	139°36.7' W	351	South Pacific Gyre-IME3B
S221-030	CTD/HC	28-Feb-13	1029	8°5.3' S	139°40.2' W	492	South Pacific Gyre-IME3C
S221-031	CTD/HC	28-Feb-13	1307	8°5.4' S	139°47.3' W	438	South Pacific Gyre-IME3D
S221-032	CTD	28-Feb-13	2020	7°36.9' S	139°50.0' W	529	Equatorial Pacific
S221-032	NT	28-Feb-13	2352	7°40.4' S	139°53.2' W	n/a	South Pacific Gyre
S221-033	CTD/HC	1-Mar-13	0916	7°16.8' S	139°50.4' W	510	Equatorial Pacific
S221-033	NT	1-Mar-13	1029	7°18.3' S	139°52.4' W	n/a	Equatorial Pacific
S221-034	NT	2-Mar-13	0001	6°40.2' S	139°49.3' W	n/a	Equatorial Pacific
S221-034	CTD	1-Mar-13	2119	6°34.6' S	139°47.8' W	609	Equatorial Pacific
S221-034	MN	1-Mar-13	2231	6°36.3' S	139°48.7' W	n/a	Equatorial Pacific
S221-035	CTD/HC	2-Mar-13	0907	6°6.9' S	139°45.8' W	599	Equatorial Pacific
S221-035	NT	2-Mar-13	1024	6°8.4' S	139°46.0' W	n/a	Equatorial Pacific
S221-036	CTD	2-Mar-13	2013	5°31.0' S	139°50.0' W	618	Equatorial Pacific
S221-036	NT	2-Mar-13	2120	5°31.7' S	139°50.8' W	n/a	Equatorial Pacific
S221-037	CTD	3-Mar-13	0457	5°3.3' S	140°0.6' W	608	Equatorial Pacific
S221-038	NT	3-Mar-13	0902	4°43.4' S	140°6.8' W	n/a	Equatorial Pacific
S221-039	CTD	4-Mar-13	2009	3°45.5' S	140°30.6' W	528	Equatorial Pacific
S221-039	NT	3-Mar-13	2105	3°45.5' S	140°31.8' W	n/a	Equatorial Pacific
S221-040	CTD/HC	4-Mar-13	0915	2°44.9' S	140°59.4' W	599	Equatorial Pacific
S221-040	NT	4-Mar-13	1029	2°44.6' S	141°1.3' W	n/a	Equatorial Pacific
S221-041	CTD	4-Mar-13	2037	2°16.2' S	141°29.0' W	464	Equatorial Pacific
S221-041	MN	4-Mar-13	2146	2°16.5' S	141°31.7' W	n/a	Equatorial Pacific
S221-041	NT	4-Mar-13	2305	2°18.3' S	141°33.9' W	n/a	Equatorial Pacific
S221-042	CTD/HC	5-Mar-13	1008	1°34.0' S	141°52.6' W	544	Equatorial Pacific
S221-042	NT	5-Mar-13	1220	1°37.4' S	141°53.8' W	n/a	Equatorial Pacific
S221-043	CTD/HC	6-Mar-13	0050	1°11.4' S	142°9.3' W	175	Equatorial Pacific
S221-043	NT	5-Mar-13	2248	1°8.0' S	142°8.5' W	n/a	Equatorial Pacific
S221-043	CTD	5-Mar-13	2346	1°10.2' S	142°8.7' W	802	Equatorial Pacific
S221-044	CTD/HC	6-Mar-13	1151	0°45.8' S	142°14.5' W	588	Equatorial Pacific
S221-045	CTD/HC	6-Mar-13	2142	0°1.5' N	142°29.5' W	31	Equatorial Pacific
S221-045	NT	6-Mar-13	2254	0°0.6' N	142°30.2' W	n/a	Equatorial Pacific
S221-046	CTD/HC	7-Mar-13	1002	1°12.7' N	142°55.6' W	414	Equatorial Pacific
S221-046	NT	7-Mar-13	1059	1°12.6' N	142°57.7' W	n/a	Equatorial Pacific
S221-047	CTD	7-Mar-13	2027	2°1.5' N	143°22.9' W	423	Equatorial Pacific
S221-047	NT	7-Mar-13	2131	2°1.1' N	143°25.4' W	n/a	Equatorial Pacific
S221-048	CTD/HC	8-Mar-13	0930	3°30.7' N	143°58.7' W	416	Equatorial Pacific
S221-048	NT	8-Mar-13	1109	3°31.7' N	144°2.2' W	n/a	Equatorial Pacific
S221-049	CTD	8-Mar-13	2028	4°17.4' N	144°20.0' W	489	Equatorial Pacific
S221-049	CTD	8-Mar-13	2028	4°17.4' N	144°20.0' W		Equatorial Pacific
S221-049	CTD	8-Mar-13	2117	4°18.4' N	144°20.7' W	229	Equatorial Pacific
S221-049	CTD	8-Mar-13	2117	4°18.4' N	144°20.7' W		Equatorial Pacific
S221-049	NT	8-Mar-13	2210	4°19.9' N	144°21.3' W	n/a	Equatorial Pacific
S221-050	CTD	9-Mar-13	0934	5°34.8' N	144°27.1' W	606	Equatorial Pacific
S221-050	CTD/HC	9-Mar-13	0934	5°34.8' N	144°27.1' W	606	Equatorial Pacific
S221-050	NT	9-Mar-13	1025	5°34.8' N	144°26.2' W	n/a	Equatorial Pacific

Station	Type	Date	Time	Latitude	Longitude	Cast Depth	Locale
S221-051	CTD	9-Mar-13	2015	6°27.8' N	144°44.7' W	620	Equatorial Pacific
S221-051	MN	9-Mar-13	2134	6°26.5' N	144°44.8' W	n/a	Equatorial Pacific
S221-051	NT	9-Mar-13	2245	6°24.6' N	144°44.0' W	n/a	Equatorial Pacific
S221-052	CTD	10-Mar-13	0920	7°25.1' N	145°2.9' W	615	NECC
S221-052	NT	10-Mar-13	1012	7°24.5' N	145°2.5' W	n/a	Equatorial Pacific
S221-053	CTD	10-Mar-13	2022	8°19.0' N	145°33.8' W	598	NECC
S221-053	NT	10-Mar-13	2145	8°17.6' N	145°34.4' W	n/a	North Pacific Gyre
S221-054	CTD	11-Mar-13	0910	9°14.2' N	146°18.3' W	586	North Pacific Gyre
S221-054	NT	11-Mar-13	1004	9°13.4' N	146°19.4' W	n/a	North Pacific Gyre
S221-055	CTD	11-Mar-13	2108	9°46.1' N	146°49.1.1' W	595	North Pacific Gyre
S221-055	NT	11-Mar-13	2226	9°45.5' N	146°50.9' W	n/a	North Pacific Gyre
S221-056	CTD	12-Mar-13	1001	10°32.7' N	147°21.1' W	603	North Pacific Gyre
S221-057	CTD/HC	12-Mar-13	2011	11°35.0' N	147°46.3' W	614	North Pacific Gyre
S221-057	NT	12-Mar-13	2112	11°35.0' N	147°46.5' W	n/a	North Pacific Gyre
S221-058	CTD/HC	13-Mar-13	0909	12°50.3' N	148°27.9' W	600	North Pacific Gyre
S221-059	CTD	13-Mar-13	2028	13°47.8' N	149°16.9' W	600	North Pacific Gyre
S221-059	NT	13-Mar-13	2128	13°48.2' N	149°17.6' W	n/a	North Pacific Gyre
S221-060	CTD	14-Mar-13	0915	15°2.3' N	150°15.9' W	600	North Pacific Gyre
S221-062	CTD	17-Mar-13	1042	19°59.9' N	154°47.3' W	3045	North Pacific Gyre
S221-063	NT	19-Mar-13	0021	20°27.6' N	156°57.3' W	n/a	North Pacific Gyre
S221-066	2MN	16-Mar-13	2203	19°57.9' N	154°52.9' W	n/a	North Pacific Gyre

Table 2: Surface Station Data.

Entries labeled S221-### are from hydrocast surface samples (bottle #13)

Station	Date	Time	Latitude	Longitude	Temp (deg C)	Salinity (psu)	PO4 (uM)	Chl-a (ug/l)	NO3 (uM)
SS001	14-Feb-13	0130	16°45.4' S	148°59.0' W	29.1	36.25	0.280	0.014	
S221-004	14-Feb-13	0930	16°19.1' S	148°28.6' W	28.9	35.94	0.301	0.052	0.000
S221-005	14-Feb-13	1943	15°51.4' S	148°8.6' W	28.9	35.93	0.337	0.077	1.684
S221-006	14-Feb-13	2231	15°54.4' S	148°15.0' W	28.9	36.02	0.347	0.154	0.000
S221-007	15-Feb-13	0254	15°50.8' S	148°19.2' W	29.0	36.02	0.327	0.078	1.533
S221-008	15-Feb-13	0649	15°51.1' S	148°25.7' W	28.9	35.99	0.240	0.121	0.091
S221-009	15-Feb-13	1001	15°50.9' S	148°31.7' W	28.9	35.93	0.000	0.072	0.424
S221-010	16-Feb-13	2103	14°44.1' S	147°30.6' W	29.2	36.11	0.223	0.011	0.141
S221-011	17-Feb-13	0844	14°4.3' S	147°26.0' W	29.2	36	0.254	0.047	0.000
S221-013	18-Feb-13	0916	13°19.8' S	146°6.5' W	29.2	35.83	0.410	0.037	1.438
SS002	18-Feb-13	2330	12°48.9' S	145°54.8' W	29.1	35.88	0.617	0.080	
S221-015	19-Feb-13	0927	11°59.9' S	145°37.5' W	29.10	35.89	0.565	0.127	1.424
SS003	19-Feb-13	2002	11°28.8' S	145°20.7' W	29.1	35.83	0.607	0.074	
S221-017	20-Feb-13	0900	10°45.8' S	145°20.5' W	29	35.86	0.332	0.110	2.054
SS004	21-Feb-13	2144	10°9.4' S	145°3.1' W	28.8	35.95	0.347	0.035	
S221-019	21-Feb-13	0949	10°13.8' S	143°56.4' W	28.8	35.87		0.052	
SS005	22-Feb-13	0945	10°4.1' S	141°46.4' W	28.8	35.81	0.311	0.233	
SS006	22-Feb-13	2154	9°48.8' S	141°34.4' W	28.5	35.73	0.410	0.301	
S221-023	23-Feb-13	0918	9°25.6' S	140°47.2' W	28.6	35.80	0.617	0.089	3.082
S221-024	23-Feb-13	1700	9°10.0' S	140°47.8' W	28.4	35.72	0.622	0.291	3.050
S221-025	23-Feb-13	1956	9°10.2' S	140°39.9' W	28.4	35.71		0.083	4.250
S221-027	24-Feb-13	0027	9°10.0' S	140°34.0' W	28.2	35.61	0.659	0.358	10.108
S221-028	28-Feb-13	0624	8°7.3' S	139°33.7' W	27.9	35.52	0.406	0.048	4.946
S221-030	28-Feb-13	1029	8°5.3' S	139°40.2' W	28.0	35.55	0.333	0.090	7.332
S221-031	28-Feb-13	1307	8°5.4' S	139°47.3' W	28.0	35.50	0.240	0.038	4.960
SS007	1-Mar-13	0011	7°40.9' S	139°53.3' W	27.6	35.25	0.323	0.047	
S221-033	1-Mar-13	0916	7°16.8' S	139°50.4' W	26.9	35.01	0.495	0.095	5.248
SS008	2-Mar-13	0130	6°39.3' S	139°49.0' W	27.0	35.04	0.610	0.069	
S221-035	2-Mar-13	0907	6°6.9' S	139°45.8' W	27.3	35.06	0.318	0.107	5.291
SS009	2-Mar-13	2030	5°31.2' S	139°50.1' W	27.3	35.14	0.396	0.079	
SS010	3-Mar-13	0910	4°34.6' S	140°7.0' W	27.5	35.19	0.453	0.076	
SS011	3-Mar-13	2009	3°45.5' S	140°30.0' W	27.5	35.23	0.552	0.084	
S221-040	4-Mar-13	0915	2°44.9' S	140°59.4' W	27.0	35.11	0.589	0.107	6.441
SS012	5-Mar-13	0028	2°11.8' S	141°36.3' W	26.1	35.20	0.761	0.097	
S221-042	5-Mar-13	1008	1°34.0' S	141°52.6' W	26.0	35.20	0.584	0.122	5.368
S221-043	6-Mar-13	0050	1°11.4' S	142°9.3' W	25.8	35.18	0.542	0.157	6.560
S221-044	6-Mar-13	1151	0°45.8' S	142°14.5' W	25.8	35.18	0.542	0.178	8.771
S221-045	6-Mar-13	2142	0°1.5' S	142°29.5' W	25.6	35.04	0.464	0.137	9.490
S221-046	7-Mar-13	1002	1°12.7' N	142°55.6' W	26.1	34.94	0.875	0.177	7.916
SS013	7-Mar-13	2217	2°0.9' N	143°27.4' W	26.5	34.71	0.485	0.131	
S221-048	8-Mar-13	0930	3°30.7' N	143°58.7' W	26.8	34.56	0.354	0.186	3.557
SS014	8-Mar-13	2210	4°20.0' N	144°21.4' W	26.9	34.61	0.365	0.176	
S221-050	9-Mar-13	0934	5°34.8' N	144°27.1' W	26.7	34.65	0.511	0.433	7.362
SS015	9-Mar-13	2303	6°23.9' N	144°44.8' W	27.0	34.93		0.083	
SS016	10-Mar-13	1023	7°24.2' N	145°0.2' W	26.9	34.81			
SS017	10-Mar-13	2145	8°17.6' N	145°34.4' W	26.7	34.72			

Station	Date	Time	Latitude	Longitude	Temp (deg C)	Salinity (psu)	PO4 (uM)	Chl-a (ug/l)	NO3 (uM)
SS018	11-Mar-13	1010	9°12.9' N	146°19.6' W	26.3	34.58		0.241	
SS019	11-Mar-13	2126	9°46.0' N	146°49.7' W	26.2	34.43		0.046	
S221-057	12-Mar-13	2011	11°35.0' N	147°46.3' W	26.6	34.36		0.081	
SS020	12-Mar-09	0000	13°48.4' N	149°48.4' W	26.0	34.39		0.080	

Table 3: Surface PAR Data.

Station	Station	Date	Time On	Time Off	Latitude	Longitude	Ave. SPAR (µEinsteins/m^2/sec)	1% light value	1% light depth (m)
S221-004-SPAR	S221-004	14-Feb-13	0940	1022	16°19.1' S	148°28.6' W	84.36	0.84	100
S221-009-SPAR	S221-009	15-Feb-13	0946	1036	15°50.9' S	148°31.7' W	2760.00	27.60	100
S221-011-SPAR	S221-011	17-Feb-13	0850	0928	14°4.3' S	147°26.0' W	2347.54	23.48	77
S221-013-SPAR	S221-013	18-Feb-13	0902	1008	13°19.8' S	146°6.5' W	2444.94	24.45	71
S221-015-SPAR	S221-015	19-Feb-13	0927	0956	11°59.9' S	145°37.5' W	2009.09	20.09	72
S221-017-SPAR	S221-017	20-Feb-13	0905	0940	10°46.0' S	145°20.6' W	2169.51	21.70	69
S221-019-SPAR	S221-019	21-Feb-13	0946	1032	10°13.8' S	143°56.3' W	2774.86	27.75	78
S221-021-SPAR	S221-021	22-Feb-13	0917	0952	10°4.1' S	141°46.4' W	2184.11	21.84	67
S221-023-SPAR	S221-023	23-Feb-13	0920	0950	9°25.6' S	140°47.2' W	2452.75	24.53	72
S221-024-SPAR	S221-024	23-Feb-13	1709	1739	9°10.1' S	140°47.9' W	161.08	1.61	51
S221-029-SPAR	S221-029	28-Feb-13	0904	0934	8°9.0' S	139°37.9' W	2468.96	24.69	78
S221-031-SPAR	S221-031	28-Feb-13	1309	1339	8°5.4' S	139°47.3' W	2173.60	21.74	63
S221-033-SPAR	S221-033	1-Mar-13	0904	1029	7°16.7' S	139°50.2' W	329.29	3.29	78
S221-035-SPAR	S221-035	2-Mar-13	0909	0939	6°6.9' S	139°45.8' W	2615.30	26.15	86
S221-040-SPAR	S221-040	4-Mar-13	0918	0958	2°44.9' S	140°59.5' W	2475.06	24.75	81
S221-042-SPAR	S221-042	5-Mar-13	1017	1048	1°34.2' S	141°52.7' W	2222.56	22.23	84
S221-044-SPAR	S221-044	6-Mar-13	1205	1236	0°46.0' S	142°14.5' W	1996.51	19.97	75
S221-046-SPAR	S221-046	7-Mar-13	0955	1058	1°12.7' N	142°55.3' W	2430.51	24.31	74
S221-048-SPAR	S221-048	8-Mar-13	0932	1002	3°30.7' N	143°58.7' W	2562.98	25.63	69
S221-050-SPAR	S221-050	9-Mar-13	0936	1006	5°34.8' N	144°27.1' W	2294.61	22.95	63
S221-052-SPAR	S221-052	10-Mar-13	0929	1000	7°25.0' N	145°2.8' W	2602.32	26.02	70
S221-054-SPAR	S221-054	11-Mar-13	0919	0957	9°14.1' N	146°18.5' W	2421.64	24.22	73
S221-056-SPAR	S221-056	12-Mar-13	0953	1043	10°32.6' N	147°21.0' W	2425.11	24.25	93
S221-056-Secchi	S221-056	12-Mar-13	1100	n/a	10°32.7' N	147°21.0' W	n/a	n/a	107
S221-058-SPAR	S221-058	13-Mar-13	0912	0942	12°50.3' N	148°27.9' W	1307.45	13.07	91

Table 4: Neuston Net Data.

Station Locations are as in Table 1.

Station	Tow Area (m^2)	Temp	Sal (PSU)	Zoo Biomass (ml)	Zoo Density (ml/m2)	Plastic Pieces	Plastic Pel.	Halo bates	Myct ophid	Gel. >2cm (ml)
S221-003	2043.3	29.1	36.29	5	0.0024	0	1	13	0	2.8
S221-009	1724.5	29.2	35.90	5	0.0029	0	0	0	0	0
S221-010	1354.8	29.2	36.10	9.3	0.0069	0	0	11	38	0.8
S221-011	2333.3	29.3	36.00	3.2	0.0014	0	0	4	0	0
S221-012	2120.2	29.3	36.00	12	0.0057	0	0	7	37	0
S221-013	2432	29.2	35.84	18.5	0.0076	1	0	3	1	0
S221-014	1966.4	29.1	35.86	16	0.0081	0	0	2	0	3.5
S221-015	2403.4	29.1	35.88	7	0.0029	1	0	0	0	0
S221-016	1881.1	28.9	35.82	14.5	0.0077	0	0	2	9	0.2
S221-017	1811.9	29.1	35.83	2.7	0.0015	1	0	1	1	5
S221-018	783.7	29.1	35.87	12.5	0.0159	0	0	3	9	7.5
S221-019	1283.4	28.8	35.87	2	0.0016	0	0	0	2	1
S221-020	1550.9	28.9	35.95	33	0.0213	0	0	2	3	71
S221-021	3290.7	28.8	35.81	2.75	0.0008	1	0	1	0	4
S221-022	1718	28.4	35.72	19	0.0111	0	0	2	7	8
S221-023	1575	28.6	35.80	22.3	0.0142	1	0	0	1	2.6
S221-032	2451.7	27.6	35.25	37	0.0151	0	0	5	1	7.5
S221-033	1282.2	27.0	35.02	33	0.0257	0	0	19	0	17
S221-034	2542.6	27.0	35.04	48	0.0189	0	0	2	21	2.6
S221-035	2037.2	27.4	35.07	5.3	0.0026	0	0	8	0	3.5
S221-036	1045.2	27.3	35.14	37.5	0.0359	0	0	4	0	7
S221-038	1956.6	27.2	35.18	5.5	0.0028	0	0	2	0	1.1
S221-039	2158	27.5	35.24	9.5	0.0044	0	0	3	10	8
S221-040	1837.4	27.0	35.02	4	0.0022	0	0	0	1	15
S221-041	1481.6	23.4	35.00	46	0.0310	0	0	8	0	72
S221-042	2778	26.2	35.21	11	0.0040	0	0	0	0	0
S221-043	2037.2	25.8	35.18	58	0.0285	0	0	0	63	7.5
S221-045	1852	25.5	35.04	32	0.0173	1	0	0	0	8.5
S221-046	2410.6	26.1	34.94	8.5	0.0035	0	0	0	0	0
S221-047	2407.6	26.5	34.71	34	0.0141	0	0	1	0	6
S221-048	2963.2	26.8	34.55	7.5	0.0025	0	0	1	0	3
S221-049	1481.6	26.9	34.61	49.5	0.0334	1	0	86	7	5
S221-050	2222.4	26.7	34.65	19	0.009	0	0	11	0	4.3
S221-051	2778	27.0	34.93	26	0.009	0	0	36	1	6
S221-052	2408	26.9	34.80	7	0.003	1	0	17	0	5
S221-053	1481.6	26.7	34.72	59	0.040	1	0	4	2	25.6
S221-054	1968.2	26.3	34.56	35	0.018	2	0	1	0	16
S221-055	2037.2	26.1	34.43	23.0	0.011	0.0	0	1.0	2.0	27.4
S221-057	1597.4	26.9	34.37	355.0	0.222	0	0	31	14	112
S221-059	1574.2	26.0	34.39	609.0	0.387	4.0	0	54.0	0.0	240.0
S221-063	981.6	23.7	35.12	14.5	0.015	0.0	0	7.0	0.0	3.0

Table 5: Meter Net Data.

Station Locations are as in Table 1. All tows employed a 1-m diameter ($0.785m^2$), 200 μm mesh net.

Station	Depth	Tow Volume (m3)	ZoopBio mass (ml)	Zpl Density (ml/m3)	Gel. >2cm (ml)
S221-014	117	2182	122.0	0.05592	0.50000
S221-022	235	2195	94.0	0.04282	2.20000
S221-034	125	2277	246.0	0.10805	19.50000
S221-041	100	1948	571.0	0.29312	14.50000
S221-051	200	1561	152.0	0.09737	10.00000

Table 6: Hydrocast Station Data.

Station Locations are as in Table 1.

Station	Depth (m)	Temp (deg C)	Salinity (psu)	Density (kg/m3)	PO4 (uM)	Nitrat e (uM)	Nitrite (uM)	Chl a (ug/l)	Alk (umol/ kg)	pH
S221-004	496.5	8.162	34.484	26.852	1.965	23.810	0.000			
S221-004	495.4	8.190	34.476	26.842						
S221-004	494.1	8.217	34.479	26.840						
S221-004	396.8	11.029	34.639	26.498						
S221-004	297.4	17.154	35.371	25.774	0.596	7.291	0.000			
S221-004	248.3	20.519	35.812	25.256						
S221-004	198.1	22.585	36.144	24.933						
S221-004	139.1	24.609	36.385	24.516	0.337	0.913	0.483	0.035		
S221-004	109.0	25.387	36.494	24.360	0.161	0.109	2.858	0.107		
S221-004	89.5	25.943	36.516	24.202	0.099	0.000	0.000	0.065		
S221-004	59.6	27.320	36.549	23.786				0.043		
S221-004	39.9	28.730	36.058	22.952	0.332	0.000	0.000	0.035		
S221-004	0.0	28.900	35.940		0.301	0.000	0.000	0.052		
S221-005	375.5	12.962	34.821	26.273	1.193	3.835	0.000			
S221-005	149.3	24.467	36.311	24.504	0.254	0.000	0.000	0.038		
S221-005	124.4	25.051	36.408	24.399	0.301	0.000	0.639	0.08		
S221-005	99.4	25.811	36.491	24.225	0.337	0.210	1.597	0.116		
S221-005	40.2	28.599	36.066	23.002	0.342	0.000	0.000	0.086		
S221-005	20.2	28.721	36.056	22.953				0.063		
S221-005	0.0	28.900	35.930		0.337	1.684	0.000	0.077		
S221-006	390.4	10.398	34.628	26.601	1.748	22.463	0.000			
S221-006	148.9	24.347	36.328	24.553	0.353	0.365	2.556	0.025		
S221-006	124.3	25.559	36.501	24.312	0.363	0.165	4.355	0.068		
S221-006	99.0	26.064	36.499	24.152	0.264	0.137	1.104	0.096		
S221-006	39.9	28.651	36.049	22.972	0.363	0.000	0.000	0.057		
S221-006	20.2	28.659	36.044	22.964				0.05		
S221-006	0.0	28.900	36.020		0.347	0.000	0.000	0.154		
S221-007	391.2	12.284	34.778	26.372	1.146	23.760	0.000			
S221-007	148.9	24.468	36.396	24.568	0.430	2.005	1.387	0.004		
S221-007	124.5	25.002	36.450	24.445	0.207	0.908	3.433	0.04		
S221-007	99.3	25.530	36.506	24.324	0.446	0.434	3.953	0.122		
S221-007	40.1	28.349	36.141	23.141	0.353	0.785	0.000	0.152		
S221-007	20.4	28.719	36.037	22.939				0.041		
S221-007	0.0	29.000	36.020		0.327	1.533	0.000	0.078		
S221-008	394.3	11.837	34.720	26.412	1.296	11.544	0.063			
S221-008	150.2	24.386	36.309	24.527	0.337	0.525	0.255	0.025		
S221-008	124.7	25.019	36.419	24.417	0.083	0.091	1.442	0.097		
S221-008	100.1	25.953	36.498	24.186	0.342	0.000	1.077	0.160		
S221-008	40.1	28.700	36.029	22.941	0.254	0.000	0.000	0.048		
S221-008	20.1	28.697	36.021	22.934				0.069		
S221-008	0.0	28.900	35.990		0.240	0.091	0.000	0.121		

Station	Depth (m)	Temp (deg C)	Salinity (psu)	Density (kg/m3)	PO4 (uM)	Nitrate (uM)	Nitrite (uM)	Chl a (ug/l)	Alk (umol/kg)	pH
S221-009	393.3	11.165	34.679	26.505	1.639	18.532	0.000			
S221-009	149.8	24.484	36.338	24.519	0.202	0.936	0.063	0.021		
S221-009	125.3	24.801	36.382	24.455	0.285	0.397	0.794	0.038		
S221-009	100.3	25.273	36.460	24.368	0.254	0.000	1.625	0.056		
S221-009	40.0	28.652	36.020	22.950	0.104	0.000	0.000	0.037		
S221-009	20.4	28.633	35.957	22.907				0.035		
S221-009	0.0	28.900	35.930		0.000	0.424	0.000	0.072		
S221-010	599.1	6.783	34.505	27.066	2.188	24.413	0.000			
S221-010	500.4	8.135	34.529	26.891						
S221-010	399.6	10.215	34.599	26.610						
S221-010	300.0	16.298	35.163	25.816	0.586	9.068	0.136			
S221-010	199.8	23.201	36.273	24.853						
S221-010	150.2	25.041	36.494	24.468	0.373	0.288	3.880	0.029		
S221-010	100.3	26.249	36.462	24.066	0.161	0.086	0.000	0.097		
S221-010	59.8	28.191	36.245	23.273	0.311	0.000	0.000	0.057		
S221-010	39.9	28.785	36.150	23.003				0.042		
S221-010	20.1	28.928	36.126	22.935	0.239	0.000	0.000	0.015		
S221-010	0.0	29.200	36.110		0.223	0.141	0.000	0.011		
S221-011	589.0	6.380	34.489	27.107						7.664
S221-011	496.3	7.728	34.526	26.949						7.646
S221-011	396.7	10.607	34.660	26.590						7.655
S221-011	347.1	12.633	34.763	26.292						7.790
S221-011	298.4	17.178	35.274	25.694						8.146
S221-011	248.5	20.298	35.762	25.277						8.011
S221-011	198.5	22.391	36.149	24.992						8.082
S221-011	148.8	24.401	36.426	24.611				0.030		8.128
S221-011	99.5	26.120	36.471	24.113				0.227		8.152
S221-011	59.1	28.407	36.218	23.181				0.262		8.208
S221-011	39.2	28.858	36.045	22.900				0.088		8.227
S221-011	20.2	28.883	36.029	22.878				0.066		8.249
S221-011	0.0	29.200	36.000		0.254	0.000	0.000	0.047		8.240
S221-013	595.1	6.738	34.532	27.094	2.779	22.619	0.000		2328.513	7.692
S221-013	496.0	7.761	34.563	26.973						7.695
S221-013	395.7	10.563	34.663	26.600	2.468					7.702
S221-013	346.8	12.591	34.842	26.361						7.783
S221-013	297.7	15.510	35.114	25.957					2082.971	7.938
S221-013	248.7	18.545	35.511	25.538						7.995
S221-013	198.6	22.212	36.123	25.023	0.638	3.515	0.000			8.057
S221-013	149.1	24.173	36.419	24.674	0.633	2.238	1.597	0.040		8.094
S221-013	98.8	26.474	36.274	23.853	0.560	0.470	1.853	0.130		8.128
S221-013	59.0	28.649	35.974	22.918	0.327	0.611	0.000	0.293		8.203
S221-013	40.0	28.825	35.855	22.768				0.037		8.185
S221-013	20.3	28.833	35.852	22.761	0.316	0.967	0.000	0.012		
S221-013	0.0	29.200	35.830		0.410	1.438	0.000	0.037		8.194

Station	Depth (m)	Temp (deg C)	Salinity (psu)	Density (kg/m3)	PO4 (uM)	Nitrate (uM)	Nitrite (uM)	Chl a (ug/l)	Alk (umol/kg)	pH
S221-015	558.9	7.047	34.543	27.060	2.562	21.957	0.000			7.641
S221-015	496.1	7.621	34.582	27.009						7.731
S221-015	396.7	10.255	34.678	26.665						7.597
S221-015	348.1	12.242	34.781	26.381	1.690	18.446	0.511			7.719
S221-015	297.4	14.428	34.943	26.061						7.842
S221-015	248.8	18.127	35.414	25.569						8.035
S221-015	199.3	21.816	36.052	25.080	0.472	3.227	0.000			8.078
S221-015	149.5	24.680	36.454	24.548	0.482	0.278	5.506	0.039		8.151
S221-015	99.0	26.188	36.481	24.099	0.503	0.474	0.000	0.136		8.177
S221-015	74.6	27.400	36.166	23.473	0.591	1.027	0.091	0.178		8.196
S221-015	40.1	28.777	35.905	22.822				0.076		8.223
S221-015	19.5	28.776	35.905	22.820				0.063		8.215
S221-015	0.0	29.100	35.890		0.565	1.424	0.000	0.127		8.215
S221-017	582.0	7.163	34.577	27.071						7.547
S221-017	400.1	9.397	34.676	26.808						7.847
S221-017	200.6	21.214	35.916	25.144						7.993
S221-017	150.5	24.377	36.322	24.539						8.118
S221-017	99.9	26.890	36.073	23.569				0.092		8.187
S221-017	74.9	28.512	35.866	22.883				0.121		8.200
S221-017	19.6	28.724	35.868	22.810						8.223
S221-017	9.7	28.738	35.868	22.804				0.048		8.200
S221-017	0.0	29.000	35.860		0.332	2.054	0.000	0.110		8.198
S221-019	599.0	6.683	34.558	27.121	2.686	22.345	0.000		2265.356664	7.539
S221-019	499.3	7.433	34.593	27.044						7.589
S221-019	398.0	8.674	34.674	26.921						7.624
S221-019	350.5	10.191	34.721	26.709						7.637
S221-019	299.1	12.260	34.846	26.428	2.059	20.820	0.000			7.689
S221-019	249.5	16.513	35.196	25.789						8.064
S221-019	199.5	20.911	35.908	25.220						8.119
S221-019	149.6	23.506	36.295	24.777	0.534	4.305	0.000	0.008		8.169
S221-019	98.9	26.383	36.257	23.868	0.669	2.238	1.387	0.078	2343.269	8.251
S221-019	73.8	28.461	35.892	22.919	0.539	1.588	0.000	0.067	2441.84	8.275
S221-019	39.9	28.488	35.887	22.905				0.090		8.322
S221-019	20.2	28.503	35.887	22.898	0.524	1.922	0.000		2340.908	8.290
S221-019	0.0	28.800	35.870					0.052		8.311
S221-023	577.5	7.286	34.586	27.061					2424.722557	7.567
S221-023	496.3	8.112	34.631	26.975						7.615
S221-023	396.6	9.121	34.684	26.858	2.344	18.931	0.492			7.644
S221-023	347.0	9.830	34.717	26.766						7.642
S221-023	298.1	11.667	34.788	26.495	2.442	21.724	0.000		2342.088	7.624

Station	Depth (m)	Temp (deg C)	Salinity (psu)	Density (kg/m3)	PO4 (uM)	Nitrate (uM)	Nitrite (uM)	Chl a (ug/l)	Alk (umol/kg)	pH
S221-023	248.4	14.459	34.995	26.093						7.728
S221-023	198.6	19.316	35.644	25.441						7.910
S221-023	149.2	23.002	36.274	24.909				0.017		7.953
S221-023	99.5	26.850	36.130	23.624				0.170		8.030
S221-023	74.9	28.106	35.811	22.976	0.410	3.128	0.191	0.089		8.070
S221-023	39.1	28.163	35.818	22.959				0.174		8.090
S221-023	20.5	28.173	35.819	22.956				0.077		8.088
S221-023	0.0	28.600	35.800		0.617	3.082	0.556	0.089		8.014
S221-024	393.8	9.297	34.698	26.841	2.862	31.224	0.000			
S221-024	150.1	23.154	36.280	24.869	0.752	3.685	1.497	0.011		
S221-024	125.2	24.255	36.394	24.629	0.519	3.205	0.803	0.002		
S221-024	100.3	26.489	36.143	23.749	0.767	4.269	2.675	0.020		
S221-024	40.0	27.976	35.747	22.968	0.591	2.922	0.246	0.231		
S221-024	20.9	28.029	35.748	22.949				0.134		
S221-024	0.0	28.400	35.720		0.622	3.050	0.072	0.291		
S221-025	390.6	9.339	34.698	26.834	2.821	50.583	0.000			
S221-025	148.5	22.669	36.224	24.966	0.809	6.949	0.000	0.000		
S221-025	123.8	24.544	36.417	24.560	0.778	4.411	4.921	0.010		
S221-025	99.2	25.542	36.297	24.162	0.633	7.104	1.835	0.013		
S221-025	39.8	27.933	35.788	23.012	0.747	5.757	0.730	0.044		
S221-025	20.8	28.079	35.737	22.925				0.388		
S221-025	0.0	28.400	35.710			4.250	0.365	0.083		
S221-027	388.9	9.407	34.718	26.839	3.059	60.811	0.000			
S221-027	148.7	21.974	36.096	25.067	0.954	8.117	0.000	0.002		
S221-027	123.8	23.694	36.361	24.771	0.762	7.383	1.004	0.007		
S221-027	98.6	26.307	36.166	23.824	0.871	7.689	1.972	0.031		
S221-027	39.9	27.872	35.639	22.921	0.695	7.675	0.045	0.207		
S221-027	19.6	27.869	35.638	22.919				0.208		
S221-027	0.0	28.200	35.610		0.659	10.108	0.091	0.358		
S221-028	390.6	9.047	34.693	26.877	1.537	32.665	0.000			
S221-028	149.7	22.683	36.171	24.922	0.151	3.571	5.825	0.037		
S221-028	124.3	24.469	36.271	24.472	0.365	1.313	13.139	0.032		
S221-028	98.6	25.990	36.097	23.872	0.089	0.000	10.421	0.083		
S221-028	40.9	27.552	35.540	22.950	0.323	3.170	0.402	0.053		
S221-028	19.6	27.546	35.538	22.949				0.181		
S221-028	0.0	27.900	35.520		0.406	4.946	0.364	0.048		
S221-030	390.6	9.024	34.683	26.873	1.715	44.188	0.030			
S221-030	148.4	22.100	36.099	25.034	0.208	4.636	1.605	0.009		
S221-030	124.6	23.333	36.203	24.757	0.125	2.454	8.346	0.033		
S221-030	99.9	27.253	35.742	23.203	0.406			0.097		
S221-030	40.3	27.541	35.570	22.976	0.177	0.000	8.126	0.095		
S221-030	20.4	27.549	35.563	22.967				0.054		
S221-030	0.0	28.000	35.550		0.333	7.332	0.412	0.090		

Station	Depth (m)	Temp (deg C)	Salinity (psu)	Density (kg/m3)	PO4 (uM)	Nitrate (uM)	Nitrite (uM)	Chl a (ug/l)	Alk (umol/kg)	pH
S221-031	390.8	9.040	34.685	26.872	0.741	25.359	0.755			
S221-031	149.7	23.501	36.234	24.733	0.240	1.446	5.883	0.073		
S221-031	124.3	24.758	36.319	24.421	0.234	0.502	8.422	0.120		
S221-031	100.0	26.302	35.964	23.673	0.406	3.461	0.288	0.110		
S221-031	39.1	27.647	35.588	22.955	0.360	5.924	0.374	0.092		
S221-031	20.6	27.717	35.572	22.919				0.025		
S221-031	0.0	28.000	35.500		0.240	4.960	0.555	0.038		
S221-033	503.0	7.987	34.626	26.990		21.961	0.000			7.571
S221-033	397.4	9.051	34.687	26.872						7.618
S221-033	198.2	15.378	35.116	25.984						7.708
S221-033	148.0	20.394	35.813	25.285						7.942
S221-033	99.2	25.604	35.777	23.750		3.256	0.517	0.092		8.089
S221-033	73.0	26.882	35.403	23.064						
S221-033	71.0	26.849	35.386	23.062						
S221-033	71.3	26.808	35.378	23.069		4.894	0.335	0.158		8.100
S221-033	20.1	26.728	35.053	22.846				0.085		8.091
S221-033	10.6	26.708	35.038	22.840						
S221-033	10.0	26.709	35.038	22.840						
S221-033	9.3	26.709	35.038	22.840		4.740	0.727	0.108		8.088
S221-033	0.0	26.900	35.010		0.495	5.248	0.612	0.095		8.093
S221-035	592.1	6.997	34.577	27.094					1653.273584	7.565
S221-035	495.6	8.293	34.651	26.963						7.530
S221-035	397.7	9.959	34.750	26.771	1.782	24.979	0.000			7.488
S221-035	347.9	10.506	34.785	26.704						7.504
S221-035	297.3	11.007	34.824	26.644	2.340	26.507	0.000		**1709.346769**	7.525
S221-035	248.6	11.707	34.867	26.548						7.540
S221-035	198.9	13.387	34.936	26.271						7.582
S221-035	148.0	20.602	35.736	25.170				0.078		7.975
S221-035	98.6	25.582	35.241	23.352				0.110	2193.34689	8.058
S221-035	74.7	26.509	35.102	22.956	0.094	7.901	0.297	0.215		8.040
S221-035	39.5	26.756	35.092	22.867				0.120		8.046
S221-035	20.3	26.878	35.082	22.820				0.084		8.057
S221-035	0.0	27.300	35.060		0.318	5.291	0.698	0.107		8.031
S221-040	591.5	7.130	34.604	27.097	2.845	21.942	0.000			7.556
S221-040	495.9	8.664	34.677	26.926						7.573
S221-040	396.9	10.216	34.768	26.742						7.576
S221-040	298.4	11.611	34.855	26.557	2.340	21.646	0.000			7.652
S221-040	198.7	12.846	34.929	26.374						7.640
S221-040	149.2	14.177	35.027	26.175				0.067		7.690
S221-040	100.0	22.684	35.217	24.195		5.643	1.691	0.153		8.045
S221-040	74.5	24.975	35.099	23.429				0.191		8.093
S221-040	40.3	25.602	35.089	23.227	0.610			0.146		8.100
S221-040	19.9	26.553	35.127	22.957	0.532	1.494	0.326	0.080		8.106
S221-040	10.3	26.596	35.127	22.943						8.105
S221-040	9.8	26.600	35.129	22.943						8.128
S221-040	0.0	27.011	35.109		0.589	6.441	0.507	0.107		8.114

Station	Depth (m)	Temp (deg C)	Salinity (psu)	Density (kg/m3)	PO4 (uM)	Nitrate (uM)	Nitrite (uM)	Chl a (ug/l)	Alk (umol/kg)	pH
S221-042	0.0	26.000	35.200		0.584	5.368	1.176	0.122		
S221-043	164.6	12.941	34.990	26.401					2042.244413	7.784
S221-043	149.0	14.455	35.222	26.266	1.266	19.918	0.000	0.009		7.804
S221-043	98.9	20.433	35.720	25.201					1744.761412	7.908
S221-043	74.8	25.050	35.458	23.677		7.246	3.811	0.142		8.047
S221-043	40.0	25.374	35.218	23.394						8.033
S221-043	20.0	25.440	35.200	23.359					2101.859062	8.035
S221-043	9.5	25.438	35.199	23.358						8.046
S221-043	0.0	25.800	35.180		0.542	6.560	0.459	0.157		8.004
S221-044	581.3	7.247	34.597	27.074	2.814	23.799	0.000			7.564
S221-044	495.9	8.285	34.638	26.955						7.554
S221-044	397.5	9.511	34.710	26.815						7.579
S221-044	297.6	11.620	34.861	26.561	2.137	23.225	0.297			7.677
S221-044	248.2	12.154	34.883	26.475						7.753
S221-044	197.9	13.369	35.009	26.331	1.141	20.012	0.860			7.814
S221-044	148.1	16.481	35.348	25.910				0.014		
S221-044	99.5	21.336	35.622	24.881	1.032	12.245	1.863	0.177		7.939
S221-044	74.3	23.979	35.404	23.959				0.283		8.013
S221-044	50.1	25.055	35.224	23.497	0.625	6.673	1.682	0.297		8.045
S221-044	19.9	25.110	35.195	23.457				0.093		8.041
S221-044	10.2	25.195	35.192	23.428				0.195		8.051
S221-044	0.0	25.800	35.180		0.542	8.771	1.176	0.178		8.035
S221-045	0.0	25.600	35.040		0.464	9.490	0.870	0.137		8.001
S221-046	408.0	9.077	34.661	26.847	2.741	21.735	0.689			7.450
S221-046	406.8	9.032	34.739	26.916						7.469
S221-046	396.1	9.202	34.678	26.841						7.479
S221-046	297.6	11.271	34.799	26.577	2.048	20.962	1.137		1938.951704	7.521
S221-046	248.0	11.730	34.838	26.520						7.571
S221-046	198.7	11.930	34.854	26.494					1866.94193	7.634
S221-046	149.4	12.198	34.838	26.429				0.001		7.670
S221-046	100.4	15.159	34.744	25.743	1.569	18.640	1.729	0.055	1824.444359	7.749
S221-046	74.8	21.376	34.911	24.328				0.157		7.902
S221-046	48.7	24.579	34.965	23.445				0.225		8.035
S221-046	20.8	25.585	34.956	23.130	0.620	7.734	1.548	0.181	264.780554	8.053
S221-046	10.2	25.670	34.958	23.105				0.168		8.057
S221-046	0.0	26.100	34.940		0.875	7.916	2.254	0.177		8.088

Station	Depth (m)	Temp (deg C)	Salinity (psu)	Density (kg/m3)	PO4 (uM)	Nitrate (uM)	Nitrite (uM)	Chl a (ug/l)	Alk (umol/kg)	pH
S221-048	410.3	10.059	34.709	26.723	2.382	21.262	0.689			
S221-048	396.5	10.104	34.725	26.728	2.230	18.012	4.307			7.586
S221-048	198.6	11.866	34.831	26.488						7.665
S221-048	99.1	23.029	34.889	23.847	0.776	10.613	2.063	0.157		7.969
S221-048	75.6	25.533	35.019	23.198	0.537	6.531	1.271	0.222		8.077
S221-048	50.1	26.132	34.704	22.772				0.293		
S221-048	9.5	26.428	34.577	22.581	0.479	2.802	1.109	0.216		8.121
S221-048	0.0	26.800	34.560		0.354	3.557	0.526	0.186		8.144
S221-050	594.0	7.287	34.588	27.062	3.127	20.962	0.937		1926.556579	7.537
S221-050	396.2	9.069	34.659	26.847						7.559
S221-050	297.8	9.682	34.682	26.763	2.460	14.899	6.914		1933.049264	7.601
S221-050	247.9	10.080	34.694	26.704						7.608
S221-050	197.0	11.018	34.697	26.541						7.578
S221-050	148.1	14.722	34.847	25.919				0.054		7.820
S221-050	99.0	22.995	34.934	23.891	0.839	13.768	1.328	0.238		7.991
S221-050	74.2	25.782	34.932	23.055				0.364		8.041
S221-050	59.3	26.129	34.842	22.878				0.336		8.063
S221-050	39.3	26.166	34.753	22.798				0.283		8.049
S221-050	20.5	26.293	34.672	22.695	0.516	4.158	1.032	0.316		8.088
S221-050	0.0	26.700	34.650		0.511	7.362	0.775	0.433		8.070
S221-057	594.4	7.000	34.536	27.061						
S221-057	88.2	20.100	34.871	24.642				0.080		
S221-057	0.0	26.600	34.360					0.381		
S221-058	496.2	7.535	34.546	26.992						
S221-058	98.5	19.237	34.756	24.778						
S221-058	39.1	25.482	34.610	22.902						

Table 7. ARGO Float deployment.

Float	ID	Date	Time (GMT)	Latitude	Longitude
4065	5902215	5-Mar-09	0327	1°18.44'S	142°00.84'W
4062	5902213	6-Mar-09	0639	0°02.69'S	142°27.17'W
4061	5902212	6-Mar-09	1818	1°00.9’S	142°50.8'W

Figure 2. Plot of surface temperature.

Note temperatures changes at 9-10°S and 13-14°N delineating boundary of equatorial and gyre waters, at and at the equator, indicating upwelling.

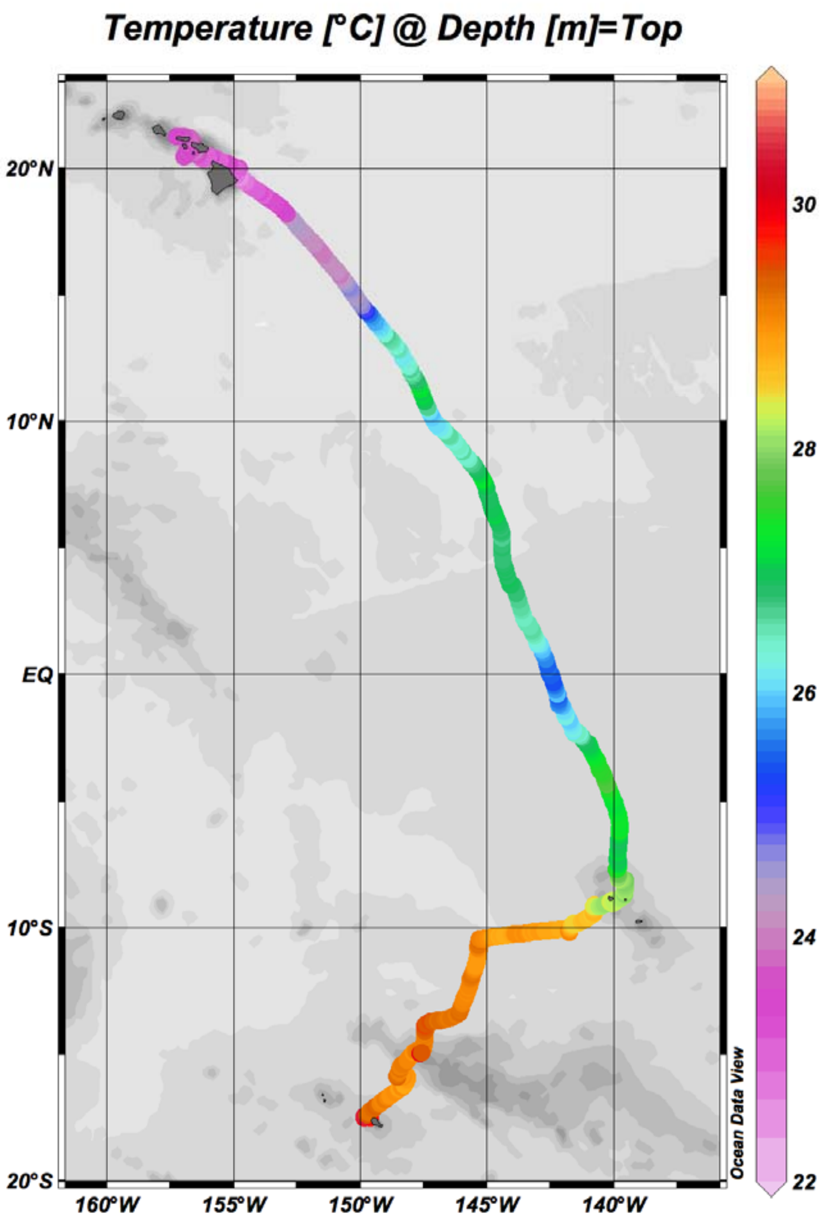


Figure 3. Plot of surface salinity.

Note salinity minimum at 2-5°N, corresponding with an unusually southern location of the ITCZ.

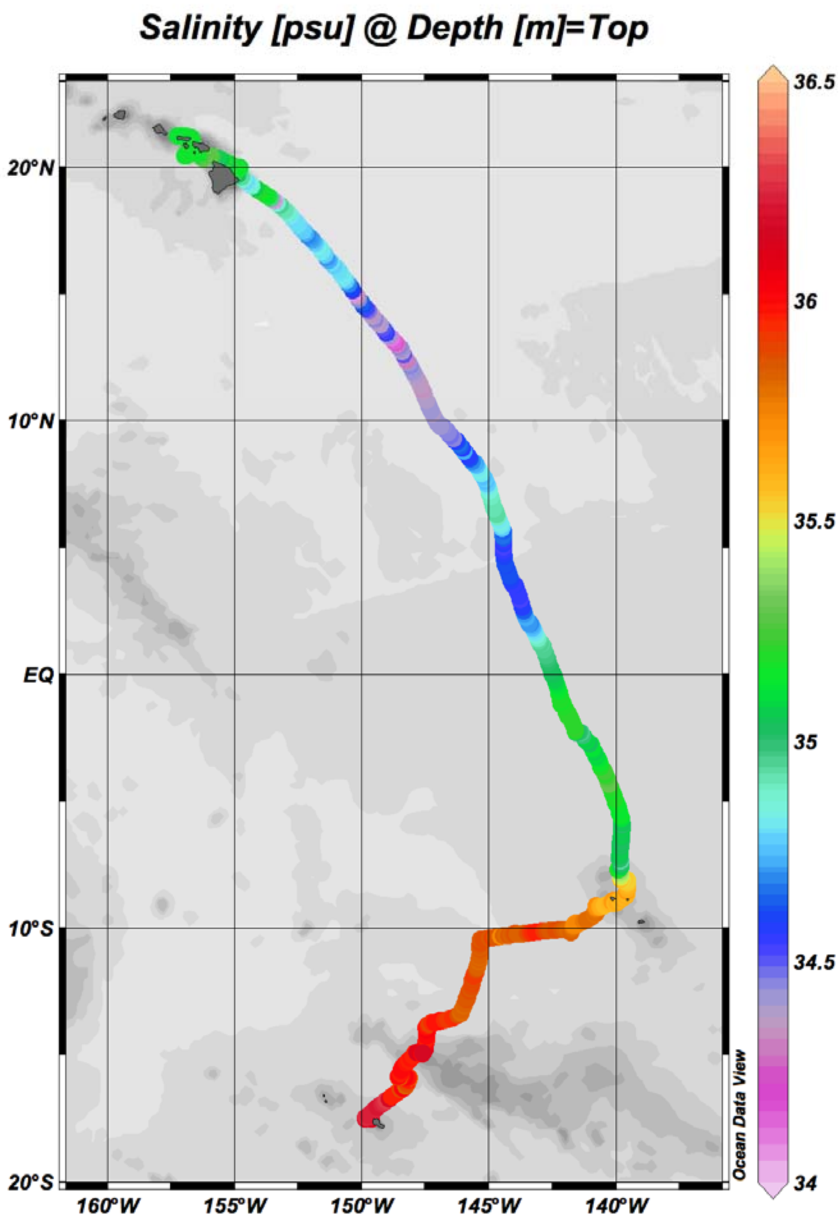


Figure 4. Plot of water column temperature and salinity.

Equatorial upwelling and the EUC are clearly visible. Acute barrier layers, salinity maximums at the base of the mixed layer, were observed at ~10°N, and less well defined salinity maxima south of 5°S.

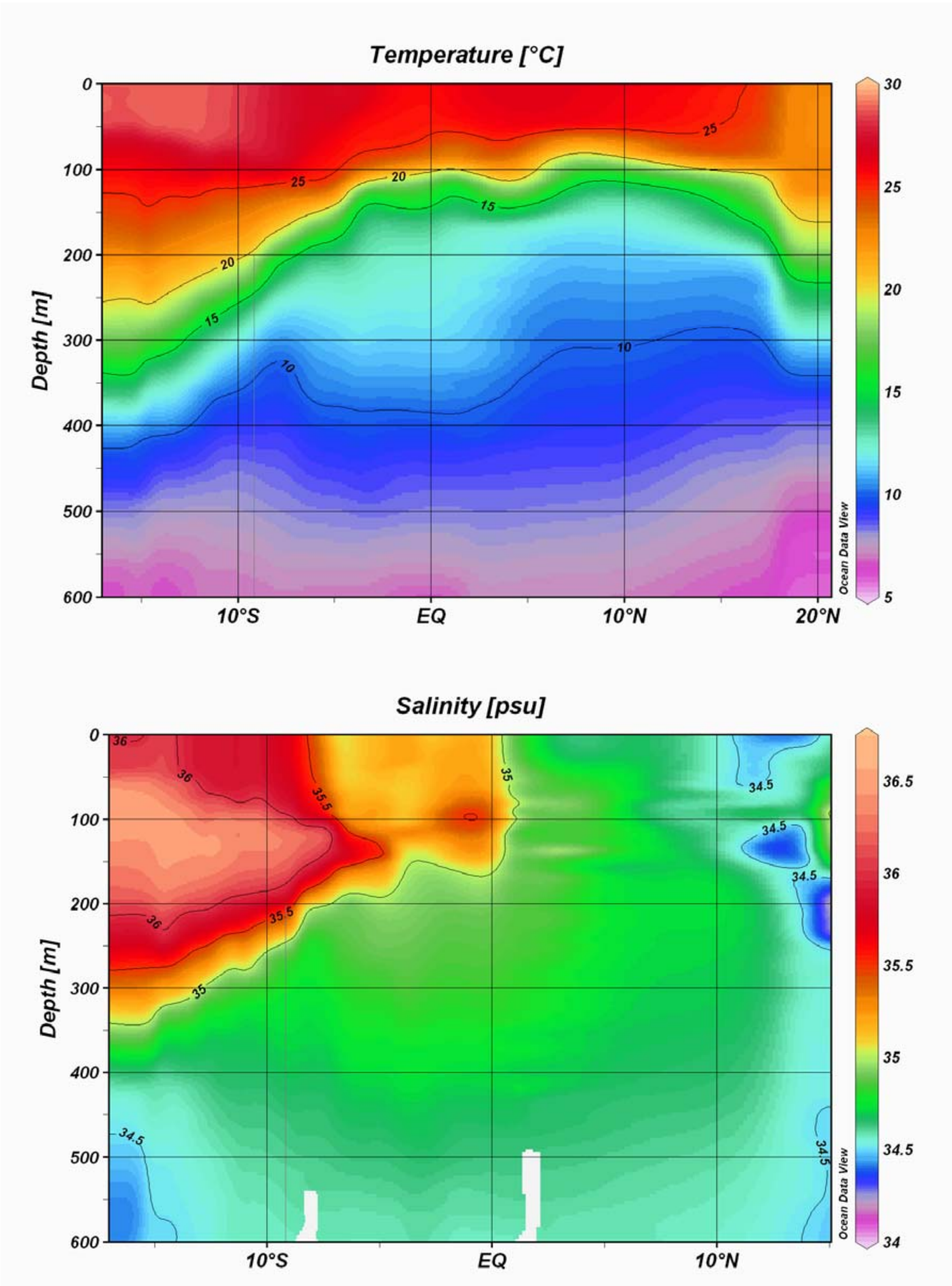


Figure 5. CTD station profile plots along cruise track.

Temperature, salinity, and density profiles articulate mix layer depth, thermocline/pycnocline strength (slope), and the presence of salinity maxima along S221 cruise track.

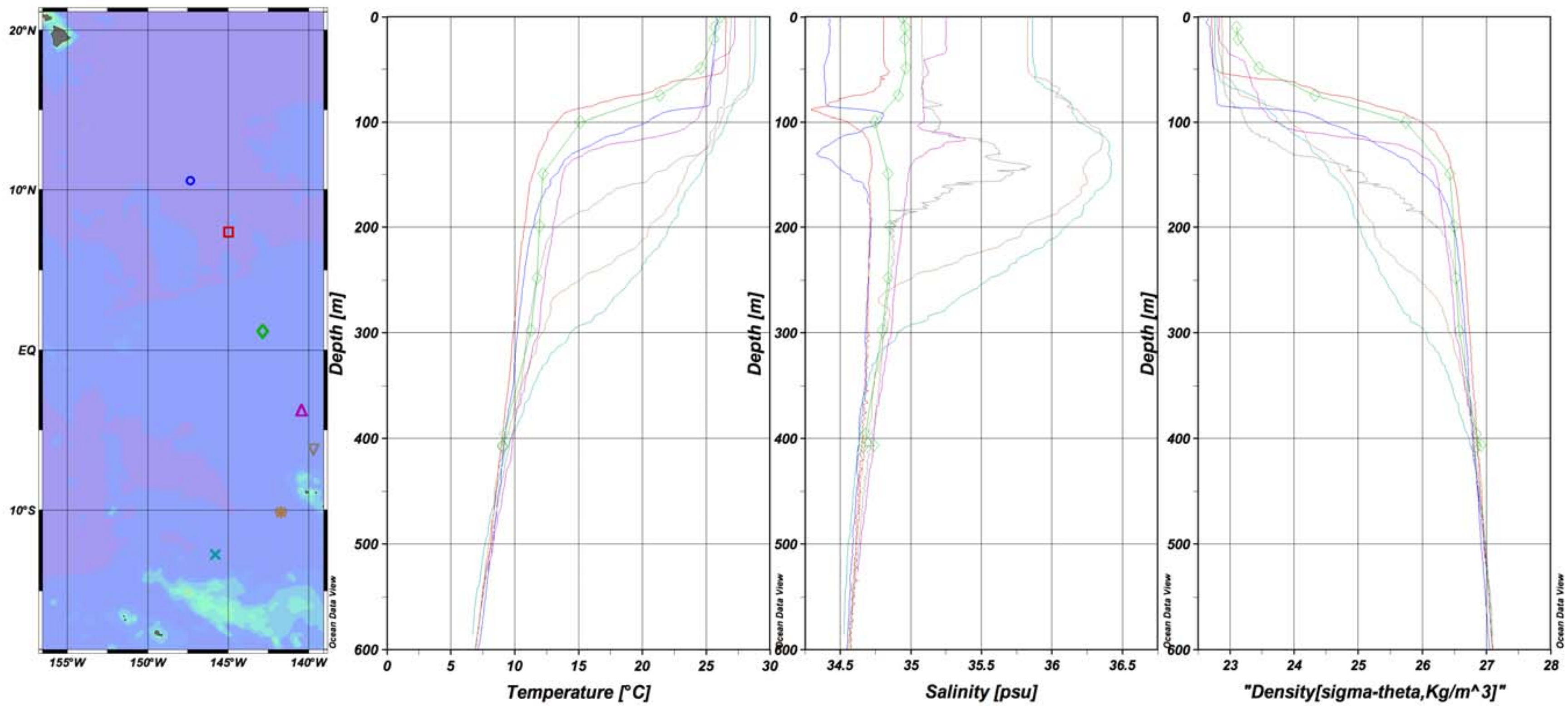


Figure 6. ADCP magnitude data.

The highest velocities of the EUC are centered at the equator, with slightly more transport south of the equator. The other regions of high magnitude currents are the predominant equatorial (SEC, NEC) currents, separated by the lower velocity counter currents.

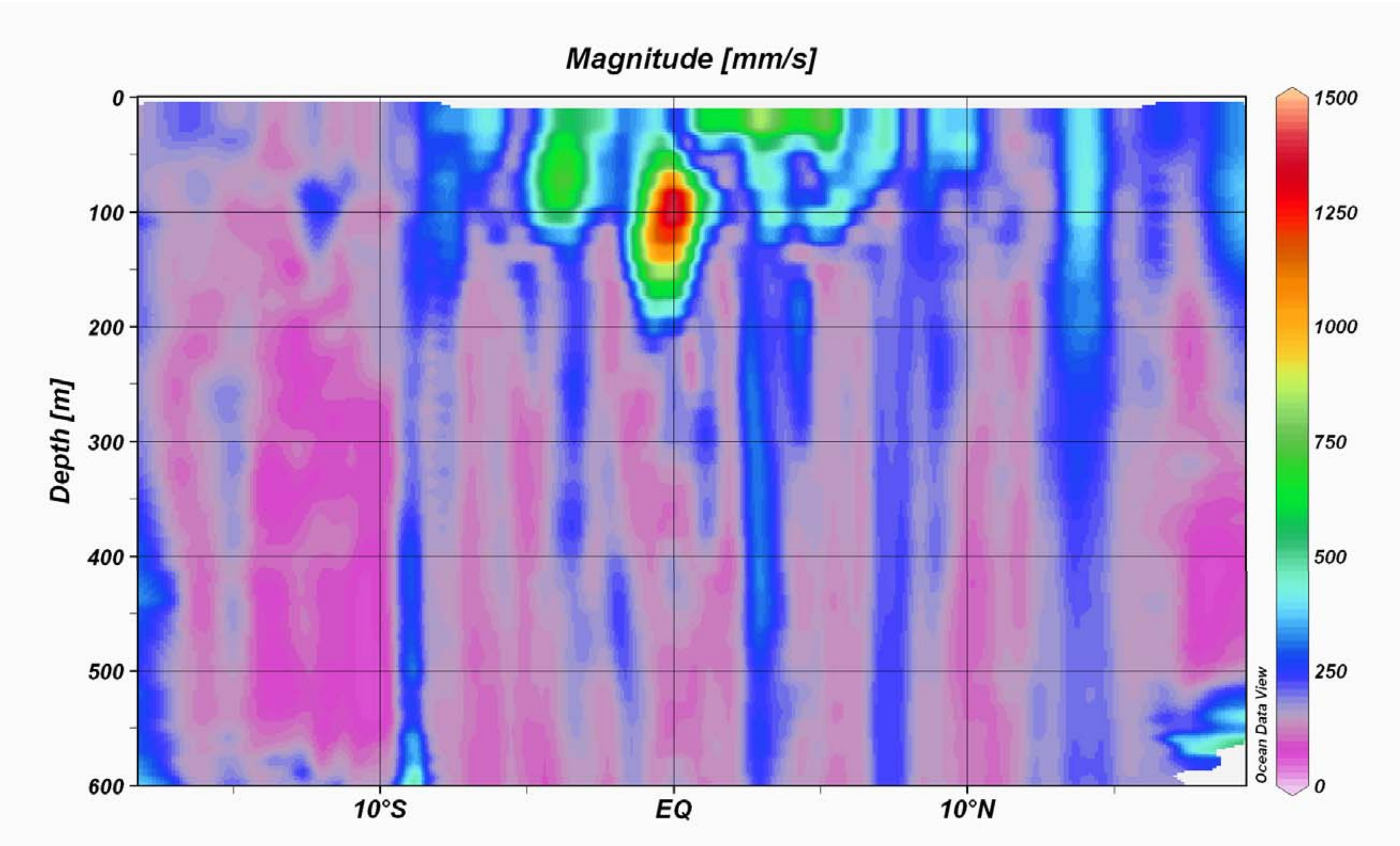
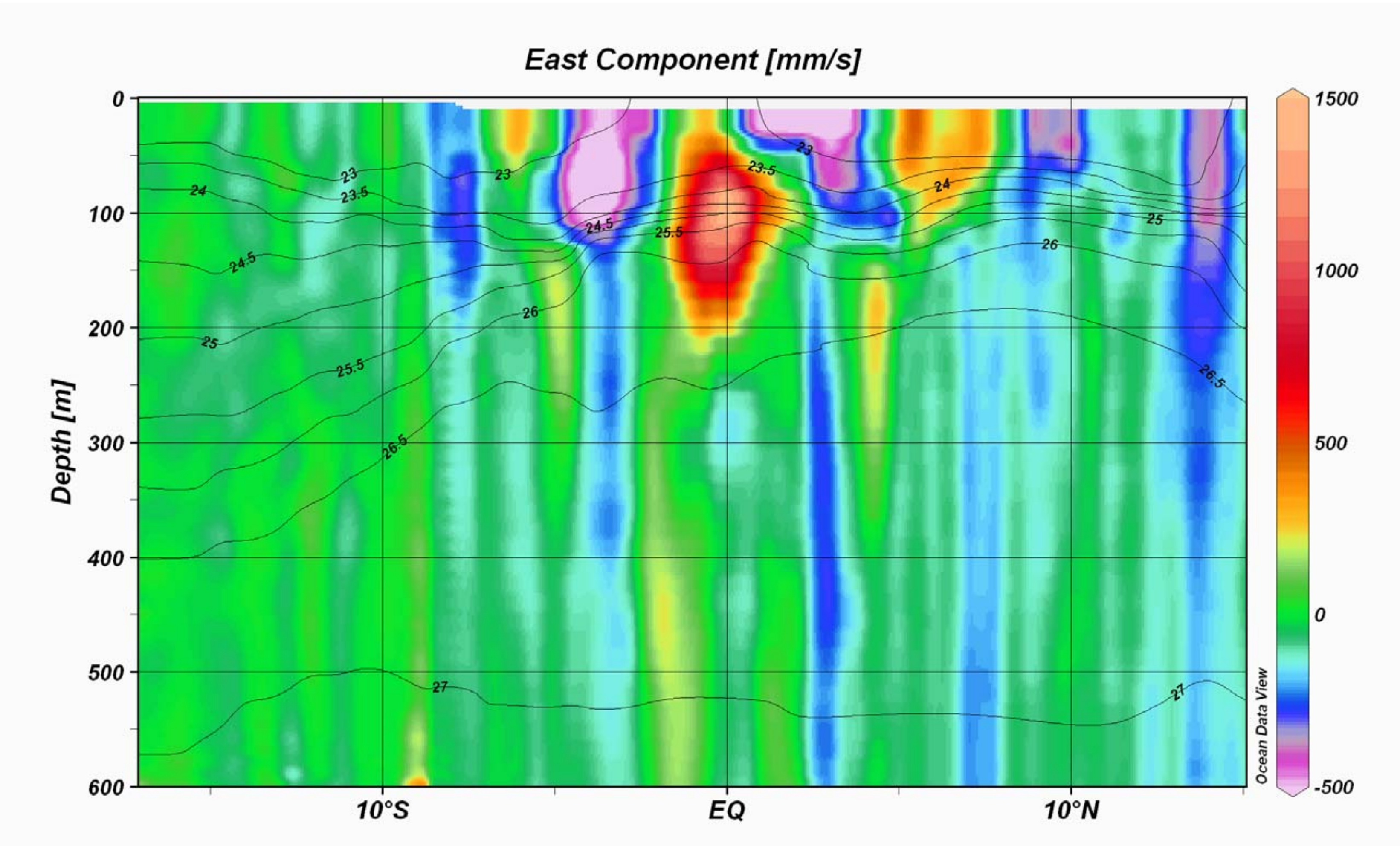


Figure 7. ADCP East component of the velocity, overlain by isopycnals.

Equatorial current structure is clearly visible, including Tsuchiya jets at ~4°S and 4°N. Note that isopycnals are compressed (stronger density gradient), at frontal boundaries.



Student Research Projects, S221

The Effect of Rising Sea Surface Temperatures on ENSO Cycles in the Equatorial Pacific
Sarah Brody

Thermal Energy Transfer and Salt Flux of the Equatorial Undercurrent
Cynthia Landgren and Erin Gilliam

Nutrient upwelling and primary production as a result of the island mass effect
Laura Dismore, Steph Floyd, and Emma Tobias

Microbial abundance within the south pacific subtropical gyre and the equatorial pacific
Tracy Sylvester, Erin O'Reilly, and Athena Aicher

Nutrient Concentration, Depth, and Productivity in the Central Equatorial Pacific
Amanda Chirlin, Ilona Matulaitis, and Brita Stepe

DIC Concentration in the Equatorial Pacific Waters and the Effect on Marine Calcifying Organisms
Amy Beeston, Jackson Elliott, and Allie Ivanowicz

Establishing water masses and currents through the equatorial Pacific
Ryan Hirce & Sarah Kearsley

Surface Zooplankton Density and Diversity in the Equatorial Pacific During a Developing La Niña Cycle
Sarah Buhlman, Douglas Garrison, and Heather Gladstone

Class photos.