NOAA Technical Memorandum ERL AOML-88

WINDWARD ISLAND PASSAGES MONITORING PROGRAM: PHYSICAL OCEANOGRAPHIC DATA COLLECTED ON CRUISE WI-07 NOAA SHIP *MALCOLM BALDRIGE* 8-10 JUNE 1993

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Atlantic Oceanographic and Meteorological Laboratory
Miami, Florida
November 1995

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WINDWARD ISLAND PASSAGES MONITORING PROGRAM

PHYSICAL OCEANOGRAPHIC DATA COLLECTED ON CRUISE

WI - 07 NOAA Ship *Malcom Baldrige* 8 - 10 June 1993

W. D. Wilson[1], W. E. Johns[2], S. C. Tosini[1]

ABSTRACT. During 1991, a collaborative program between the United Sates and Barbados was established with the support of NOAA's Climate and Global Change Atlantic Climate Change Program, to conduct regular measurements of the transport and water mass characteristics in the major southern passages to the Caribbean Sea. The purpose of the program is to determine the quantity and time-variability of South Atlantic surface, thermocline, and intermediate waters flowing into the North Atlantic in compensation for southward cross-equatorial transport of North Atlantic Deep Water, and to establish an economical means for future monitoring of this transport loop. This report contains data collected on cruise WI - 07 of this program. This cruise utilized the NOAA Ship *Malcom Baldrige,* a class I oceanographic research vessel equipped to perform comprehensive hydrographic measurements including $CTDO_2$ profiles and water samples, velocity profiles on station using a Lowered Acoustic Doppler Profiler (LADCP), underway velocity profile measurements using a hull mounted Acoustic Doppler Current Profiler (ADCP), and underway sea surface temperature and salinity monitoring using a Thermosalinograph (TSG).

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INTRODUCTION

The Windward Islands Passages Monitoring Program is an experiment designed to monitor water mass properties and transport between the Atlantic Ocean and the Caribbean Sea through the Windward Island Passages. The project is supported by NOAA's Office of Climate and Global Change and the Atlantic Climate Change Program.

Quantity and time variability of the flow of water of southern hemisphere origin into the Caribbean Sea and through the Straits of Florida is an unknown factor of significant importance to any attempts to estimate Atlantic interhemispheric heat flux. Analyses of historical data suggest that the amount of South Atlantic thermocline and intermediate water flowing northward through the Caribbean and Straits of Florida may be enough to balance the deep southward transport of cold waters in the Atlantic thermohaline circulation. The most likely location for South Atlantic inflow into the Caribbean Sea is through the Windward Island passages south of Dominica. This is also the easiest place to measure, since flow is geographically constrained by the islands, the passages are relatively shallow with sill depths of about 1000 m, and proximity to the equator makes identification of the South Atlantic water masses easier. There are few recent measurements in this region, and no repeated coverage. The latter is especially important since studies to the southeast of this region, along the South American coast, show an energetic eddy regime suggesting that South Atlantic throughflow might be highly episodic. The data will also be of importance to understanding local ocean circulation and its relationship to regional environmental issues and fisheries ecology.

Another goal of this project is to utilize regional resources to maintain an oceanographic measurement program in an area of importance to Atlantic Ocean circulation and climate studies. Data collection consists of regular $CTDO_2$ profiles, water samples, and ADCP current velocity measurements at standard station locations in the Windward Islands passages. In addition to the standard measurements, on WI-07 the NOAA Ship *Malcom Baldrige* collected station data east of the Bahamas and in the Anegada Passage, and underway data along the entire cruise track.

This report contains data collected on the seventh cruise of this project, 8 - 10 June 1993. The general area of operation is shown in Figure 1, and the specific locations of the standard oceanographic stations occupied during these cruises are shown in Figure 2. The cruise track for the entire WI-07 cruise is shown in figure 3.

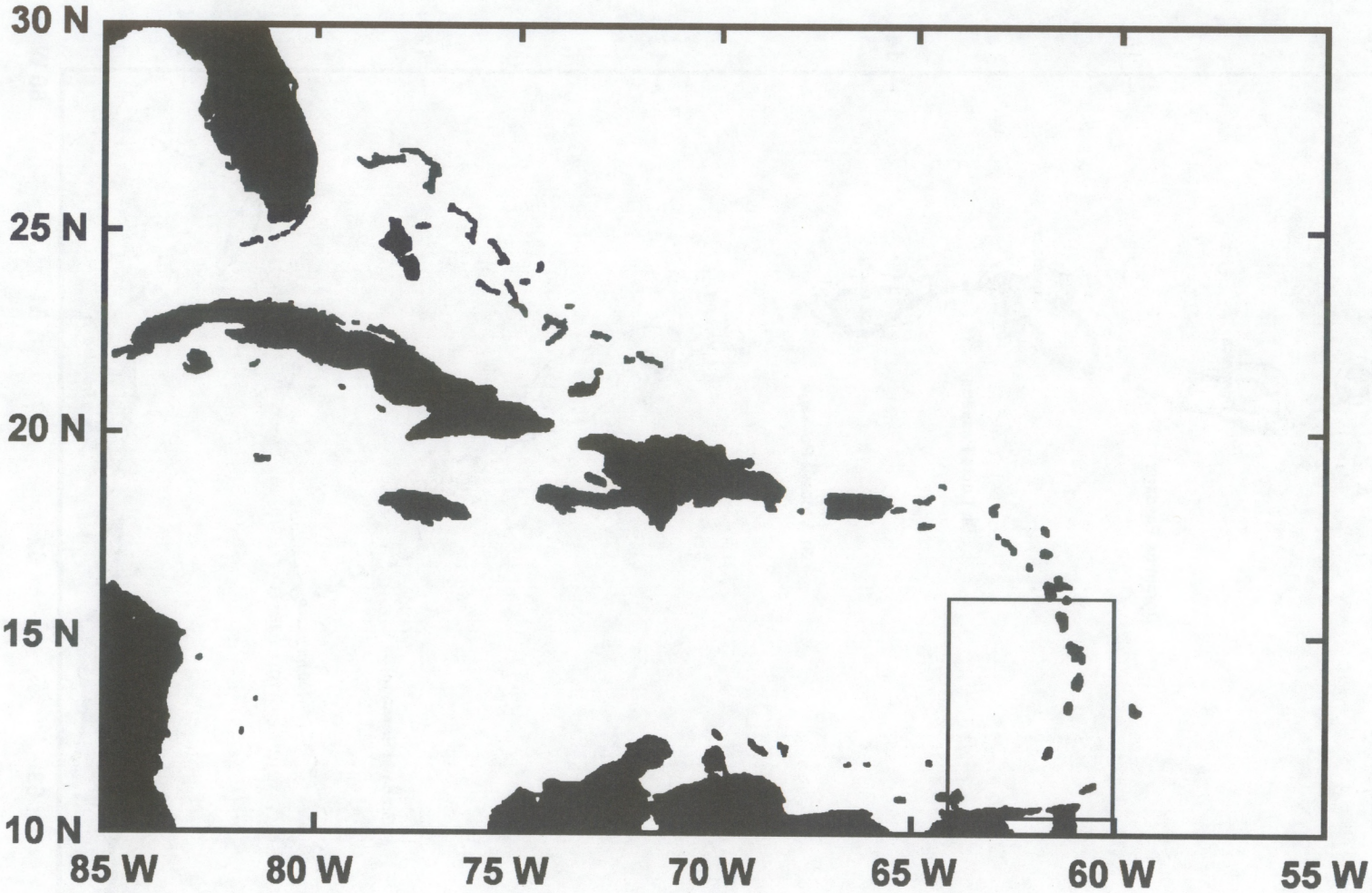


Figure 1. Location of Windward Islands Passages Monitoring Program region within the Greater Caribbean Basin

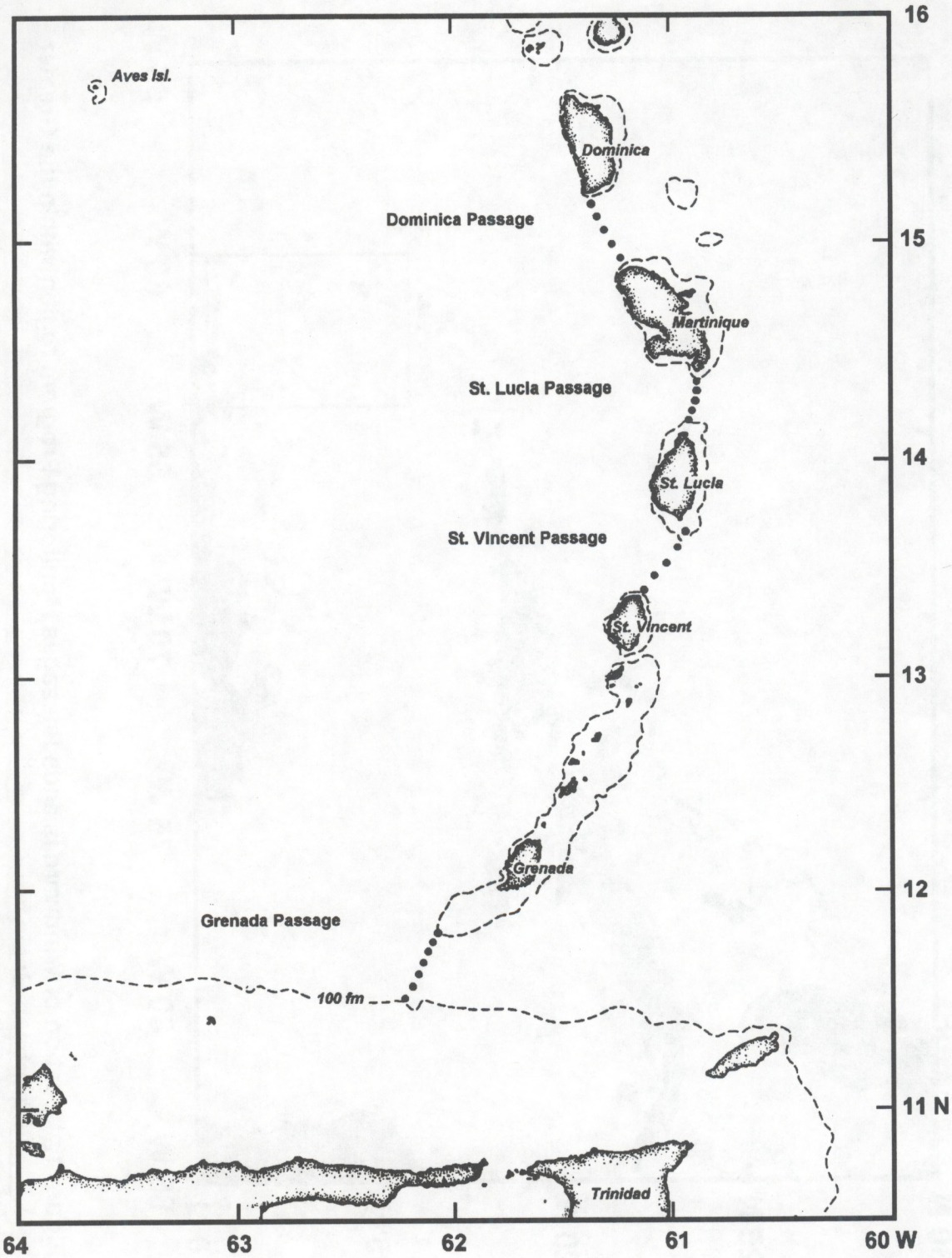
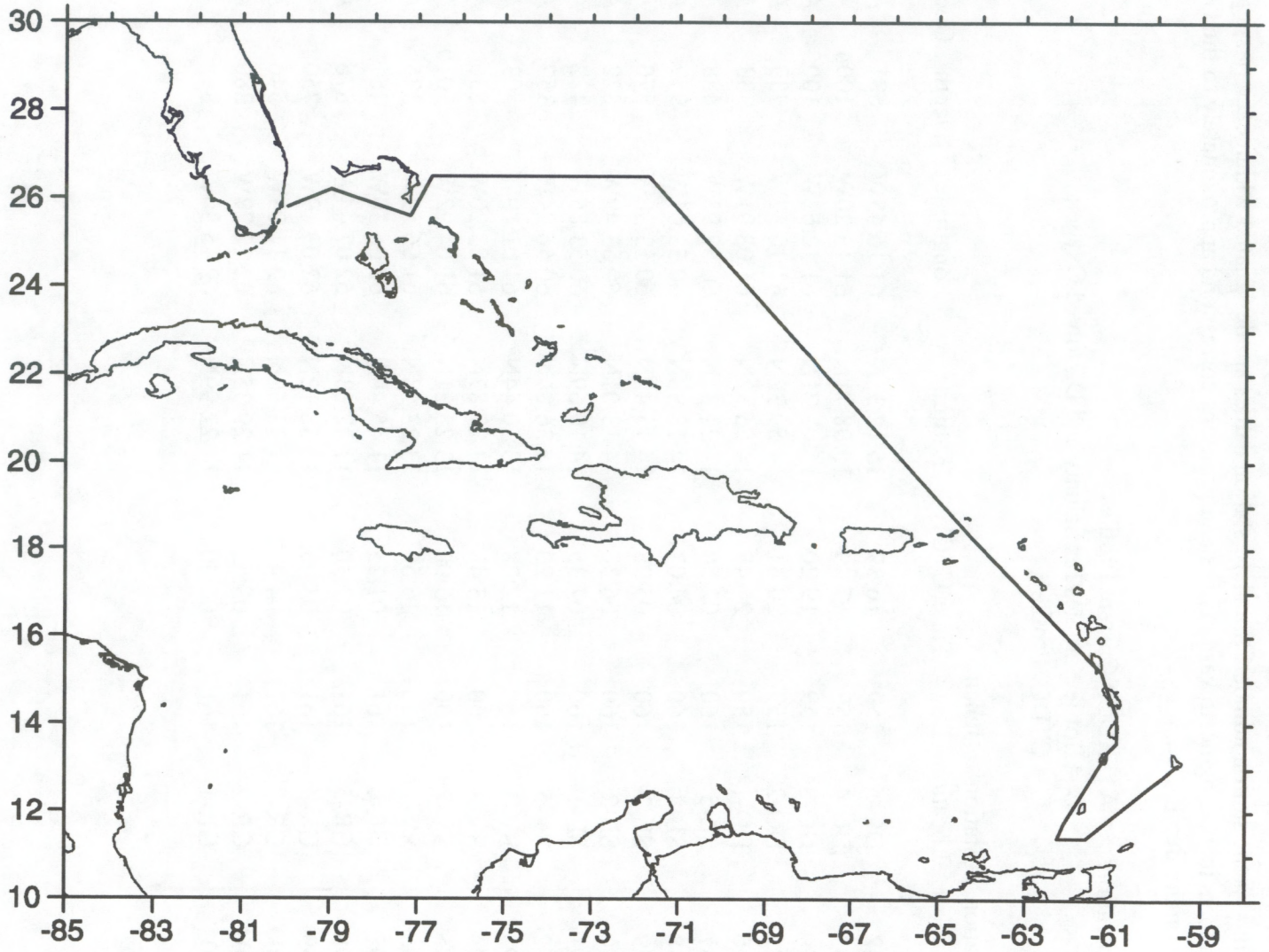


Figure 2. Windward Islands Passages Monitoring Program region, showing station locations.

FIGURE 3. - NOAA SHIP MALCOM BALDRIGE - WI-07

MIAMI, FL - BRIDGETOWN, BARBADOS - JUNE 1993



STATION INFORMATION for WI - 07

Cruise WI - 07 was carried out on the NOAA Ship MALCOM BALDRIGE over the period of 8 - 10 June 1993. The following table lists stations occupied and summarizes operations. Individual stations are numbered consecutively throughout the project and referred to as W ###, with ### the station number. Standard station names are designated within each passage with numbers increasing northward. Times and positions correspond approximately to the CTD at maximum depth.

Operations: A = ADCP Current Profile
B = Bottle Samples for Salinity and Dissolved Oxygen
C = $CTDO_2$ Profile

Station Number	Station Location	Julian Day	Time(UTC)	Latitude	Longitude	Depth	Operations
82	DO-5	159	16:39	15 12.35N	61 16.45W	681	A,B,C
83	DO-4	159	17:49	15 08.71N	61 15.20W	1004	A,B,C
84	DO-3	159	19:20	15 03.71N	61 12.62W	1005	A,B,C
85	DO-2	159	20:41	14 59.32N	61 10.52W	739	A,B,C
86	DO-1	159	21:49	14 56.32N	61 08.91W	333	A,B,C
87	SL-5	160	02:50	14 21.31N	60 52.93W	488	A,B,C
88	SL-4	160	04:03	14 18.38N	60 53.01W	977	A,B,C
89	SL-3	160	05:28	14 15.42N	60 53.30W	870	A,B,C
90	SL-2	160	06:36	14 13.01N	60 53.49W	822	A,B,C
91	SL-1	160	07:35	14 10.69N	60 53.85W	422	A,B,C
92	SV-5	160	11:20	13 36.86N	60 56.24W	357	A,B,C
93	SV-4	160	12:28	13 30.44N	61 01.19W	503	A,B,C
94	SV-3	160	13:48	13 27.87N	61 03.20W	836	A,B,C
95	SV-2	160	15:00	13 25.21N	61 04.92W	1010	A,B,C
96	SV-1	160	15:59	13 22.58N	61 06.59W	385	A,B,C
97	GR-6	161	01:25	11 45.40N	62 06.30W	461	A,C
98	GR-5	161	02:30	11 42.63N	62 07.44W	876	A,B,C
99	GR-4	161	03:43	11 38.12N	62 09.19W	750	A,B,C
100	GR-3	161	04:47	11 33.52N	62 11.03W	546	A,B,C
101	GR-2	161	05:43	11 29.35N	62 12.77W	280	A,B,C
102	GR-1	161	06:40	11 22.99N	62 15.30W	89	A,B,C

Station DATA

$CTDO_2$ DATA

$CTDO_2$ profile data were collected using a SEABIRD SBE Model 19 CTD with pumped conductivity and dissolved oxygen sensors, sampling at 2 Hz. Relevant information on the $CTDO_2$ instrument is summarized below. Profiles of temperature, salinity, and dissolved oxygen concentration for each station, along with a listing of values at standard depths, are shown in Appendices A and B. Corrected CTD salinity values, based on post-cruise instrument calibrations and comparison with bottle samples, are estimated to be accurate to better than 0.005 PSU. CTD and bottle oxygen values were similarly compared and CTD dissolved oxygen values are estimated to be accurate to 0.05 ml/liter.

$CTDO_2$ Instrument Information for WI - 07

Model SBE 19-01	S/N 195075-0822		
Instrument type	SEACAT PROFILER		
Firmware Version	2.1		
Pressure Sensor	3000 psi S/N 145868	Calibrated	March 1993
DO Sensor	YSI S/N 230297	Calibrated	March 1993
Conductivity Sensor	S/N 0822	Calibrated	March 1993
Temperature Sensor	S/N 0822	Calibrated	March 1993
Pump	S/N 050457		

Salinity and Oxygen Calibration

Water samples for $CTDO_2$ calibration were collected using 10 liter Niskin bottles attached to a rosette firing mechanism. Bottle salinity values were determined using a Guildline 8400 Autosal with an accuracy of 0.002 PSU. Water sample oxygen values were determined using Carpenter's modification of the Winkler method with a computer controlled titrator with photometric endpoint determination. Bottle data used for salinity and oxygen calibration are shown in the following tables. CTD values of Oxygen Current and Oxygen Temperature were also determined at trip depths. CTD oxygen sensor calibration coefficients were determined by a least square fit to the Owens and Millard (1985)[1] algorithm:

In the following tables, PRS is the CTD pressure in decibars, estimated at the time of bottle trip; TEMP is the corresponding CTD temperature in degrees Celsius; Salinity is the salinometer salinity (PSU) for the water sample taken at that depth; Dissolved O_2 is the titrated bottle dissolved oxygen value in ml/l.

[1] Owens, W. B., and R. C. Millard Jr., 1985. A new algorithm for CTD oxygen calibration. *Journal of Physical Oceanography*, 15, 621-631.

BOTTLE SAMPLE DATA: WI-07

Cast #	Bottle #	Pressure decibars	Temperature ° C	Salinity CTD	Salinity bottle	O_2 ml/l CTD	O_2 ml/l bottle
82	1	669.5	6.819	34.712	34.716	2.80	2.78
82	2	592.2	27.683	34.795	34.799	2.72	2.71
82	3	394.2	10.625	35.131	35.132	2.70	2.70
82	4	196.1	17.984	36.248	36.256	3.15	3.14
82	5	120.7	24.192	36.518	36.544	3.85	3.85
82	6	52.3	27.682	35.581	35.611	4.46	4.46
82	7	12.4	28.267	34.710	34.715	4.47	4.47
83	1	993.0	5.260	34.877	34.882	3.85	3.82
83	2	791.1	6.094	34.712	34.713	2.95	2.93
83	3	592.2	7.372	34.762	34.759	2.71	2.71
83	4	395.3	10.583	35.124	35.124	2.68	2.68
83	5	200.0	18.365	36.348	35.125*	3.16	3.16
83	6	121.4	23.677	36.591	36.601	3.73	3.75
83	7	54.1	27.788	35.543	35.563	4.47	4.49
83	8	17.5	28.136	35.126	35.126	4.44	4.47
84	1	994.7	5.202	34.869	34.873	3.84	3.80
84	2	793.7	6.033	34.745	34.743	3.05	2.73
84	3	595.3	7.218	34.747	34.743	2.73	2.73
84	4	394.6	10.454	35.120	35.115	2.69	2.68
84	5	199.4	18.382	36.395	36.388	3.19	3.16
84	6	121.9	23.389	36.507	36.513	3.76	3.76
84	7	54.9	27.573	35.961	35.972	4.52	4.53
84	8	14.5	28.140	35.129	35.140	4.48	4.47
85	1	727.6	6.925	34.757	34.757	2.81	2.82
85	2	590.7	7.138	34.741	34.740	2.75	2.75
85	3	394.7	10.648	35.139	35.137	2.70	2.71
85	4	197.0	18.409	36.491	36.495	3.22	3.23
85	5	120.6	23.416	36.545	36.548	3.74	3.77
85	6	53.0	27.400	36.061	36.063	4.49	4.57
85	7	13.4	28.222	35.096	35.133	4.46	4.51
86	1	325.4	13.450	35.631	35.625	2.86	2.85
86	2	192.1	18.027	36.412	36.410	3.18	3.17
86	3	95.8	24.572	36.535	36.527	3.94	3.93
86	4	46.5	27.062	36.105	36.087	4.40	4.40
86	5	8.0	28.168	35.183	35.214	4.47	4.51
87	1	480.4	10.508	35.190	35.190	2.72	2.70
87	2	393.1	11.323	35.267	35.276	2.75	2.74
87	3	193.5	17.994	36.234	36.229	3.23	3.21
87	4	114.8	24.323	36.818	36.814	4.07	4.07
87	5	47.3	27.214	36.036	36.055	4.53	4.54
87	6	10.3	28.511	34.107	34.106	4.46	4.45

Cast #	Bottle #	Pressure decibars	Temperature ° C	Salinity CTD	Salinity bottle	O_2 ml/l CTD	O_2 ml/l bottle
88	8	15.9	28.528	34.079	34.077	4.44	4.46
89	1	860.5	6.005	34.779	34.777	3.17	3.17
89	2	790.5	6.173	34.771	34.767	3.08	3.08
89	3	592.1	8.064	34.853	34.855	2.68	2.69
89	4	394.3	10.980	35.247	35.258	2.69	2.71
89	5	197.7	18.708	36.332	36.321	3.23	3.22
89	6	121.5	23.758	36.948	36.951	3.97	3.97
89	7	53.9	27.185	36.074	36.078	4.61	4.62
89	8	14.3	28.541	34.108	36.075*	4.43	4.45
90	4	199.6	16.371	36.013	36.020	2.99	3.01
90	5	121.2	23.471	36.990	36.998	3.86	3.85
90	6	53.9	27.309	35.913	36.013	4.45	4.43
90	7	17.4	28.523	34.121	34.126	4.44	4.45
91	1	414.3	9.375	35.028	99.999	2.66	2.68
91	2	193.6	17.489	36.149	99.999	3.07	9.99
91	3	116.7	22.747	36.606	36.600	3.74	3.75
91	4	50.2	26.109	36.346	36.376	4.27	4.23
91	5	10.4	28.498	34.160	34.155	4.42	4.44
92	1	346.6	11.170	35.234	35.229	2.73	2.74
92	2	191.3	18.854	36.562	36.486	3.39	3.77
92	3	113.9	22.522	36.478	36.484	3.79	3.77
92	4	44.3	27.132	36.022	36.060	4.56	4.54
92	5	8.4	28.454	34.434	34.428	4.45	4.44
93	1	492.6	8.066	34.793	34.790	2.67	2.66
93	2	389.3	9.145	34.899	34.907	2.65	2.66
93	3	192.1	16.258	36.052	36.029	3.01	3.00
93	4	115.0	24.749	37.167	37.174	4.32	4.26
93	5	49.4	27.529	35.410	35.445	4.52	4.50
93	6	13.0	28.394	34.302	34.326	4.47	4.46
94	1	825.7	5.317	34.698	34.699	3.28	3.28
94	2	589.6	7.509	34.727	34.948*	2.72	2.59*
94	3	388.0	9.513	34.949	34.948	2.58	2.59
94	4	196.1	16.618	36.091	36.074	3.04	3.01
94	5	98.1	24.850	36.888	36.926	4.16	4.11
94	6	51.8	27.498	35.462	35.483	4.56	4.54
94	7	15.0	28.430	34.224	34.233	4.49	4.51
95	1	997.9	5.046	34.819	34.821	3.80	3.77
95	2	789.7	6.488	34.664	34.711*	2.85	2.75*
95	3	593.0	7.164	34.711	34.712	2.74	2.74
95	4	394.8	10.384	35.099	35.096	2.68	2.68
95	5	196.9	17.616	36.257	36.254	3.10	3.08
95	6	120.2	21.537	36.952	36.955	3.52	3.49
95	7	53.3	26.966	35.943	35.945	4.51	4.49
95	8	17.6	28.472	34.183	34.185	4.48	4.46

Cast #	Bottle #	Pressure decibars	Temperature ° C	Salinity CTD	Salinity bottle	O_2 ml/l CTD	O_2 ml/l bottle
96	1	377.2	10.483	35.153	35.135	2.72	2.72
96	2	194.3	15.308	35.925	35.915	3.01	3.01
96	3	115	22.383	36.972	36.917	3.67	3.62
96	4	47.7	27.161	35.86	35.861	4.59	4.57
96	5	10.5	28.563	34.204	34.202	4.47	4.46
98	2	789.5	5.524	34.650	34.673	3.01	2.78
98	3	589.9	6.787	34.677	34.673	2.76	2.78
98	4	393.3	8.836	34.864	34.854	2.51	2.53
98	5	196.6	16.391	36.096	36.089	2.91	2.92
98	6	114.9	20.725	36.391	36.400	3.59	3.52
98	7	51.0	26.399	36.468	36.488	4.69	4.68
98	8	11.9	28.140	34.655	34.659	4.46	4.46
99	1	740.6	5.718	34.642	99.999	2.94	2.96
99	2	592.3	6.343	34.658	35.081*	2.81	2.66*
99	3	392.1	10.337	35.089	35.082	2.65	2.66
99	4	196.4	17.355	36.255	36.244	2.99	3.01
99	5	121.0	20.231	36.355	36.383	3.48	3.44
99	6	53.7	25.754	36.571	34.872*	4.39	4.48*
99	7	17.8	27.963	34.869	34.869	4.47	4.48
100	1	537.7	7.103	34.721	34.720	2.73	2.75
100	2	393.2	9.141	34.929	36.099*	2.63	3.01*
100	3	195.7	16.632	36.107	36.099	3.02	3.01
100	4	119.5	21.210	36.667	36.667	3.31	3.30
100	5	51.9	25.579	36.582	36.590	4.49	4.46
100	6	12.7	28.002	34.901	34.971	4.46	4.47
101	1	277.8	11.424	35.279	35.269	2.69	2.69
101	2	192.2	17.073	36.206	36.179	3.00	2.98
101	3	115.4	20.300	36.536	36.529	3.23	3.23
101	4	48.0	25.711	36.552	36.551	4.52	4.51
101	5	11.0	28.057	34.800	34.805	4.46	4.44
102	2	45.0	24.974	36.486	35.062*	4.00	4.43*
102	3	5.2	27.834	35.072	35.061	4.45	4.43

* represents an erroneous bottle value, probably due to a trip at improper depth

LOWERED ADCP DATA

Velocity measurements on cruises WI - 07 were made with a lowered RD Instruments self-contained Broadband 300 kHz acoustic Doppler current profiler (ADCP). The ADCP was attached to the CTD frame facing downward, and profiled the entire water column (for details on this technique see Firing and Gordon (1990)[1]; Fischer and Visbeck (1993)[2]; Wilson (1994)[3]. Shear velocity profiles are averaged in 10 meter vertical bins (independent of up- or downcast) and integrated to obtain relative velocity profiles. Up- and downcast comparisons, instrument specifications, and comparisons with Pegasus profilers all suggest that relative profiles are accurate to better than 2 cm/s (Hacker et al., 1995[4]), adequate to measure within the level of natural variability (Send, 1994[5]). The depth-independent component of velocity is determined by ship drift during the cast. During cruise WI - 07 a standard C/A code SPS GPS receiver was used for positioning, introducing depth-averaged velocity errors up to 3 cm/s.

[1] Firing E., and R. L. Gordon (1990). Deep ocean acoustic Doppler current profiling. *Proceedings IEEE Fourth Working Conference on Current Measurements*, Clinton, MD, Current Measurement Technology Committee of the Oceanic Engineering Society. pp. 192 - 201.

[2] Fischer J., and M. Visbeck (1993). Deep Velocity Profiling with Self-contained ADCP's. *Journal of Atmospheric and Oceanic Technology*, **10**, 764 - 773.

[3] Wilson W. D. (1994). Deep ocean current profiling with a broadband acoustic Doppler current profiler. *OCEANS '94 Proceedings*, IEEE/MTS.

[4] Hacker P., E. Firing, W. D. Wilson and R. L. Molinari (1995) Direct observations of the current structure east of the Bahamas. Submitted to *Geophysical Research Letters*.

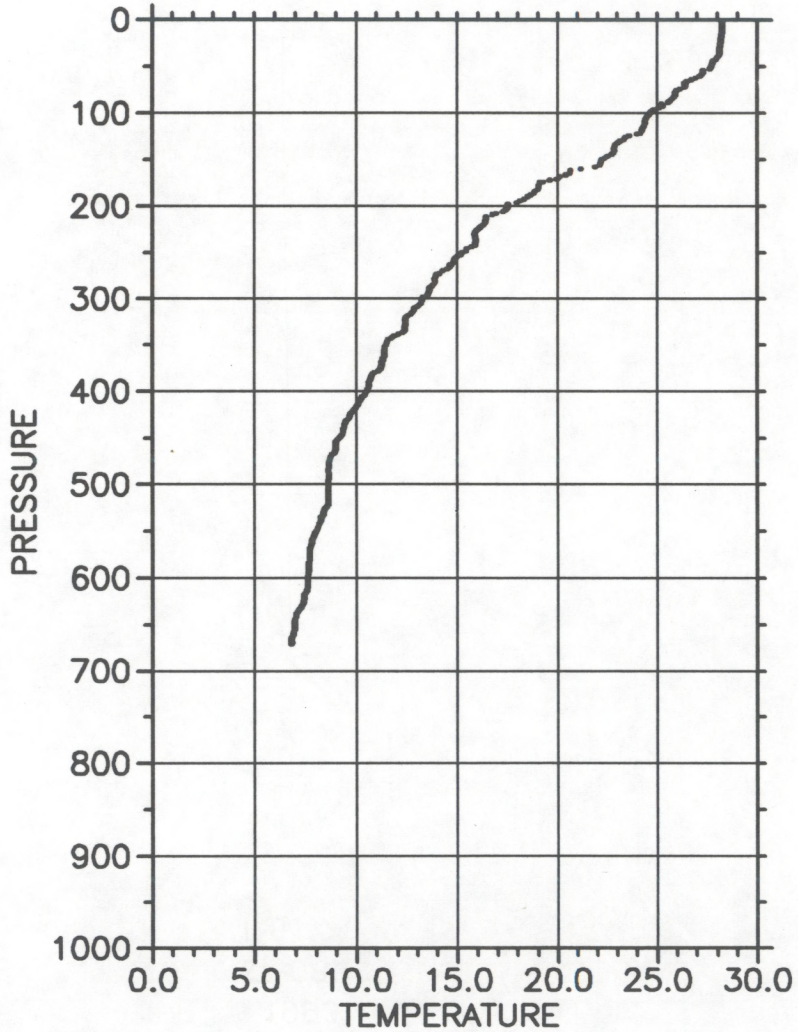
[5] Send U. (1994). Accuracy of current profile measurements: Effect of tropical and midlatitude internal waves. *Journal of Geophysical Research*, **99**, 16,229 - 16,236.

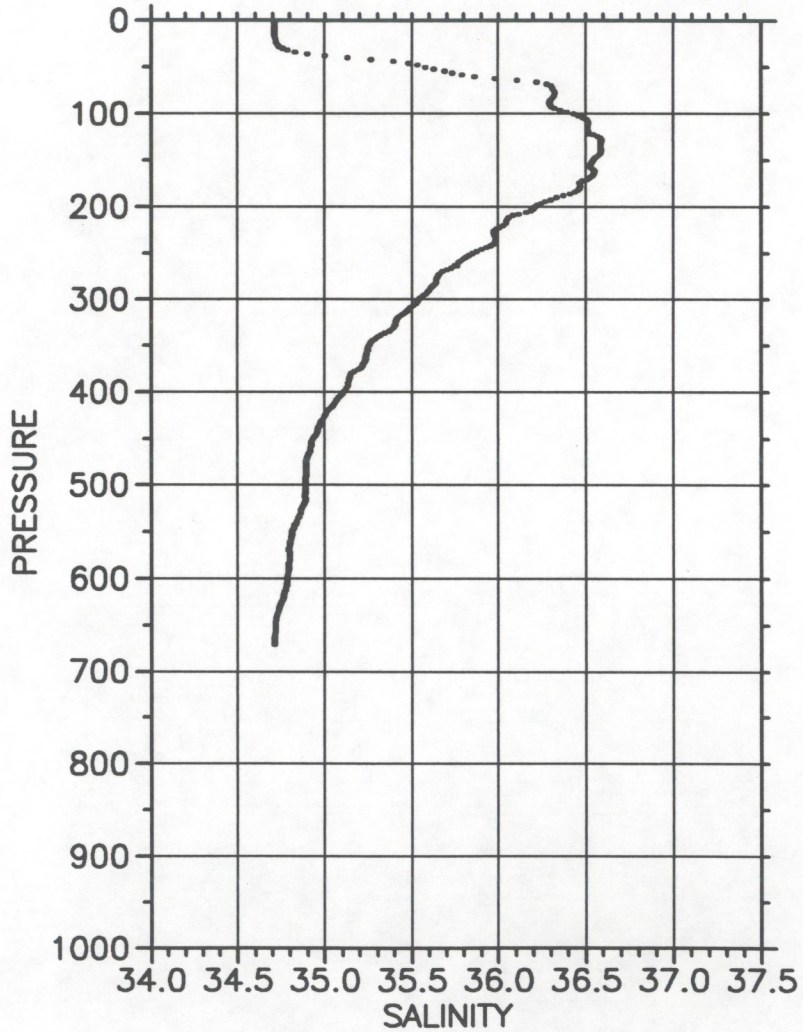
Appendix A for WI - 07

$CTDO_2$ Station Profiles

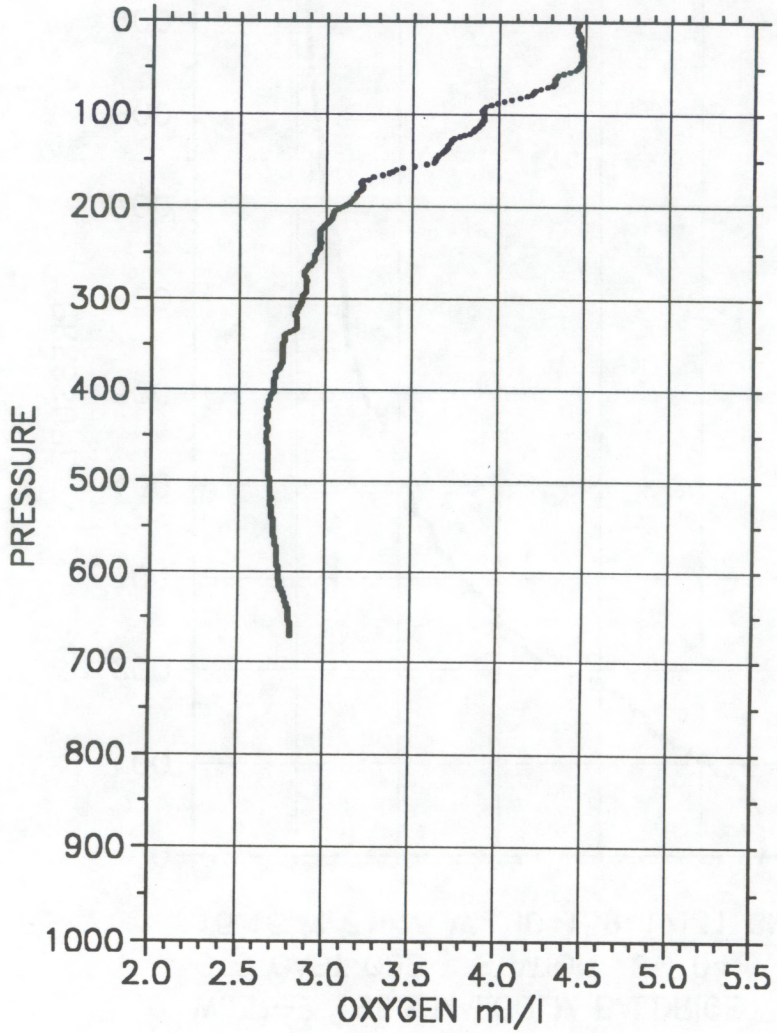
The following plots are based on calibrated downcast CTD values averaged into 2 decibar vertical bins. Pressure values are in decibars; Temperature values are in degrees Celsius; Salinity values are in Practical Salinity Units (PSS-78), and dissolved oxygen values are in milliliters/liter (ml/l).

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 082 STATION DO 05
15.21 N 61.27 W JD 159 16:25 GMT



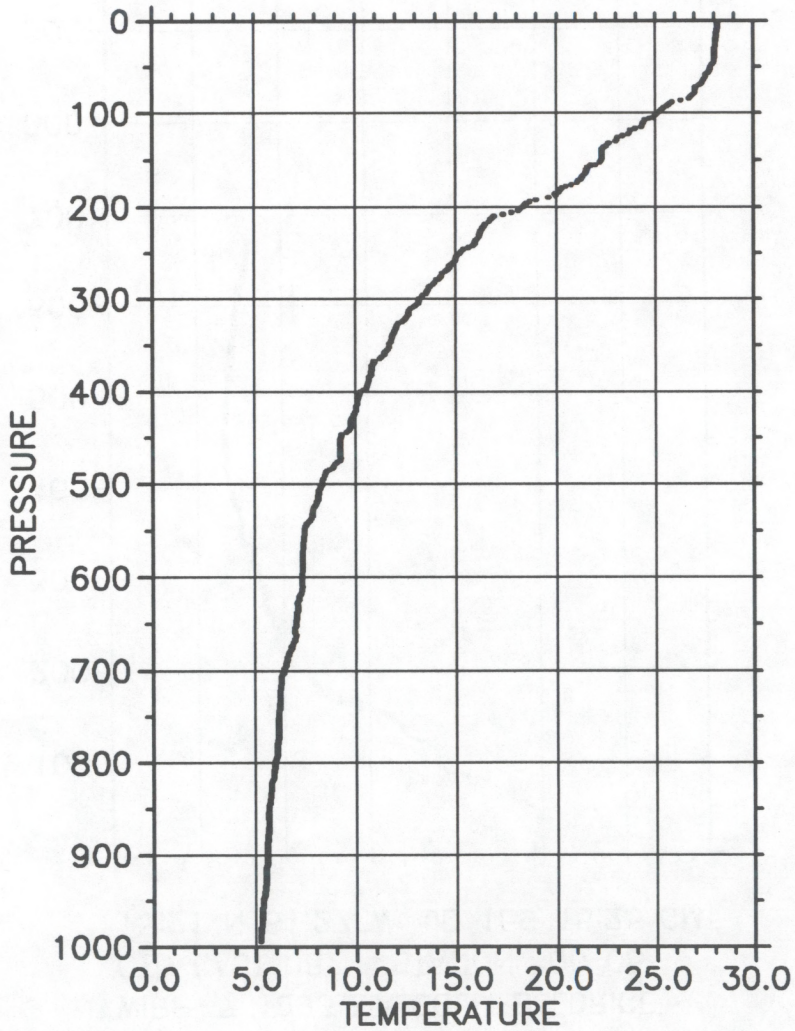


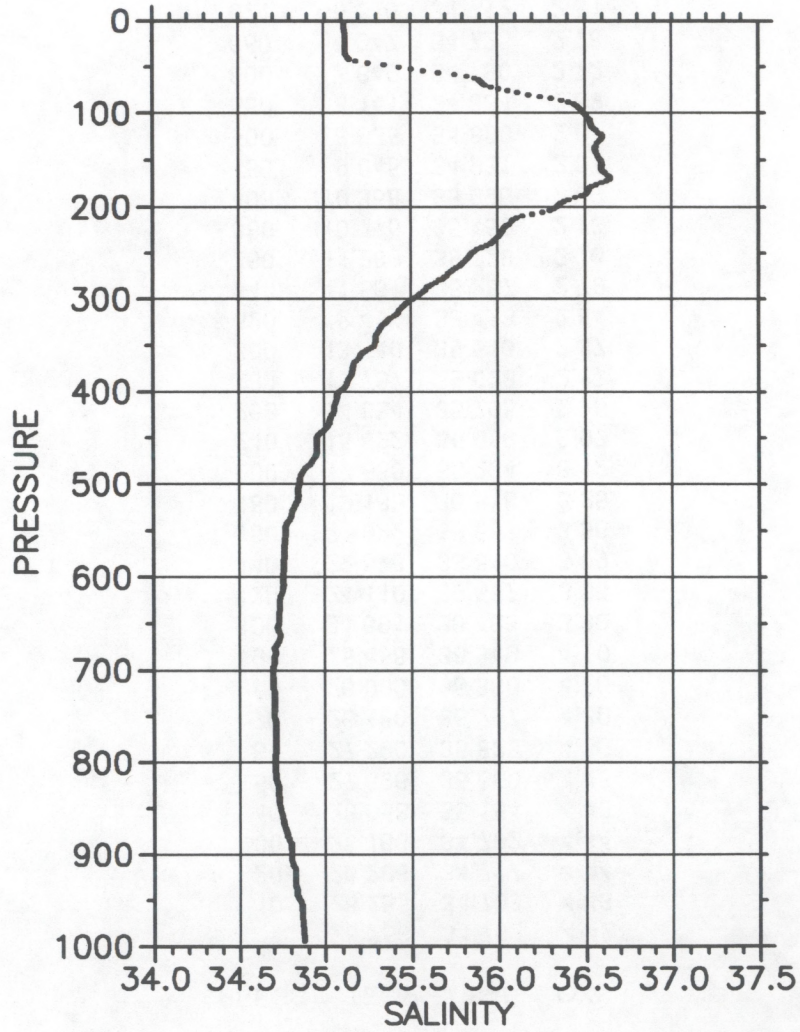
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 082 STATION DO 05
15.21 N 61.27 W JD 159 16:25 GMT



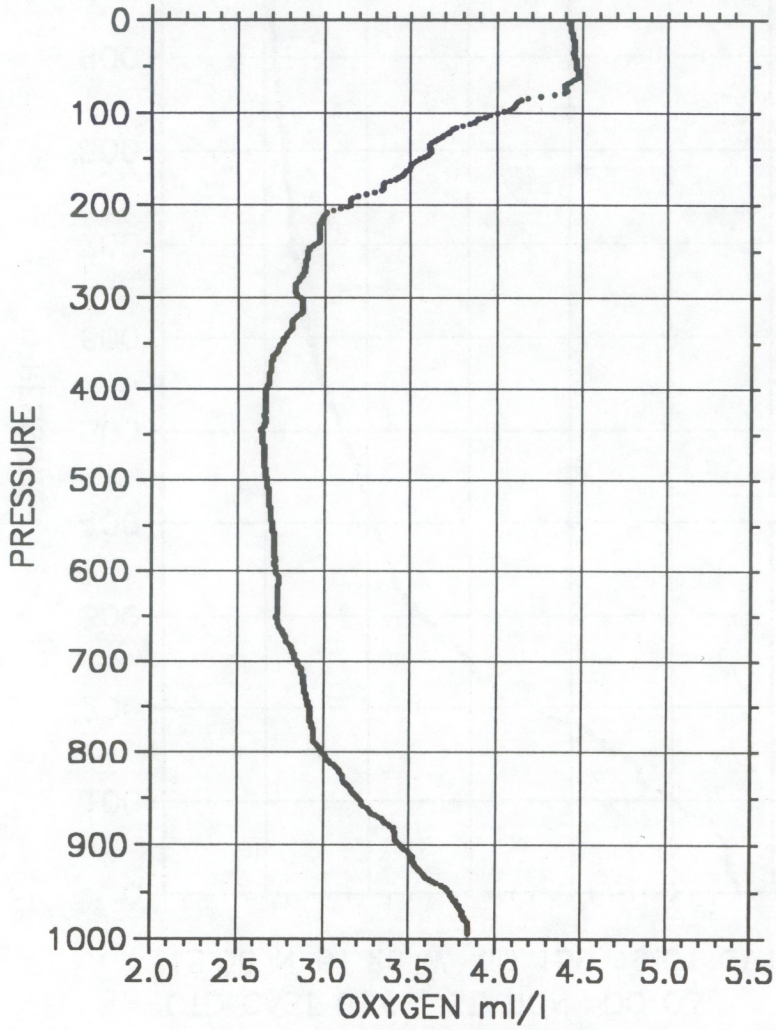
PRESS	TEMP	SAL	OXY
4.	28.258	34.702	4.42
10.	28.255	34.703	4.43
20.	28.206	34.717	4.44
30.	28.166	34.792	4.44
40.	28.058	35.154	4.43
50.	27.696	35.600	4.43
60.	27.290	35.823	4.36
70.	26.480	36.297	4.30
80.	26.000	36.360	4.26
90.	25.458	36.349	4.10
100.	24.691	36.463	3.90
120.	24.110	36.537	3.86
140.	22.876	36.610	3.69
160.	21.922	36.587	3.56
180.	19.180	36.518	3.25
200.	17.530	36.234	3.12
240.	15.822	35.959	2.97
260.	14.854	35.795	2.95
280.	13.757	35.628	2.87
300.	13.140	35.516	2.87
320.	12.454	35.423	2.84
340.	11.561	35.287	2.79
360.	11.280	35.228	2.76
380.	10.775	35.150	2.73
400.	10.368	35.096	2.69
450.	9.045	34.931	2.67
500.	8.635	34.890	2.67
550.	8.141	34.834	2.69
600.	7.649	34.790	2.72
650.	7.047	34.726	2.78
671.	6.816	34.712	2.81

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 083 STATION DO 04
15.15 N 61.25 W JD 159 17:31 GMT



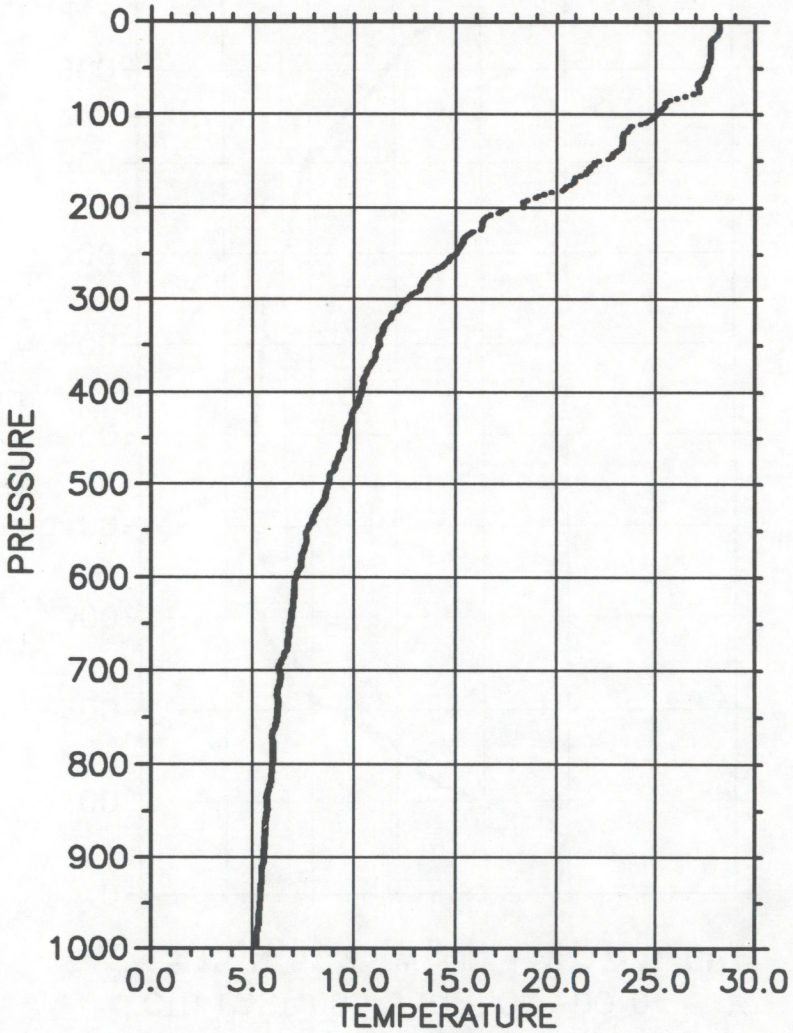


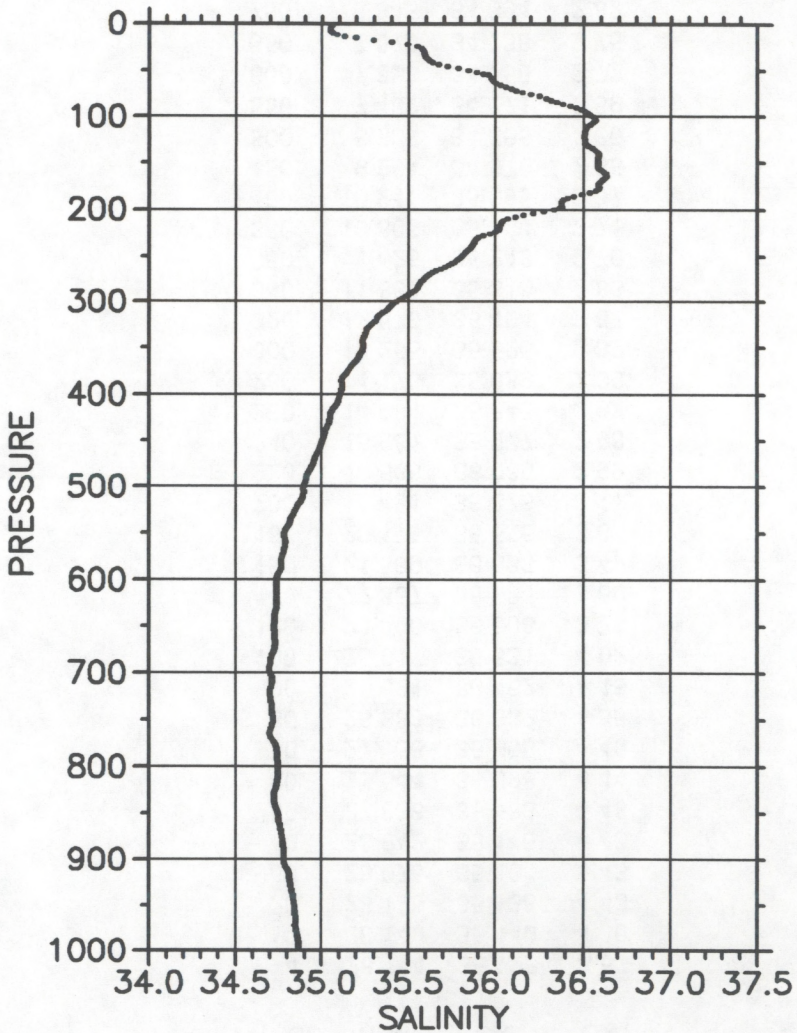
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 083 STATION DO 04
15.15 N 61.25 W JD 159 17:31 GMT

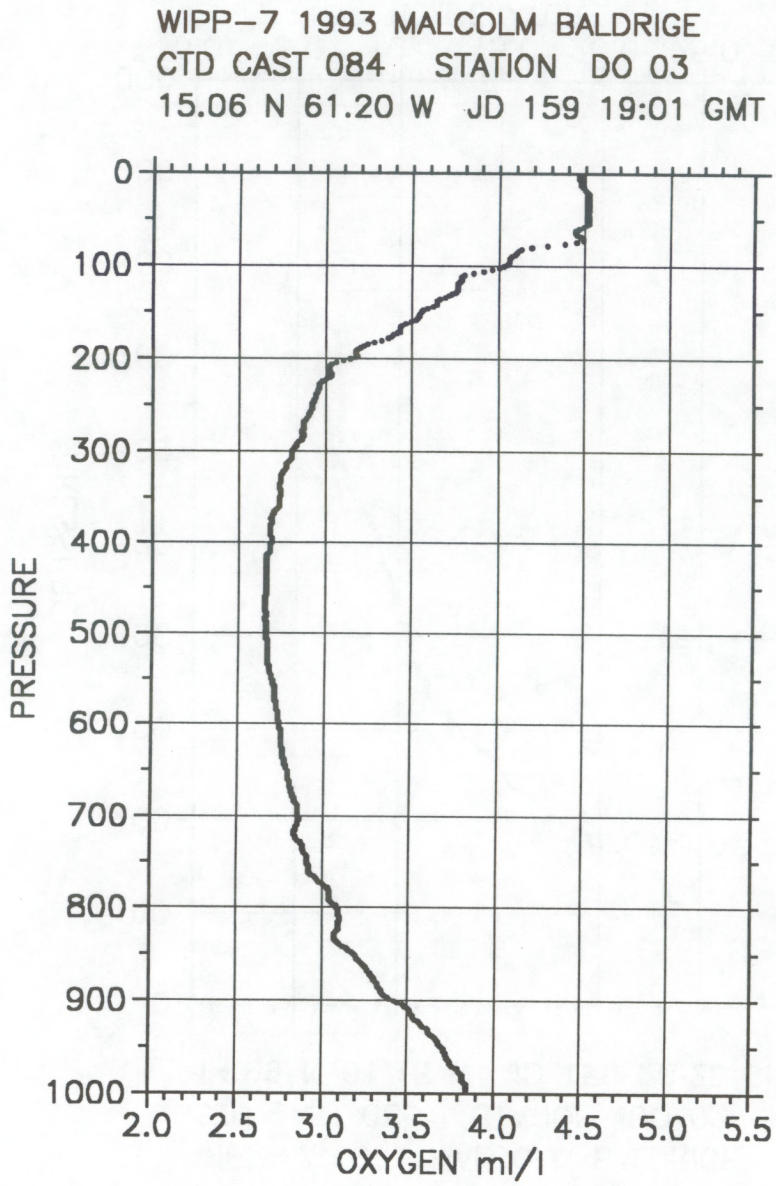


PRESS	TEMP	SAL	OXY
4.	28.144	35.127	3.53
10.	28.149	35.140	4.36
20.	28.125	35.138	4.43
30.	28.075	35.131	4.43
40.	28.042	35.146	4.43
50.	27.836	35.483	4.43
60.	27.544	35.898	4.44
70.	27.156	35.968	4.40
80.	26.883	36.232	4.35
90.	25.691	36.462	4.15
100.	25.017	36.531	4.02
120.	23.490	36.608	3.71
140.	22.367	36.584	3.60
160.	21.569	36.633	3.49
180.	20.175	36.556	3.35
200.	18.451	36.376	3.17
220.	16.536	36.080	2.99
240.	15.981	35.977	2.98
260.	14.981	35.845	2.92
280.	14.173	35.689	2.89
300.	13.255	35.526	2.82
320.	12.570	35.404	2.87
340.	11.867	35.316	2.83
360.	11.426	35.243	2.76
380.	10.806	35.164	2.71
400.	10.241	35.095	2.67
450.	9.294	34.970	2.65
500.	8.337	34.865	2.66
550.	7.482	34.771	2.69
600.	7.363	34.756	2.72
650.	7.073	34.738	2.75
700.	6.345	34.694	2.82
750.	6.197	34.703	2.91
800.	5.974	34.711	2.97
850.	5.680	34.733	3.12
900.	5.593	34.801	3.40
950.	5.461	34.840	3.58
994.	5.276	34.878	3.82

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 084 STATION DO 03
15.06 N 61.20 W JD 159 19:01 GMT

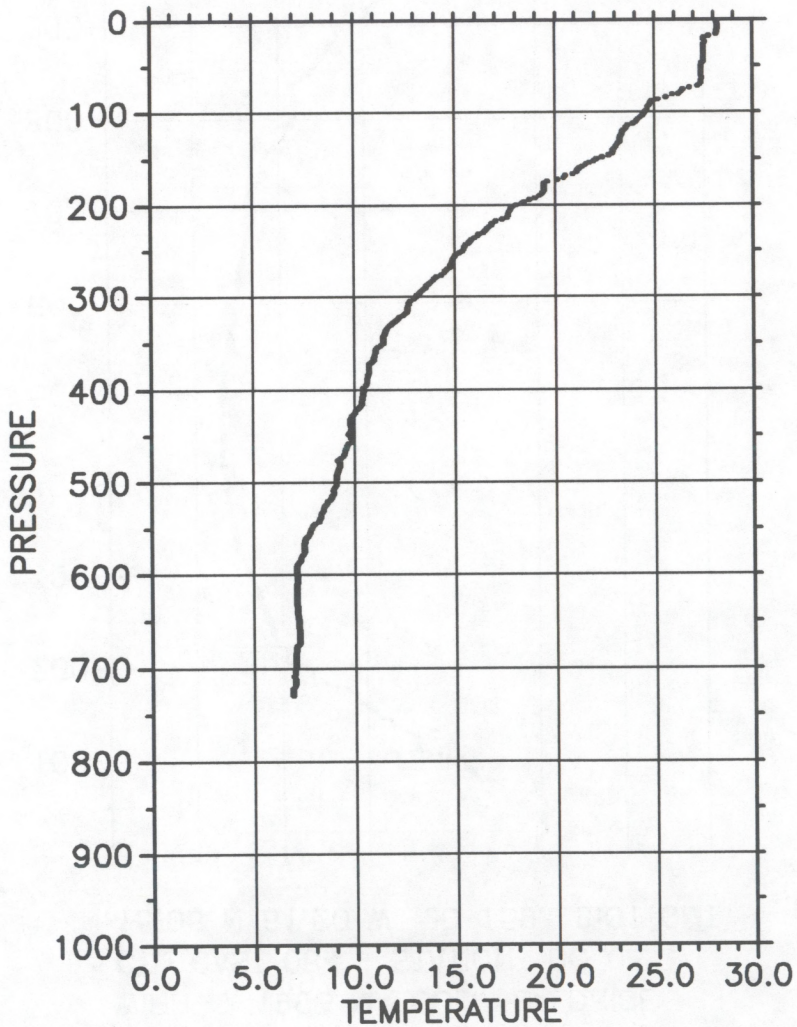


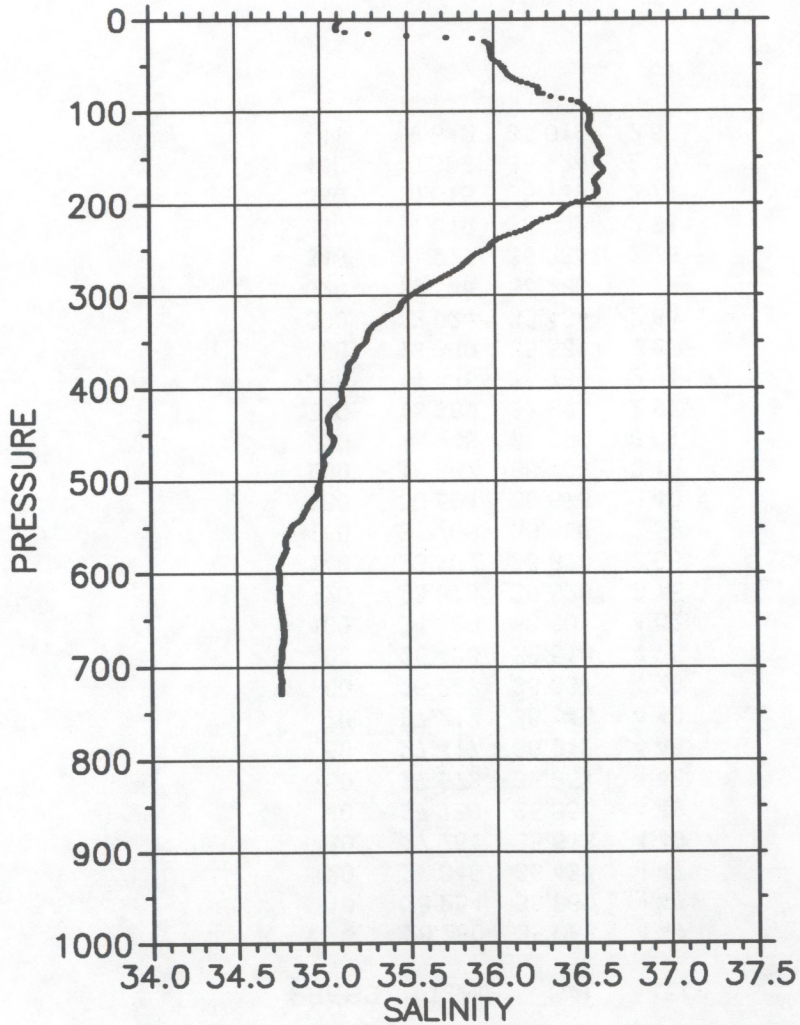




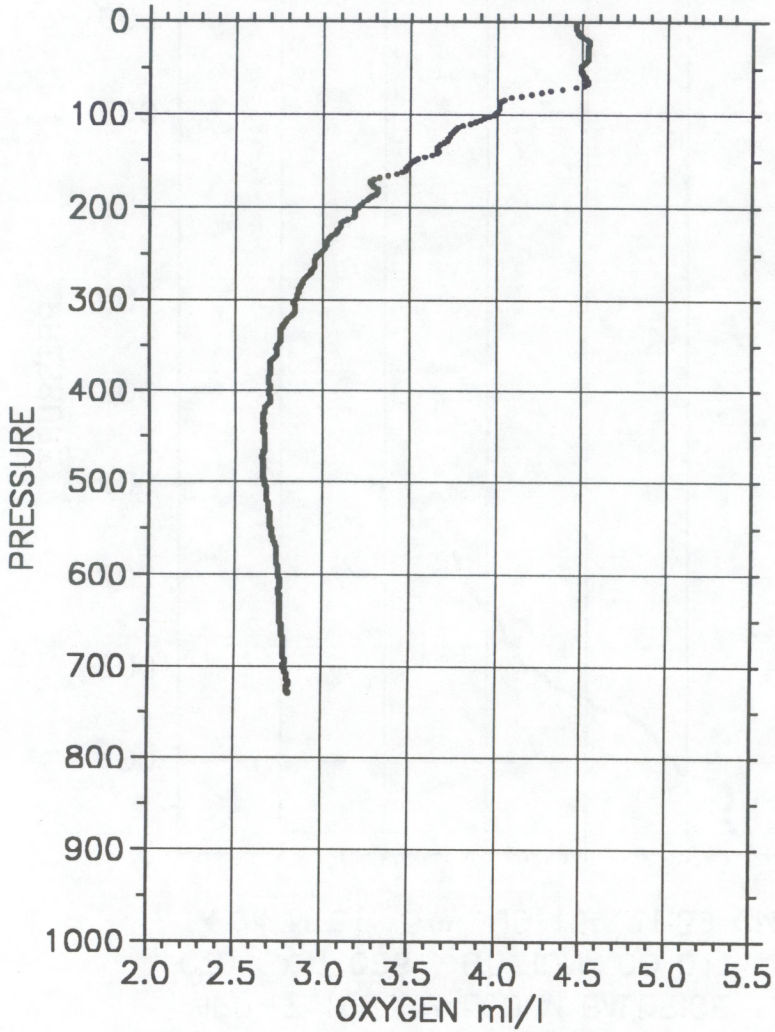
PRESS	TEMP	SAL	OXY
4.	28.250	35.053	4.47
10.	28.254	35.060	4.47
20.	27.846	35.437	4.47
30.	27.761	35.613	4.49
40.	27.766	35.656	4.49
50.	27.573	35.951	4.48
60.	27.417	36.012	4.46
70.	27.217	36.145	4.40
80.	26.268	36.337	4.29
90.	25.433	36.510	4.05
100.	24.980	36.601	4.02
120.	23.370	36.526	3.75
140.	23.102	36.628	3.63
160.	21.766	36.656	3.52
180.	20.504	36.678	3.40
200.	18.307	36.400	3.16
220.	16.248	36.060	3.01
240.	15.389	35.905	2.97
260.	14.435	35.739	2.91
280.	13.360	35.581	2.87
300.	12.524	35.434	2.84
320.	11.548	35.285	2.77
340.	11.227	35.235	2.75
360.	11.019	35.208	2.73
380.	10.615	35.139	2.71
400.	10.398	35.124	2.70
441.	9.642	35.019	2.67

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 085 STATION DO 02
14.99 N 61.18 W JD 159 20:25 GMT



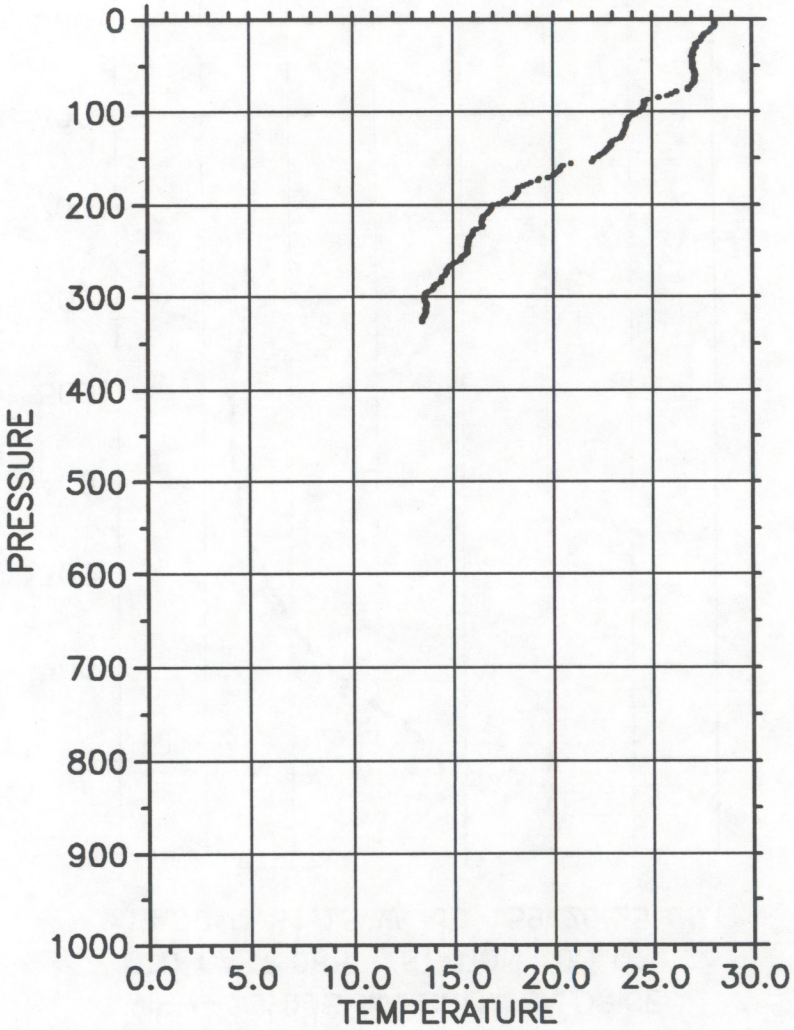


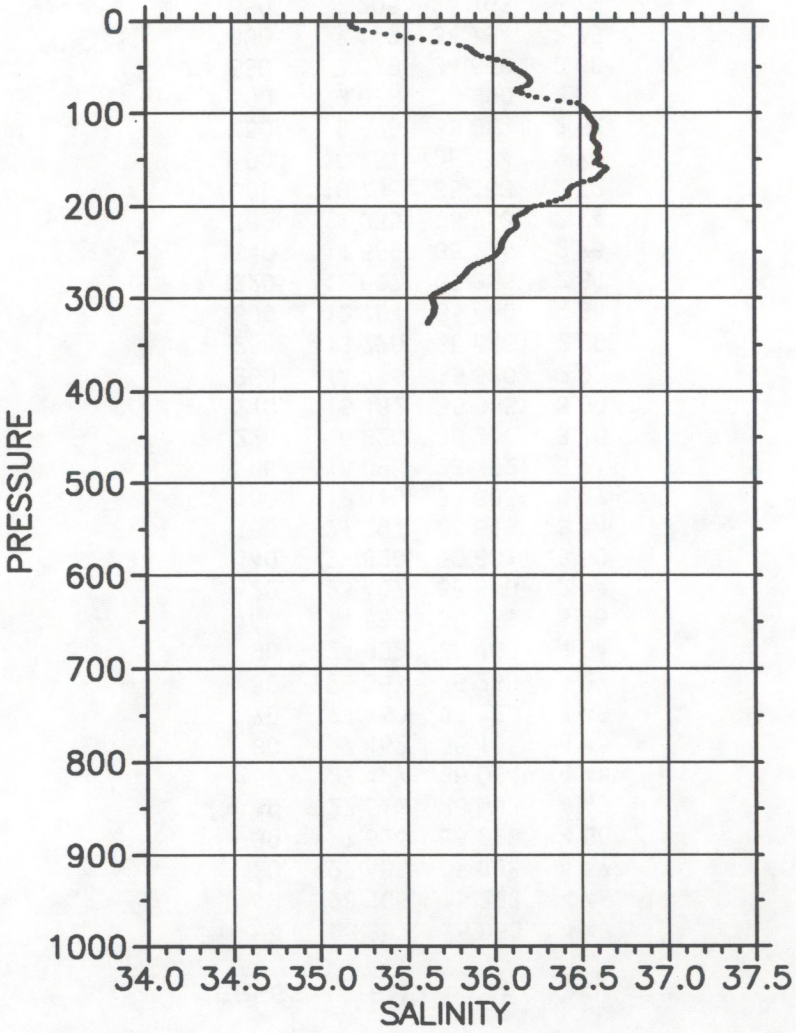
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 085 STATION DO 02
14.99 N 61.18 W JD 159 20:25 GMT

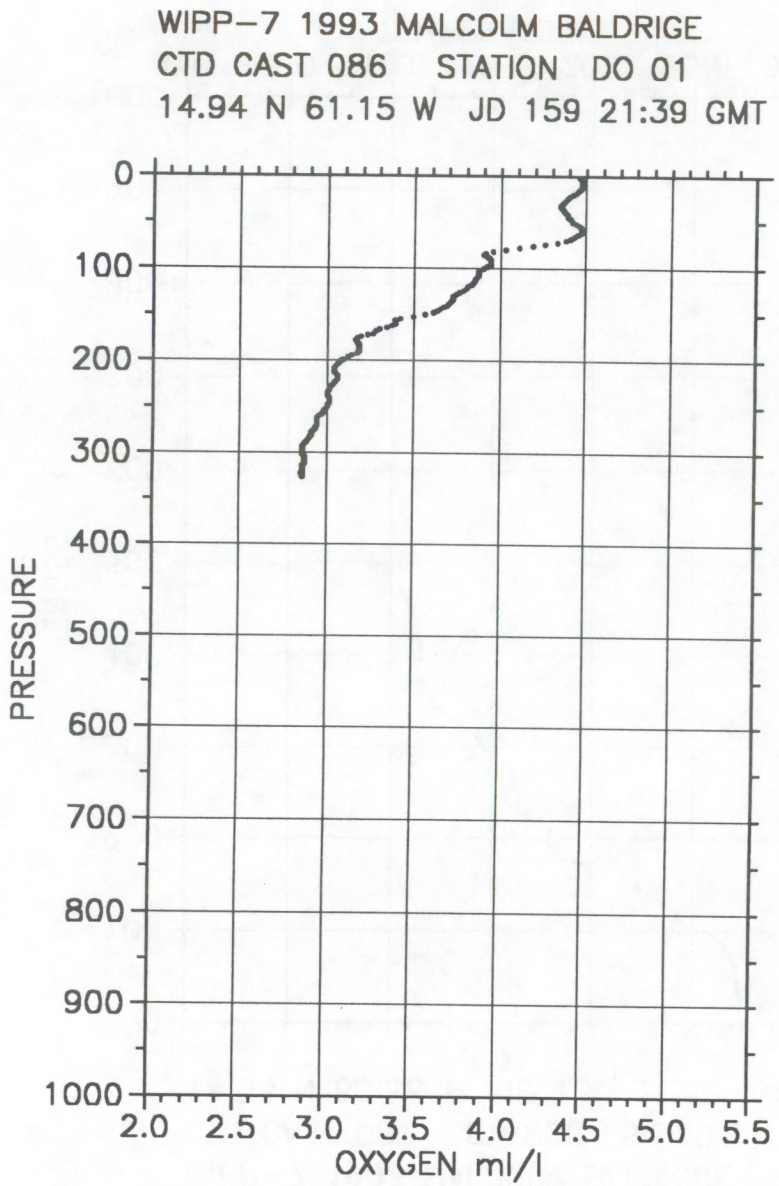


PRESS	TEMP	SAL	OXY
4.	28.302	35.053	4.47
10.	28.106	35.293	4.45
20.	27.483	35.938	4.47
30.	27.524	35.993	4.50
40.	27.515	36.003	4.49
50.	27.427	36.054	4.48
60.	27.452	36.125	4.48
70.	27.350	36.223	4.48
80.	26.367	36.280	4.27
90.	24.992	36.460	4.04
100.	24.535	36.589	3.96
120.	23.437	36.540	3.74
140.	22.820	36.631	3.59
160.	21.297	36.619	3.44
180.	19.419	36.605	3.27
200.	18.095	36.452	3.21
220.	16.920	36.266	3.10
240.	15.482	35.985	3.00
260.	14.756	35.830	2.95
280.	13.726	35.646	2.89
300.	12.704	35.480	2.84
320.	12.007	35.358	2.81
340.	11.509	35.275	2.76
360.	11.065	35.213	2.74
380.	10.793	35.163	2.72
400.	10.551	35.114	2.71
450.	9.829	35.082	2.66
500.	9.083	34.990	2.67
550.	7.829	34.820	2.68
600.	7.163	34.754	2.75
650.	7.205	34.763	2.77
700.	7.101	34.759	2.78
729.	6.919	34.757	2.81

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 086 STATION DO 01
14.94 N 61.15 W JD 159 21:39 GMT

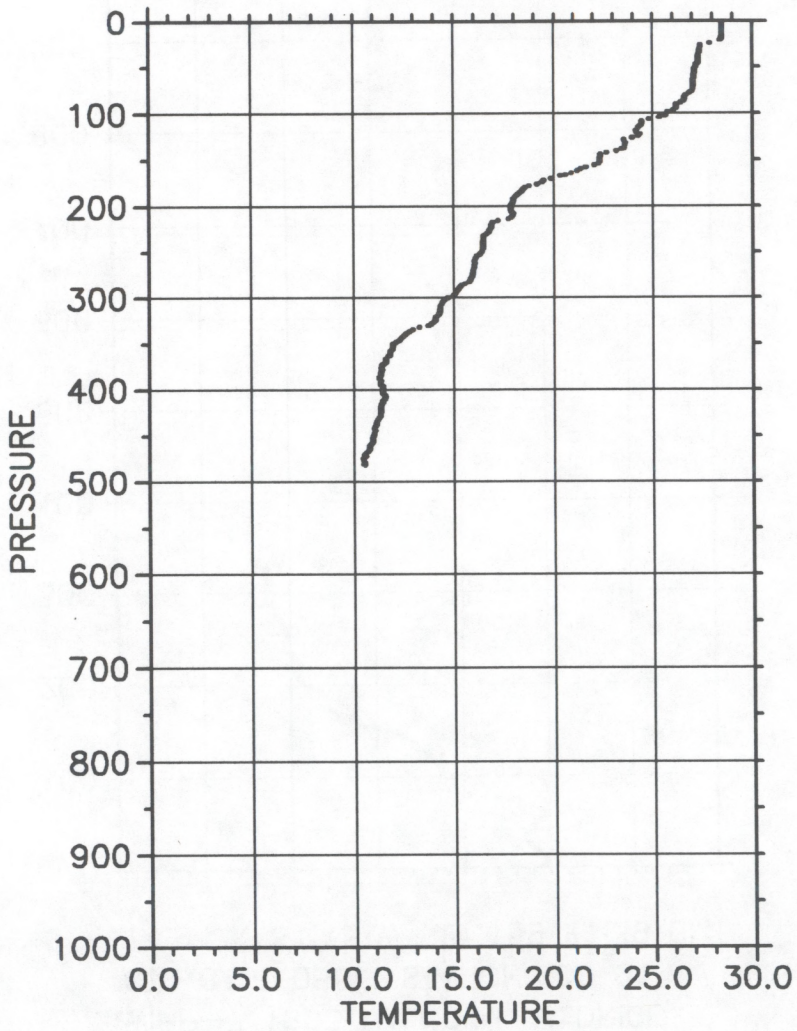


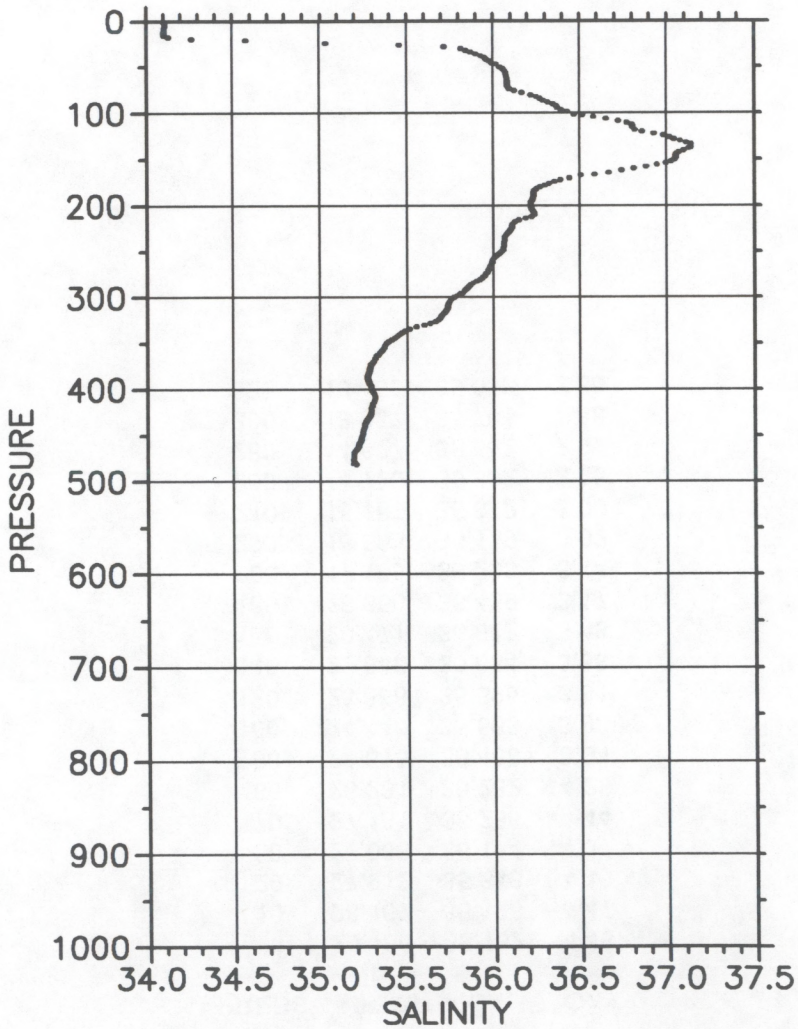




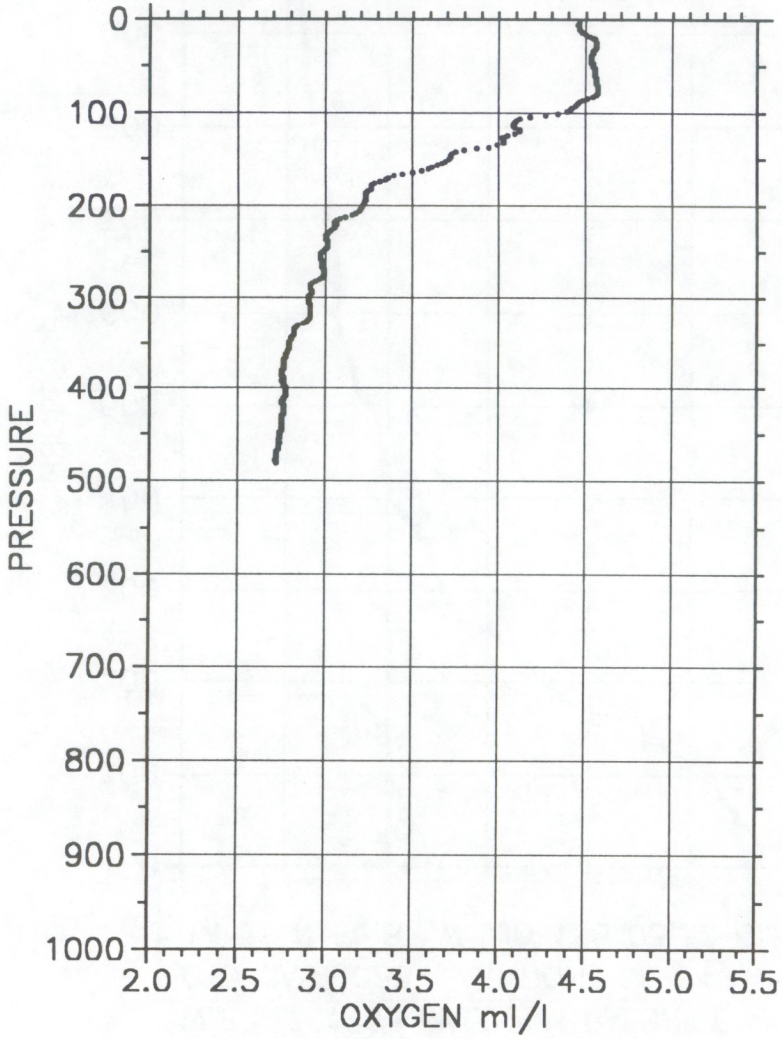
PRESS	TEMP	SAL	OXY
4.	28.166	35.182	4.48
10.	28.167	35.178	4.47
20.	27.912	35.346	4.46
50.	27.066	36.114	4.37
70.	27.161	36.236	4.44
80.	26.231	36.232	4.25
90.	24.613	36.468	3.94
100.	24.440	36.565	3.90
120.	23.668	36.595	3.81
140.	22.848	36.634	3.68
160.	20.471	36.672	3.43
180.	18.350	36.439	3.17
200.	17.165	36.233	3.14
220.	16.503	36.139	3.02
240.	15.787	36.072	3.00
260.	14.770	35.882	2.95
280.	14.627	35.852	2.94
300.	13.937	35.704	2.88
326.	13.453	35.630	2.86

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 087 STATION SL 05
14.35 N 60.86 W JD 160 02:37 GMT



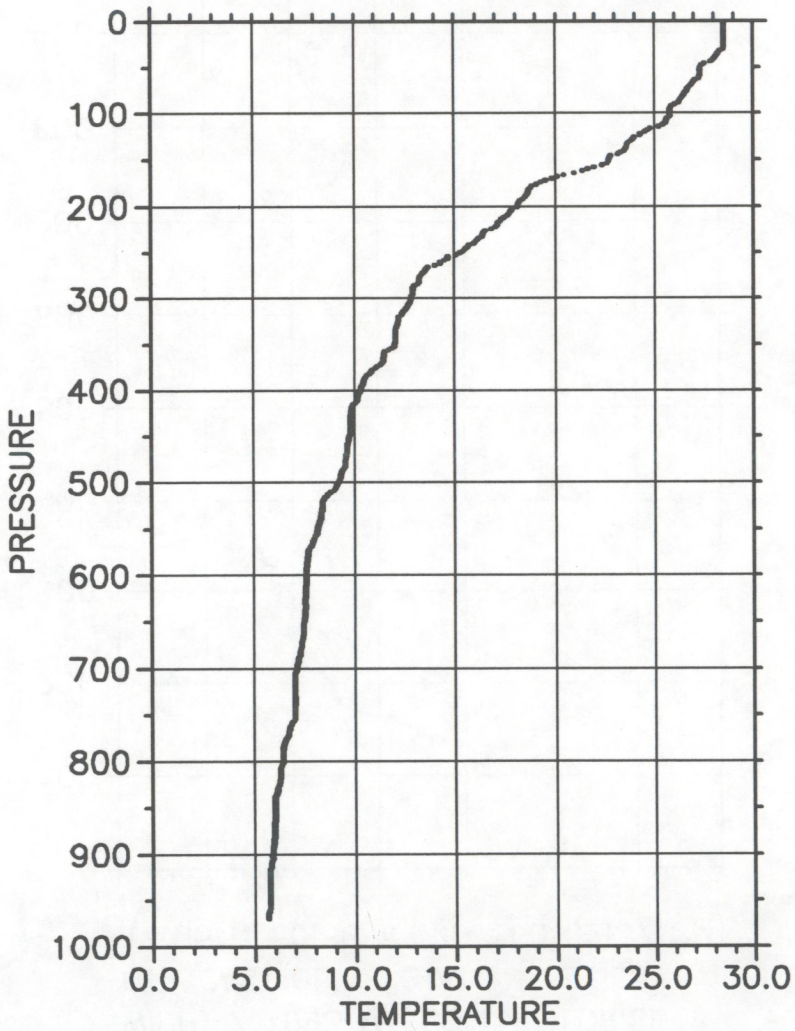


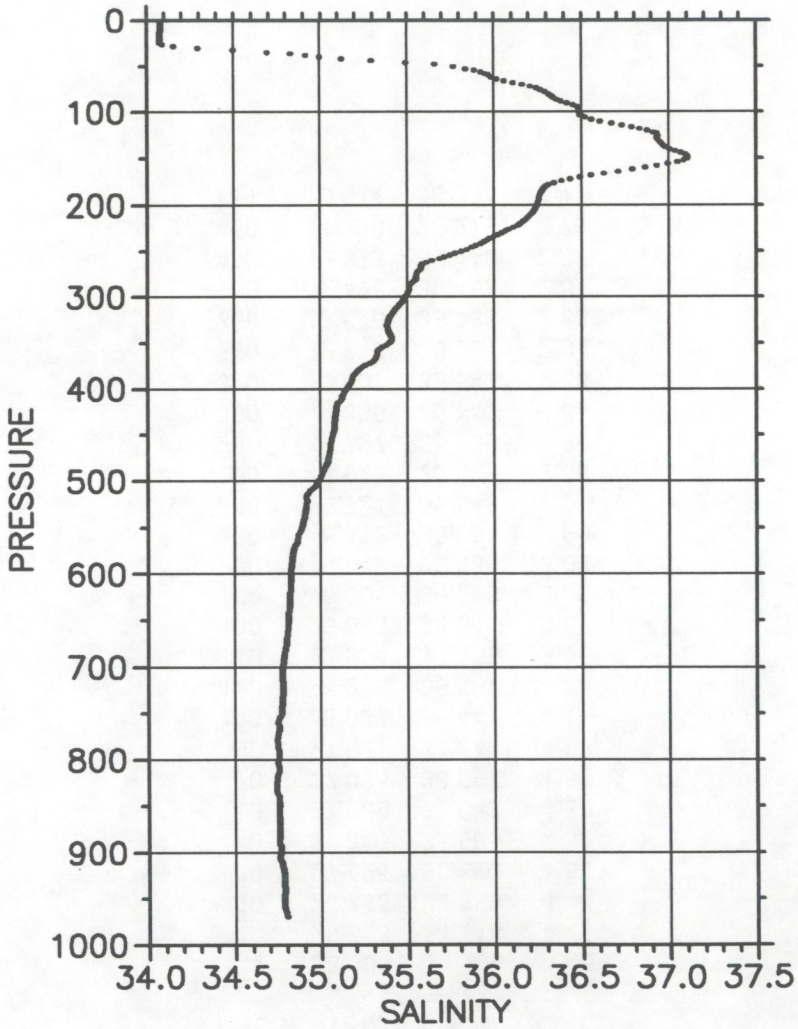
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 087 STATION SL 05
14.35 N 60.86 W JD 160 02:37 GMT



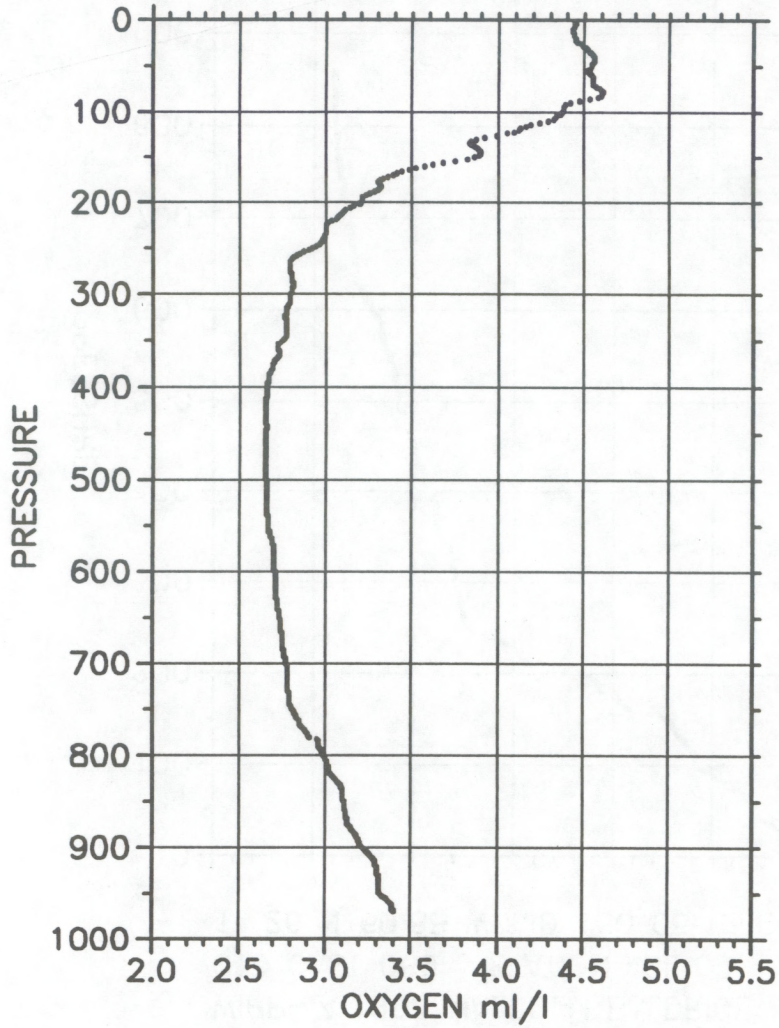
PRESS	TEMP	SAL	OXY
4.	28.508	34.108	4.46
10.	28.513	34.118	4.45
20.	28.416	34.683	4.47
30.	27.426	35.820	4.53
40.	27.316	35.965	4.52
50.	27.209	36.043	4.50
70.	27.088	36.097	4.52
80.	27.031	36.146	4.52
100.	26.037	36.441	4.41
120.	24.233	36.861	4.04
140.	23.254	37.159	3.96
160.	20.695	36.619	3.57
180.	18.605	36.298	3.26
200.	16.842	36.136	3.08
220.	16.412	36.058	2.99
240.	15.721	35.919	2.97
260.	14.943	35.809	2.88
280.	14.527	35.766	2.90
300.	14.330	35.746	2.89
320.	13.407	35.596	2.88
340.	12.947	35.531	2.84
360.	12.670	35.488	2.83
380.	12.478	35.455	2.81
400.	12.373	35.443	2.82
450.	11.230	35.273	2.76
481.	10.644	35.203	2.72

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 088 STATION SL 04
14.31 N 60.87 W JD 160 03:39 GMT



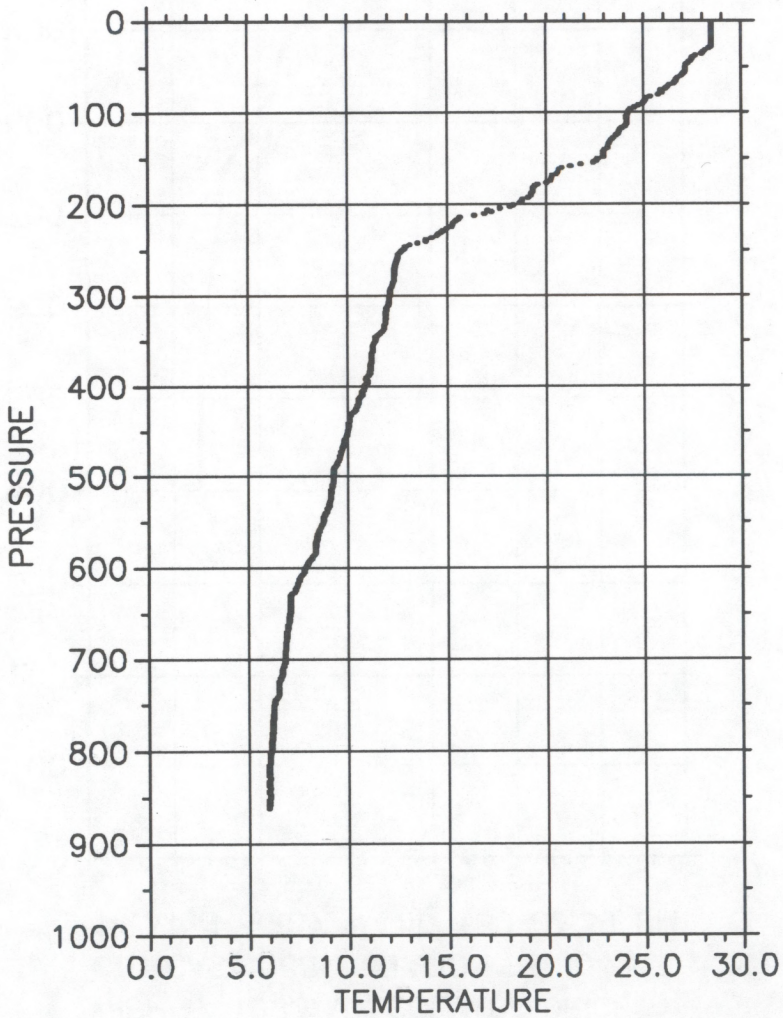


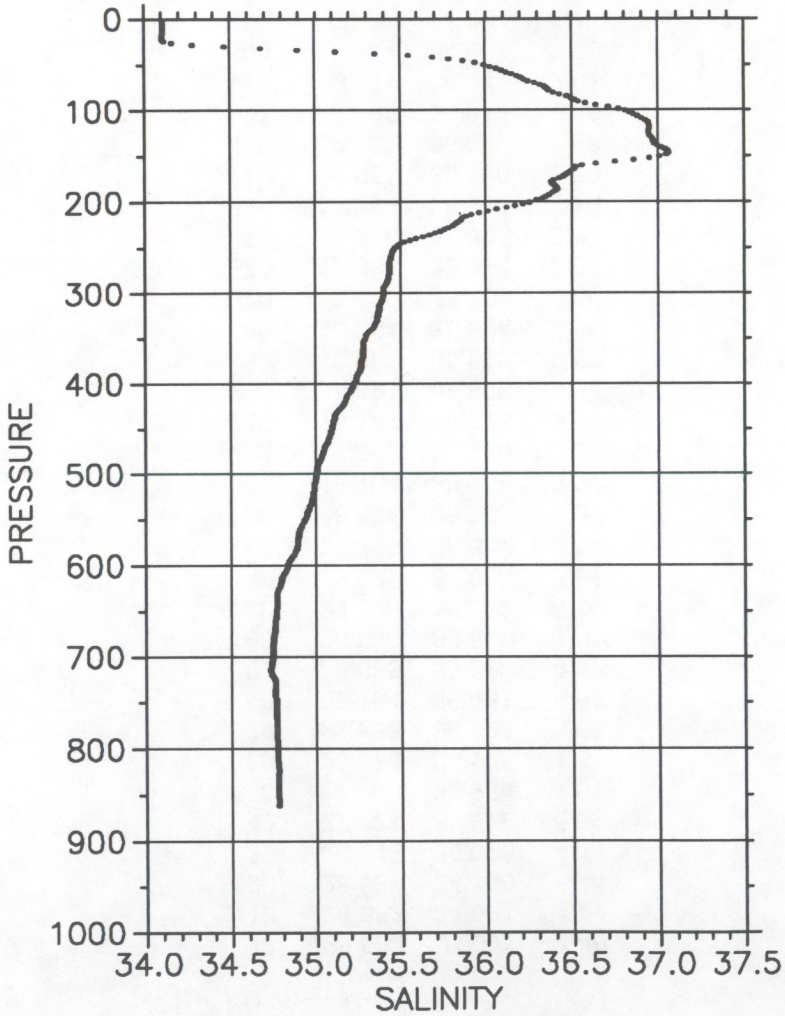
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 088 STATION SL 04
14.31 N 60.87 W JD 160 03:39 GMT



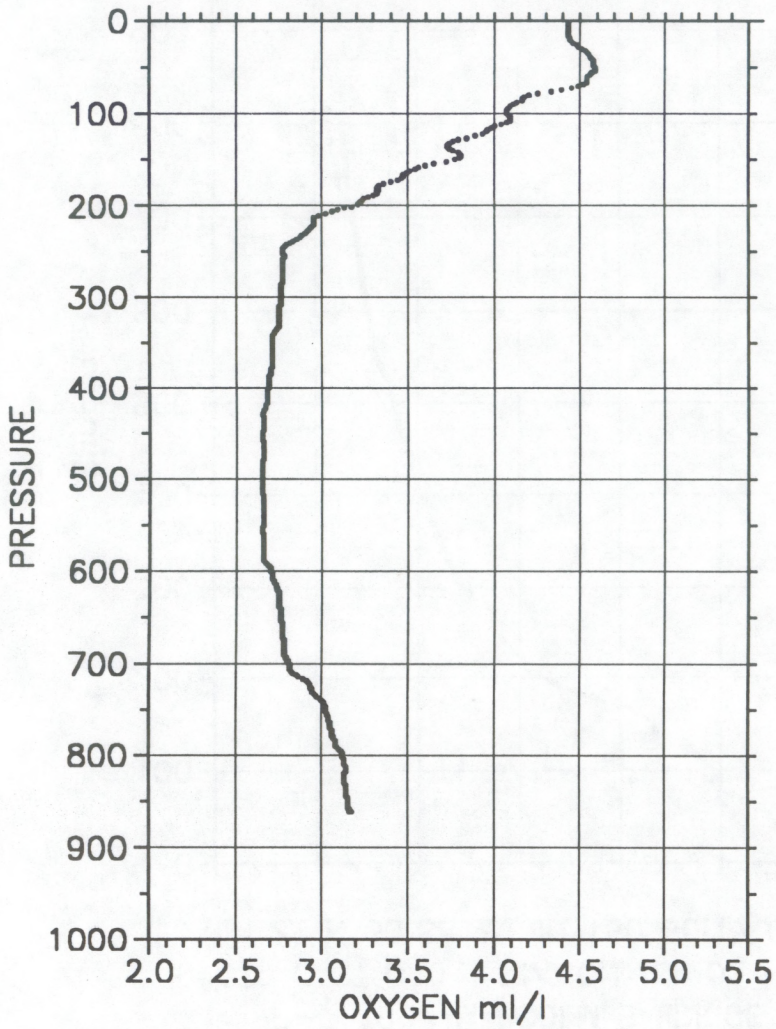
PRESS	TEMP	SAL	OXY
4.	28.533	34.091	4.46
10.	28.532	34.091	4.44
20.	28.537	34.138	4.44
30.	28.042	35.073	4.49
40.	27.321	35.819	4.52
50.	27.263	35.994	4.51
60.	26.838	36.195	4.51
70.	26.538	36.324	4.55
80.	26.154	36.431	4.52
90.	25.685	36.520	4.33
100.	25.686	36.530	4.31
120.	24.370	36.922	4.10
140.	23.277	37.088	3.81
160.	20.706	36.647	3.54
180.	18.644	36.303	3.31
200.	18.104	36.258	3.21
220.	17.296	36.220	3.09
240.	16.184	36.013	3.00
260.	15.091	35.829	2.95
280.	13.631	35.610	2.80
300.	13.004	35.524	2.79
320.	12.700	35.469	2.80
340.	12.083	35.394	2.77
360.	11.976	35.395	2.77
380.	11.393	35.314	2.73
400.	10.653	35.190	2.70
450.	9.722	35.062	2.66
500.	9.365	35.019	2.66
550.	8.841	34.943	2.67
600.	7.944	34.867	2.69
650.	7.433	34.804	2.74
689.	7.133	34.781	2.78

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 089 STATION SL 03
14.26 N 60.88 W JD 160 05:12 GMT



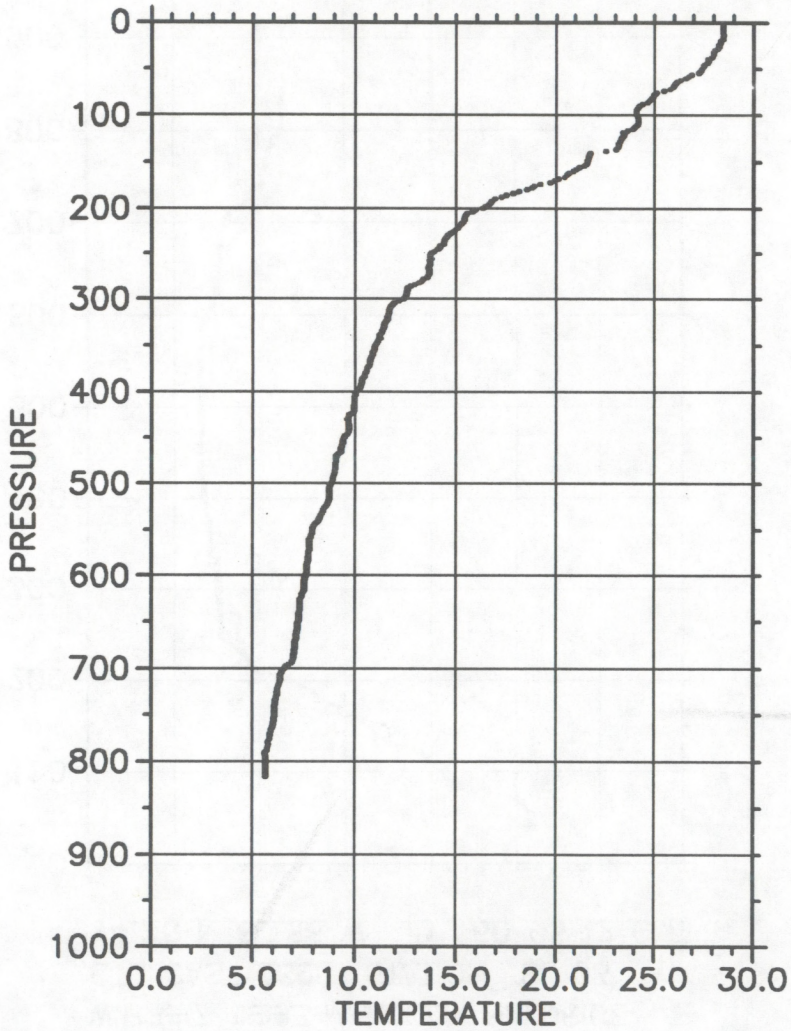


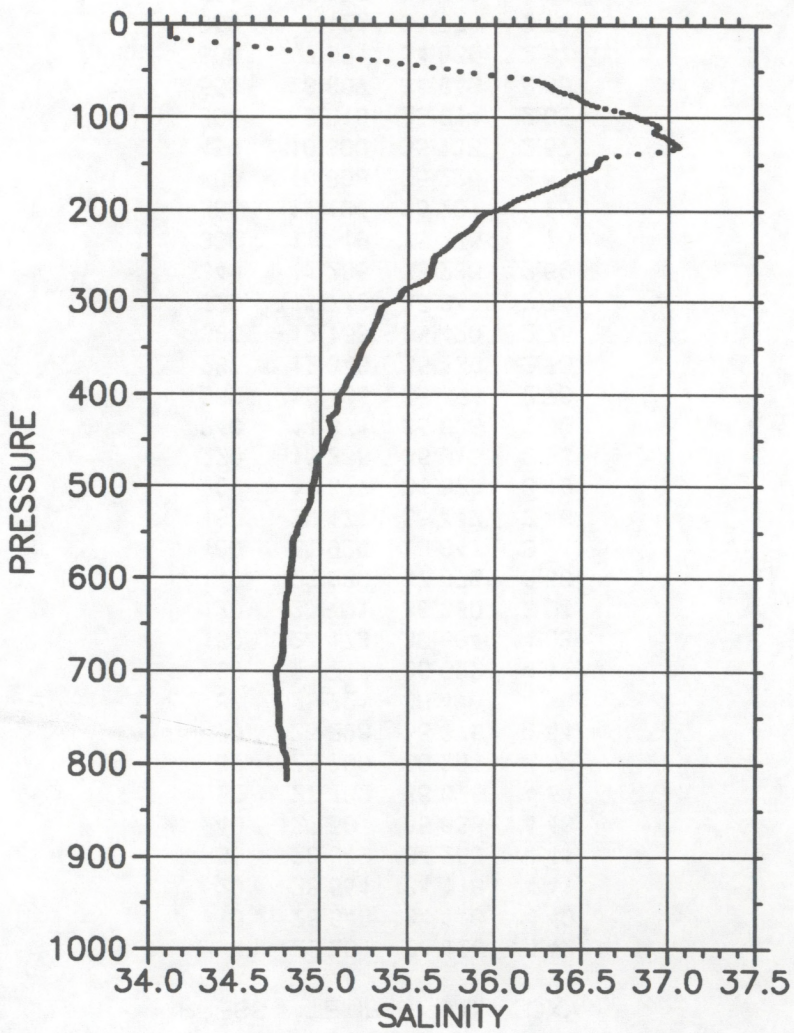
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 089 STATION SL 03
14.26 N 60.88 W JD 160 05:12 GMT



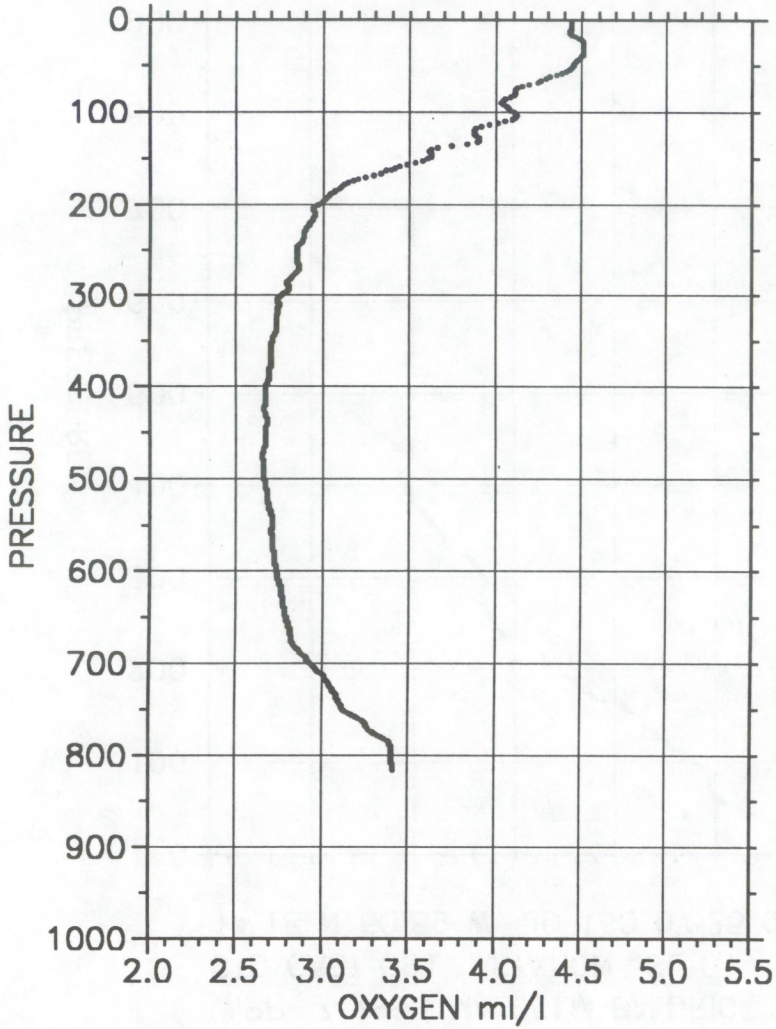
PRESS	TEMP	SAL	OXY
4.	28.561	34.120	4.42
10.	28.549	34.118	4.40
20.	28.551	34.118	4.41
30.	28.549	34.253	4.41
40.	27.507	35.638	4.48
50.	27.182	36.078	4.54
60.	26.780	36.231	4.52
70.	26.298	36.375	4.54
80.	25.721	36.446	4.36
90.	24.717	36.622	4.12
100.	24.173	36.864	4.03
120.	23.701	36.980	3.94
140.	23.020	37.076	3.68
160.	21.920	36.847	3.71
180.	20.177	36.447	3.46
200.	18.377	36.323	3.19
220.	15.385	35.915	2.93
240.	14.371	35.636	2.90
260.	12.466	35.455	2.76
280.	12.343	35.439	2.76
300.	12.168	35.420	2.75
320.	11.748	35.345	2.74
340.	11.285	35.286	2.69
360.	11.219	35.276	2.70
380.	11.134	35.267	2.70
400.	10.808	35.229	2.68
450.	10.300	35.138	2.67
500.	9.310	35.014	2.65
550.	8.807	34.946	2.66
600.	7.901	34.839	2.67
650.	7.122	34.773	2.76
700.	6.872	34.748	2.78
750.	6.442	34.761	2.95
800.	6.178	34.766	3.07
850.	5.997	34.779	3.15
861.	5.994	34.780	3.17

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 090 STATION SL 02
14.22 N 60.88 W JD 160 06:17 GMT



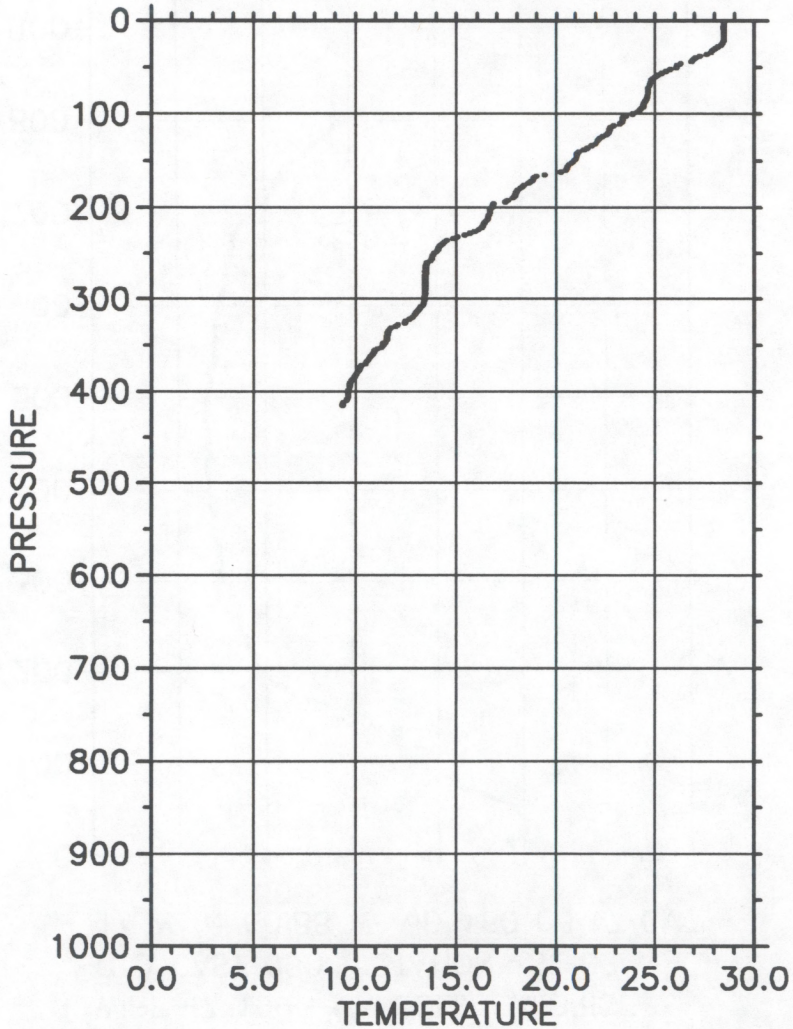


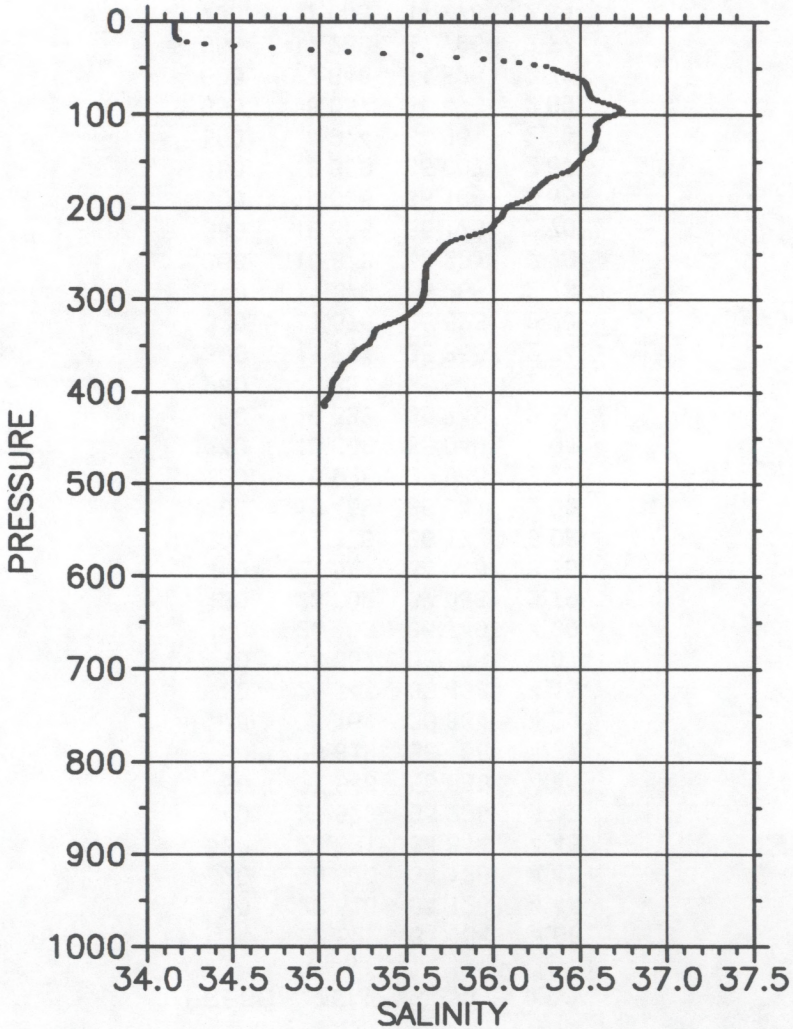
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 090 STATION SL 02
14.22 N 60.88 W JD 160 06:17 GMT



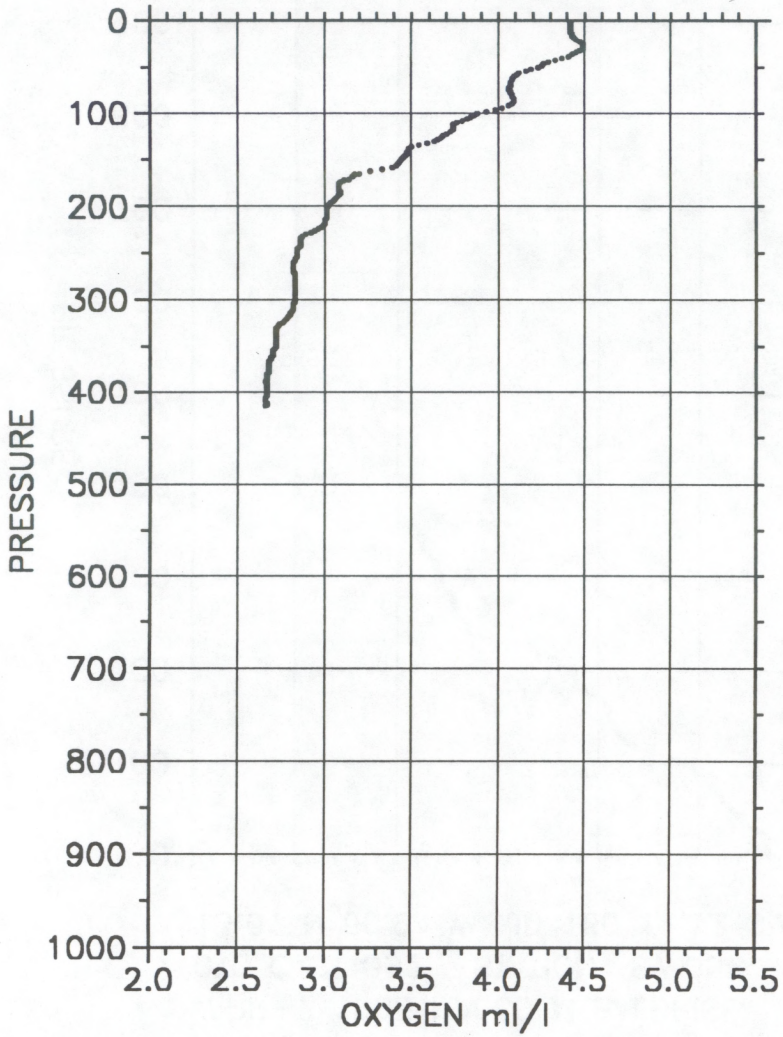
PRESS	TEMP	SAL	OXY
4.	28.522	34.104	4.08
10.	28.516	34.128	4.44
20.	28.520	34.128	4.43
30.	28.301	34.614	4.45
40.	27.973	35.208	4.47
50.	27.548	35.689	4.46
60.	26.819	36.188	4.37
70.	26.161	36.334	4.29
80.	25.545	36.438	4.15
90.	24.857	36.534	4.07
100.	24.103	36.749	4.00
120.	23.302	37.053	3.79
140.	21.521	36.618	3.56
180.	17.776	36.177	3.08
200.	16.459	36.041	2.99
220.	15.926	35.985	2.95
240.	15.699	35.940	2.94
260.	14.535	35.749	2.90
280.	13.334	35.545	2.83
300.	11.791	35.365	2.74
320.	11.576	35.328	2.73
340.	11.279	35.266	2.73
360.	10.878	35.221	2.70
380.	10.605	35.175	2.70
400.	10.006	35.108	2.68
450.	9.350	35.007	2.67
500.	8.974	34.961	2.66
550.	8.057	34.873	2.69
600.	7.648	34.828	2.73
650.	7.289	34.796	2.77
700.	7.003	34.778	2.84
750.	6.020	34.776	3.12
800.	5.642	34.809	3.38
815.	5.635	34.812	3.41

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 091 STATION SL 01
14.18 N 60.89 W JD 160 07:25 GMT



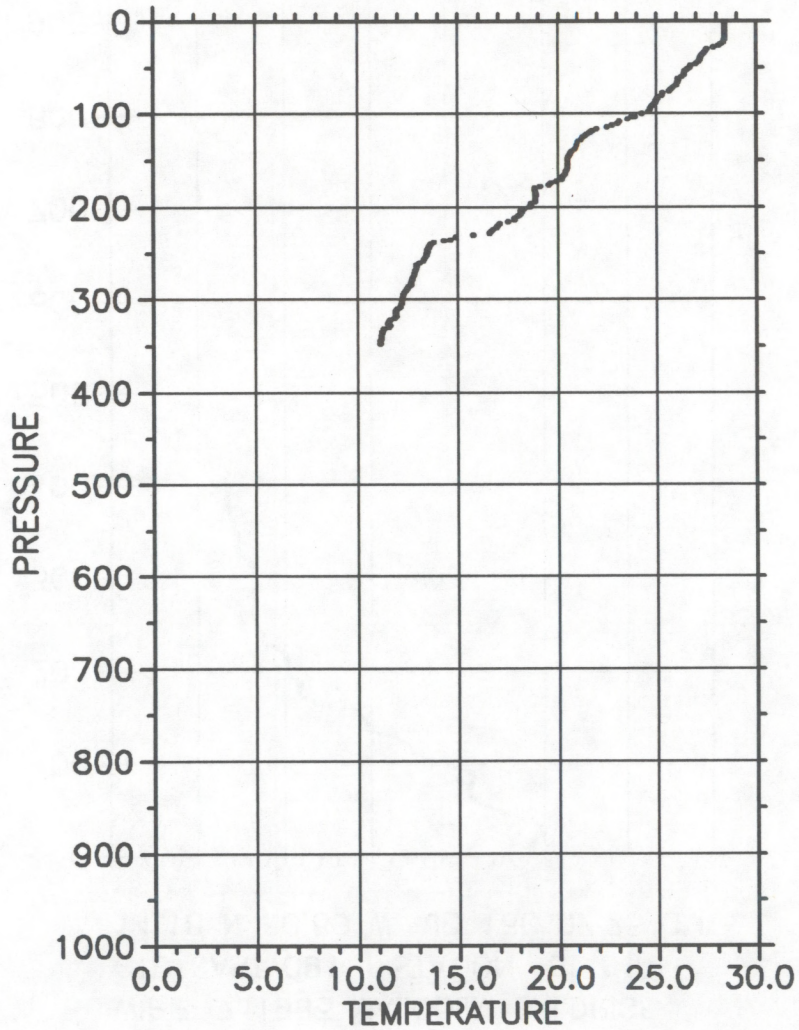


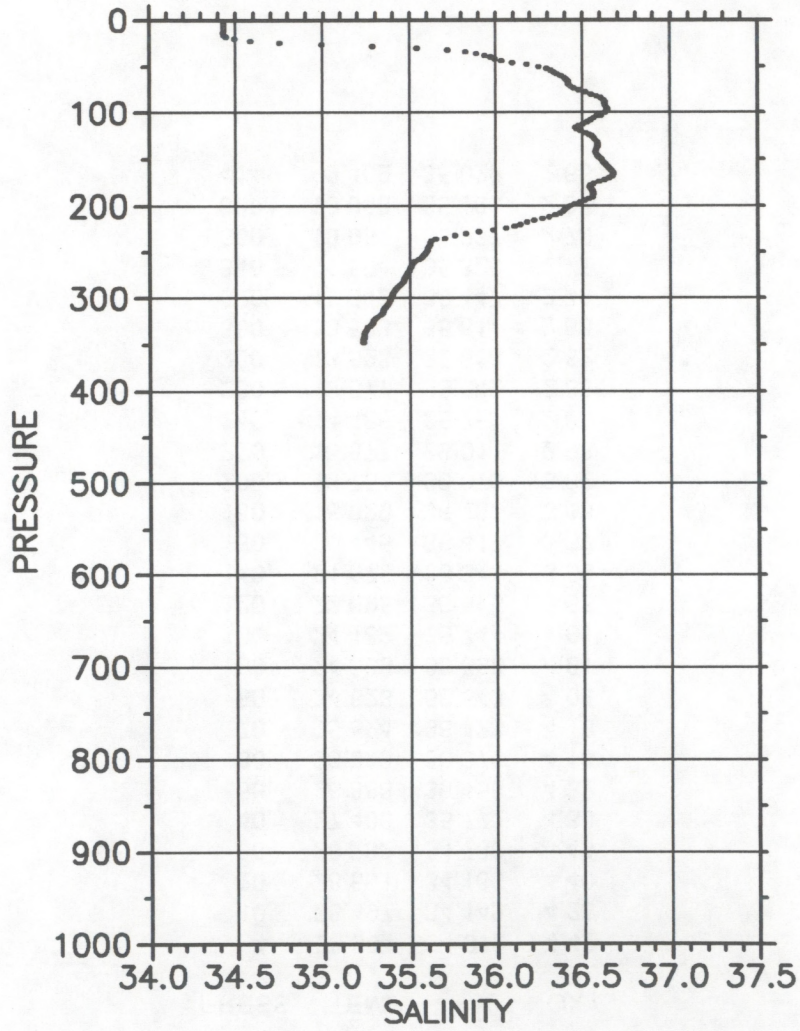
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 091 STATION SL 01
14.18 N 60.89 W JD 160 07:25 GMT



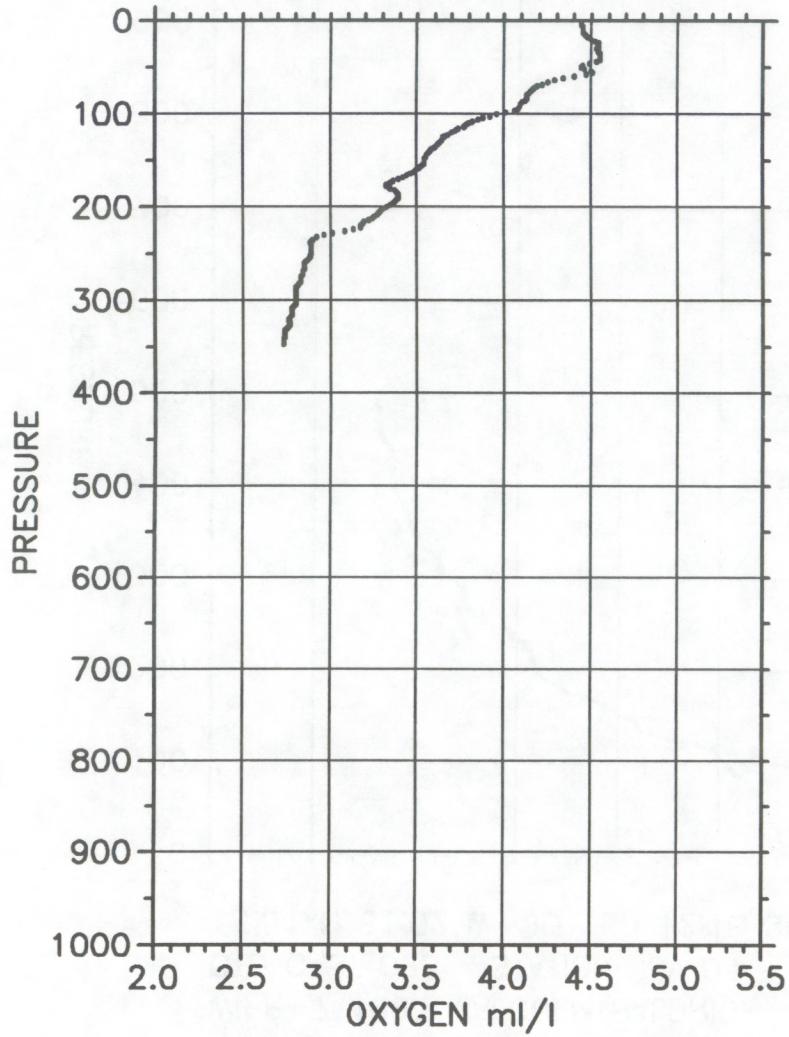
PRESS	TEMP	SAL	OXY
4.	28.504	34.073	4.42
10.	28.497	34.143	4.29
20.	28.501	34.166	4.40
30.	28.232	34.766	4.43
40.	27.403	35.772	4.38
50.	26.888	36.158	4.32
60.	26.033	36.370	4.18
70.	25.524	36.423	4.13
80.	24.823	36.543	4.04
90.	24.633	36.588	4.01
100.	24.182	36.744	4.01
120.	22.695	36.615	3.68
140.	21.575	36.541	3.59
160.	20.445	36.417	3.37
180.	18.329	36.263	3.13
200.	16.754	36.076	3.02
220.	16.377	36.011	2.98
240.	14.486	35.751	2.86
260.	13.677	35.642	2.83
280.	13.523	35.618	2.82
300.	13.533	35.614	2.83
320.	12.542	35.447	2.79
340.	11.594	35.329	2.72
360.	10.957	35.237	2.70
380.	10.060	35.109	2.67
414.	9.402	35.029	2.66

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 092 STATION SV 05
13.61 N 60.94 W JD 160 11:12 GMT



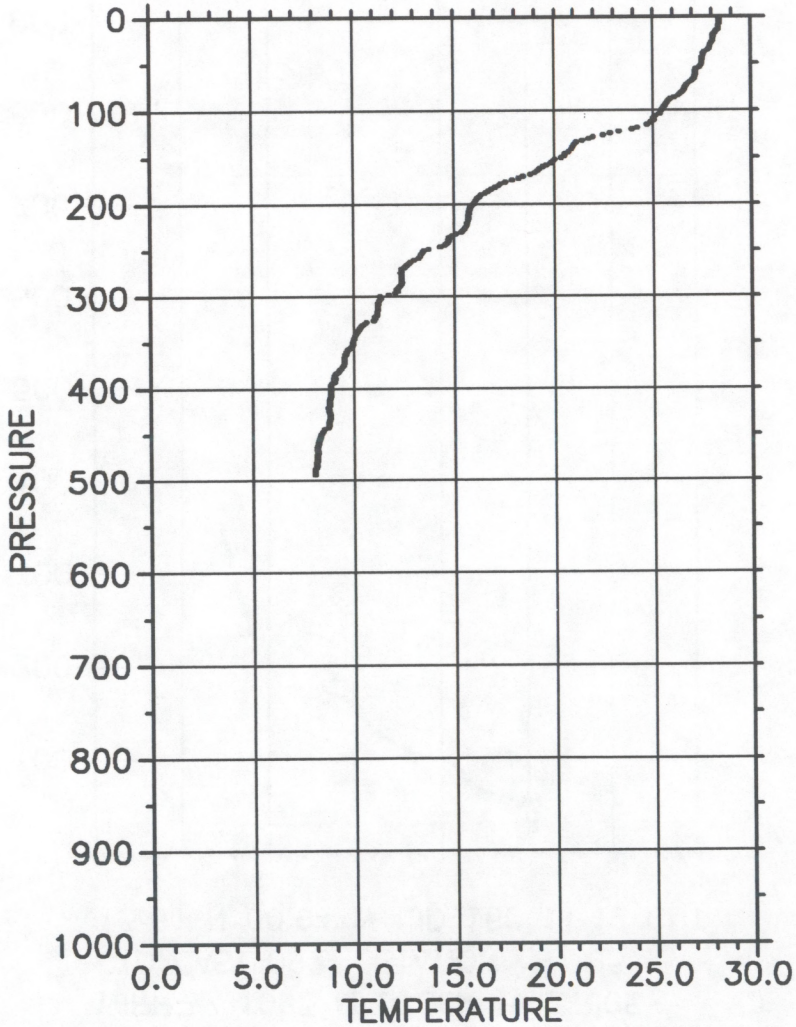


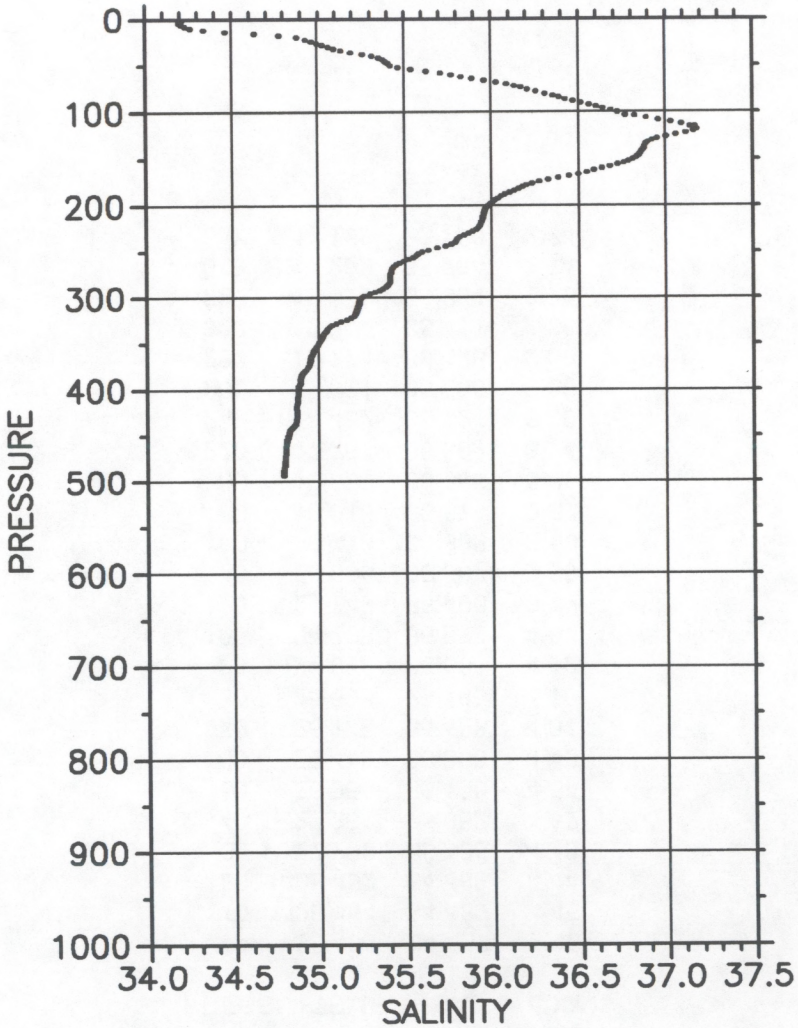
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 092 STATION SV 05
13.61 N 60.94 W JD 160 11:12 GMT



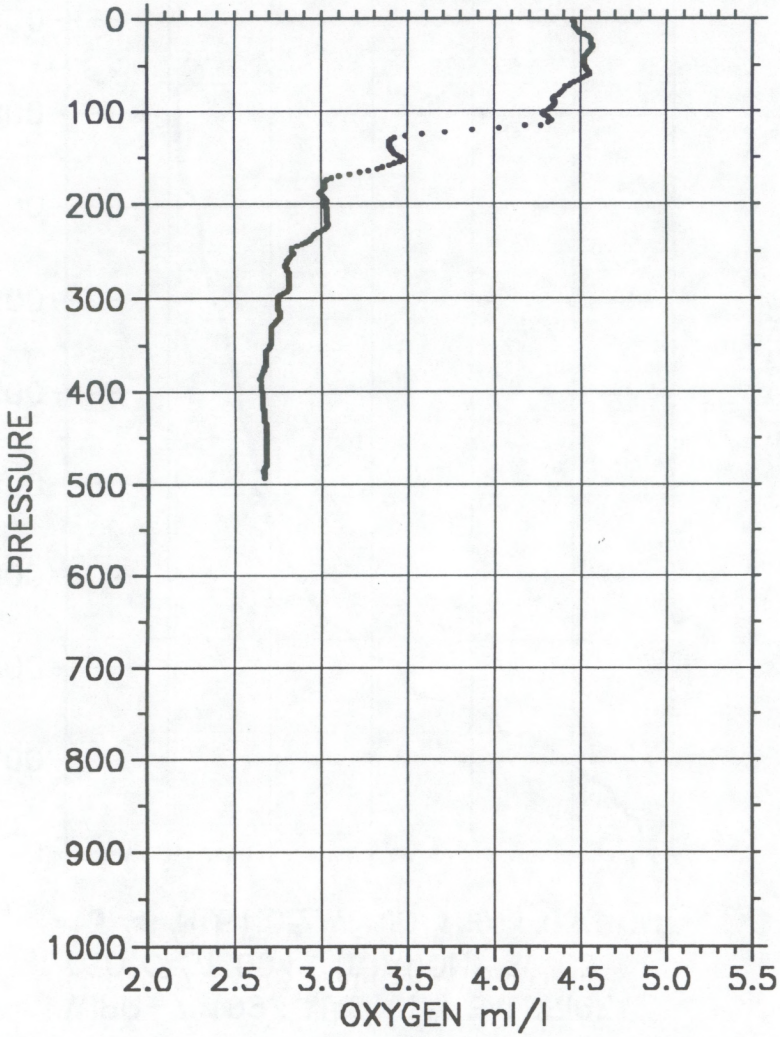
PRESS	TEMP	SAL	OXY
4.	28.456	34.437	4.46
10.	28.454	34.439	4.45
20.	28.452	34.488	4.44
30.	27.700	35.435	4.48
40.	27.261	35.962	4.52
50.	26.963	36.130	4.54
60.	26.448	36.336	4.45
70.	26.106	36.423	4.31
80.	25.698	36.485	4.16
90.	24.998	36.636	4.12
100.	24.738	36.672	4.07
120.	21.749	36.495	3.72
140.	20.696	36.587	3.59
160.	20.476	36.683	3.53
180.	19.016	36.574	3.37
200.	18.880	36.586	3.38
220.	17.767	36.309	3.24
240.	14.452	35.724	3.00
260.	13.321	35.586	2.88
280.	12.774	35.493	2.83
300.	12.297	35.411	2.80
320.	12.021	35.364	2.78
340.	11.282	35.254	2.74
347.	11.159	35.200	2.74

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 093 STATION SV 04
13.51 N 61.02 W JD 160 12:18 GMT



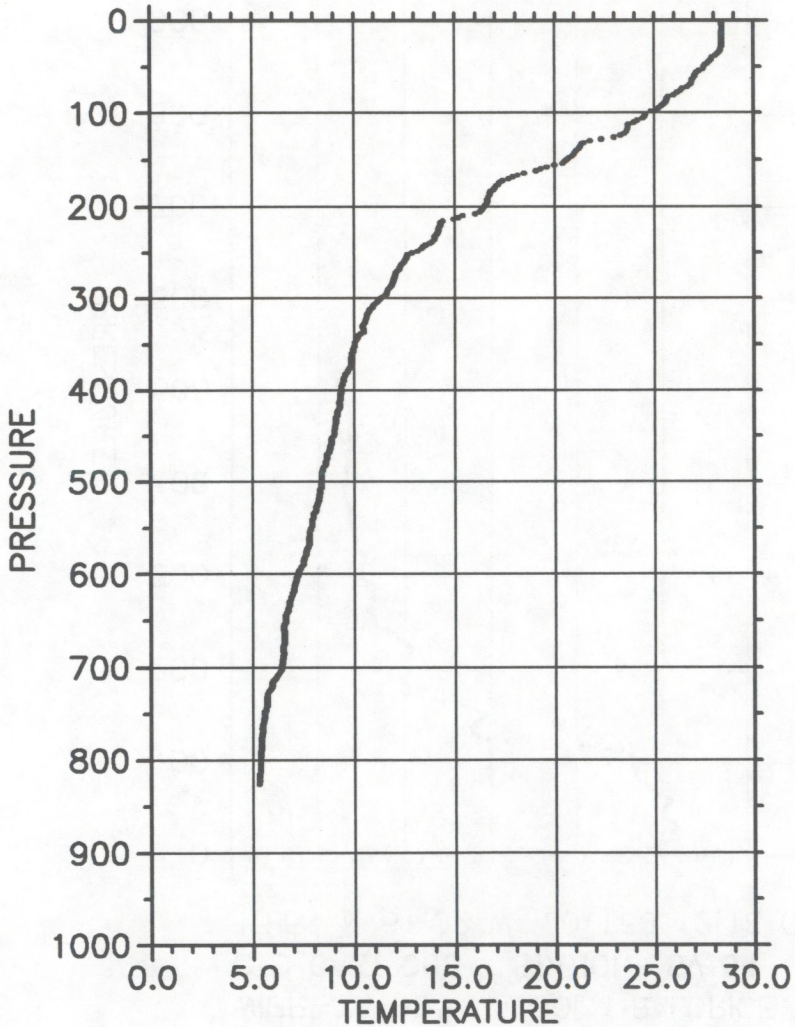


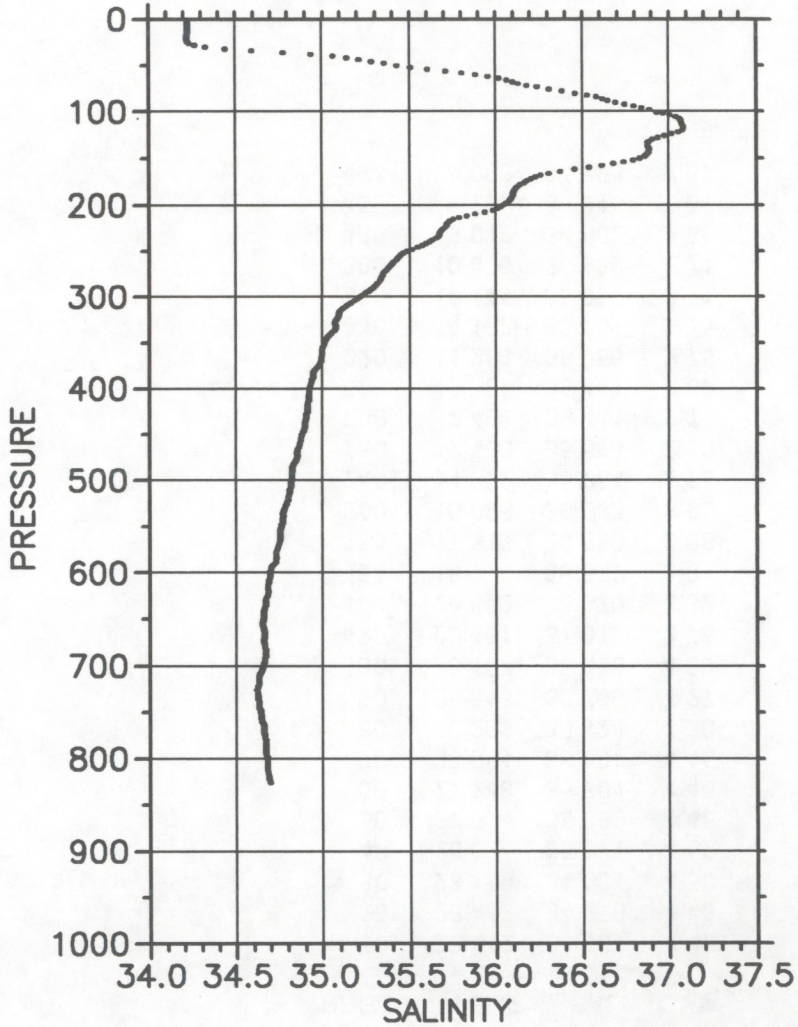
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 093 STATION SV 04
13.51 N 61.02 W JD 160 12:18 GMT



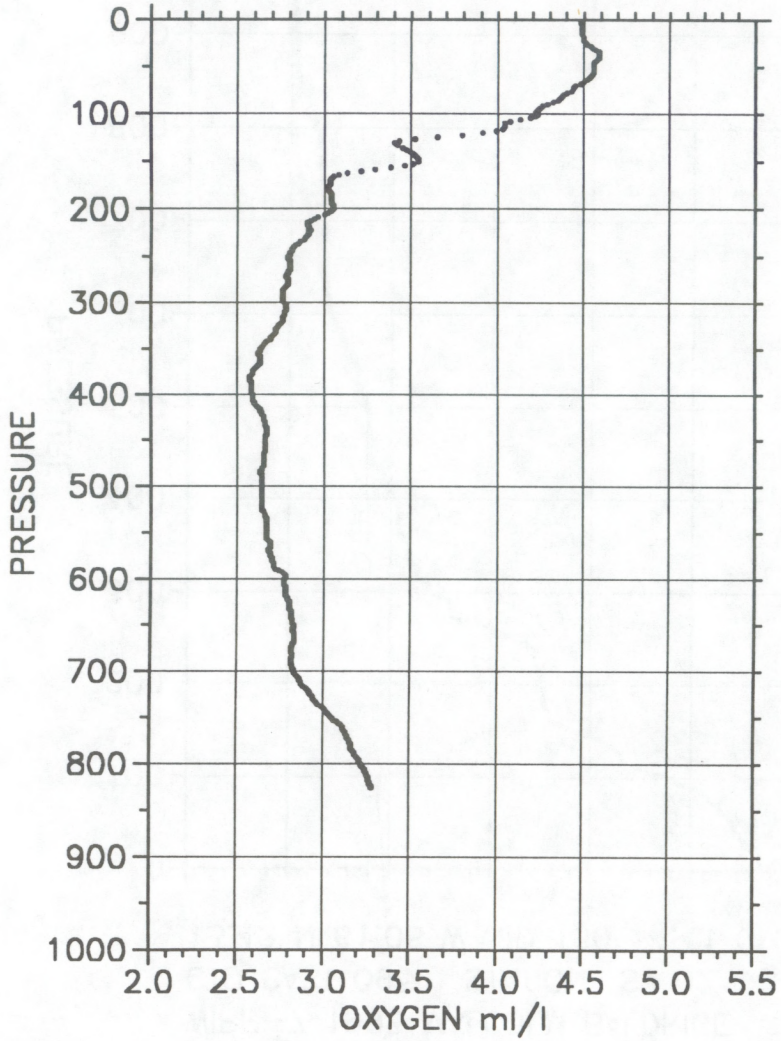
PRESS	TEMP	SAL	OXY
10.	28.412	34.167	4.45
20.	28.412	34.278	4.43
30.	28.159	34.904	4.50
40.	28.024	35.071	4.52
50.	27.594	35.360	4.48
60.	27.248	35.704	4.48
70.	26.984	36.097	4.45
80.	26.299	36.424	4.30
90.	25.516	36.709	4.27
100.	25.107	37.038	4.20
120.	22.481	37.033	3.76
140.	20.682	36.870	3.32
160.	18.770	36.522	3.31
180.	17.615	36.250	3.08
200.	16.095	36.033	2.95
240.	14.672	35.764	2.93
260.	12.969	35.514	2.80
280.	12.491	35.441	2.79
300.	12.309	35.411	2.80
320.	11.283	35.256	2.75
340.	11.162	35.209	2.75
360.	10.145	35.037	2.71
380.	10.006	34.989	2.71
400.	9.012	34.902	2.66
450.	8.292	34.815	2.67
494.	8.096	34.795	2.67

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 094 STATION SV 03
13.46 N 61.05 W JD 160 13:30 GMT



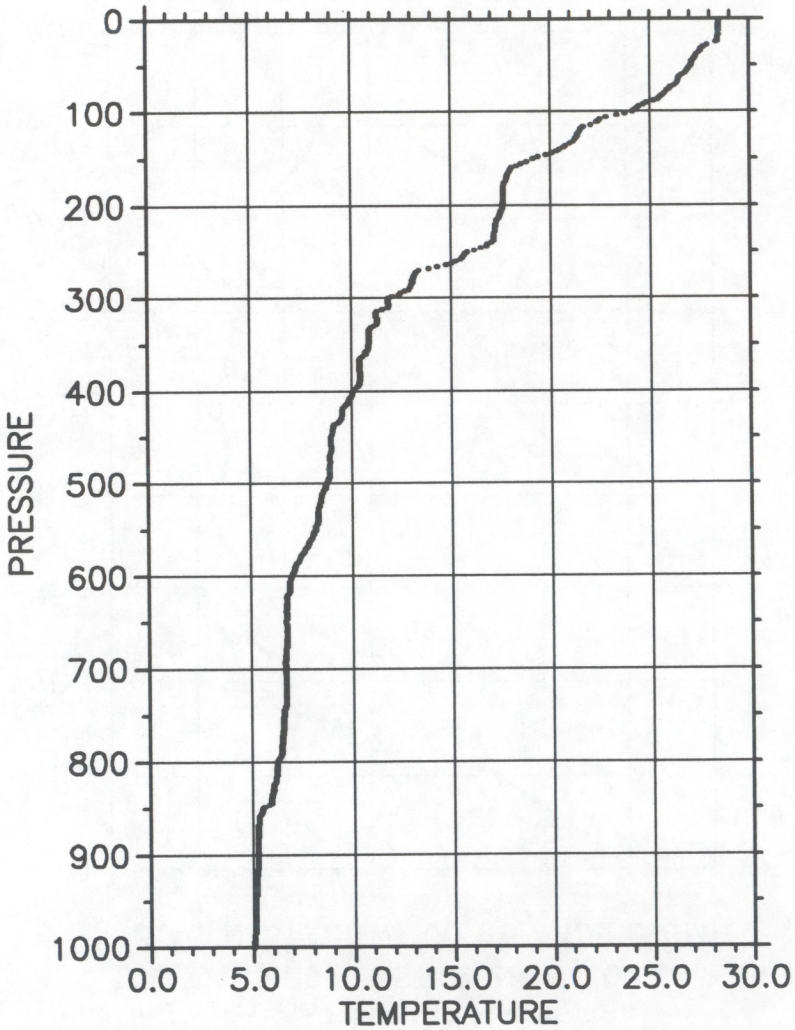


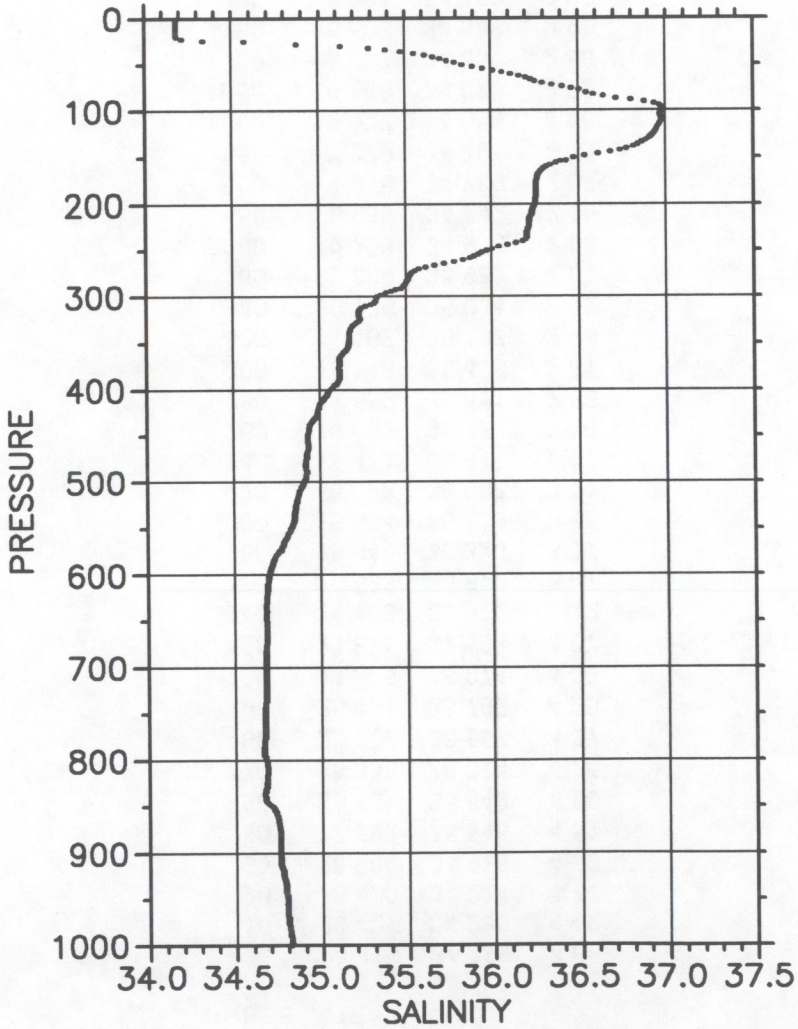
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 094 STATION SV 03
13.46 N 61.05 W JD 160 13:30 GMT



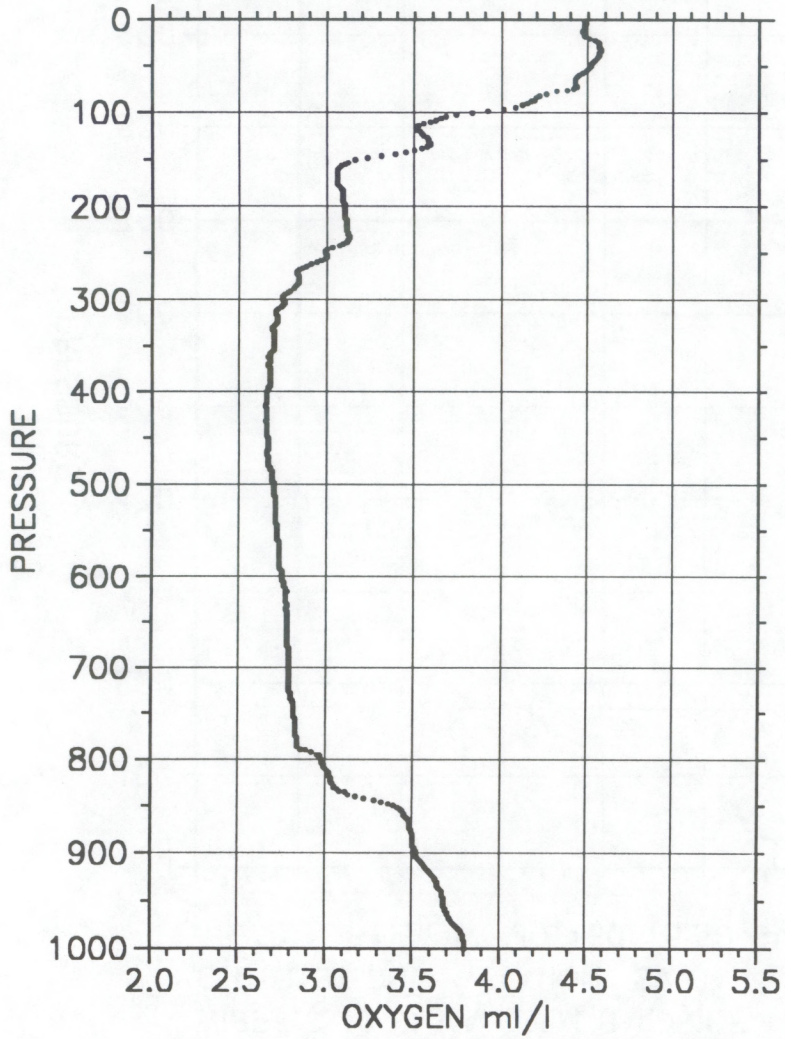
PRESS	TEMP	SAL	OXY
5.	28.425	34.235	4.66
10.	28.421	34.230	4.62
20.	28.420	34.244	4.47
30.	28.080	34.915	4.50
40.	27.397	35.545	4.51
50.	27.131	35.849	4.50
70.	26.332	36.374	4.36
80.	25.777	36.557	4.37
90.	25.427	36.767	4.29
100.	24.595	36.974	4.09
120.	23.871	37.133	4.07
140.	21.463	36.922	3.42
160.	20.583	36.872	3.47
180.	18.049	36.323	3.17
200.	16.874	36.139	3.03
220.	16.226	36.008	3.01
240.	15.414	35.917	2.97
260.	14.602	35.773	2.96
280.	13.552	35.611	2.85
300.	12.518	35.418	2.81
320.	11.167	35.197	2.76
340.	10.120	35.034	2.72
360.	9.809	34.982	2.66
380.	9.393	34.935	2.58
450.	8.569	34.842	2.65
500.	7.918	34.769	2.67
550.	7.279	34.705	2.73
600.	6.677	34.659	2.80
650.	6.548	34.673	2.82
700.	5.907	34.639	2.86
750.	5.564	34.648	2.98
826.	5.301	34.703	3.28

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 095 STATION SV 02
13.42 N 61.08 W JD 160 14:41 GMT



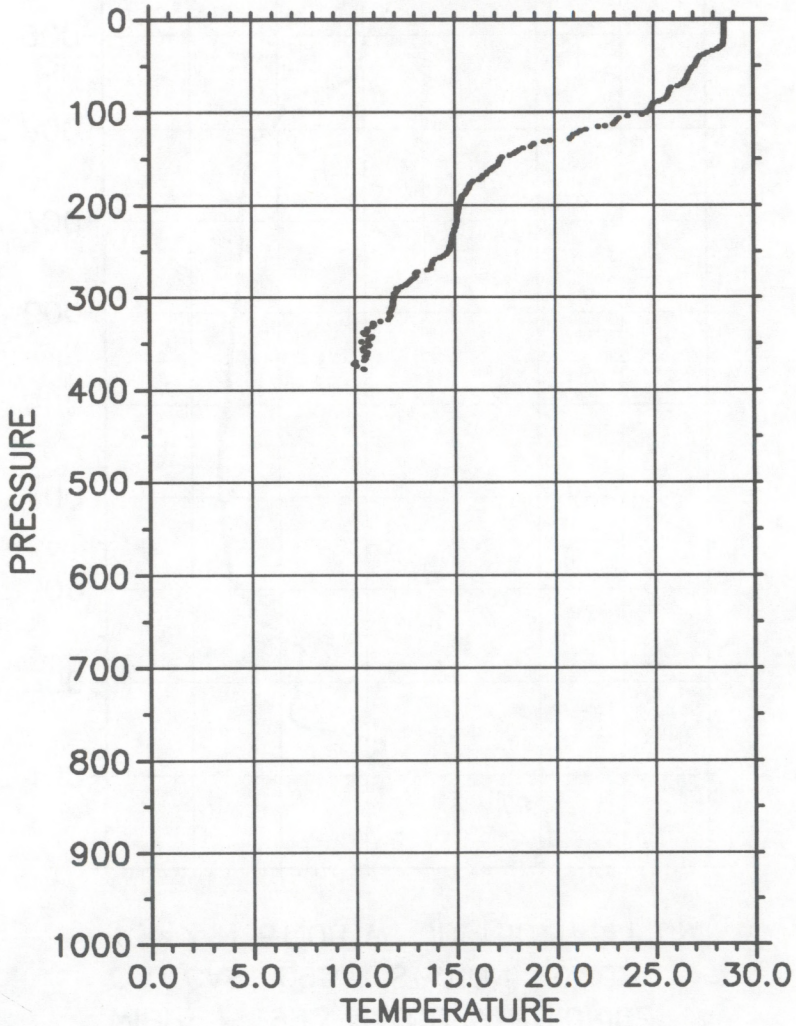


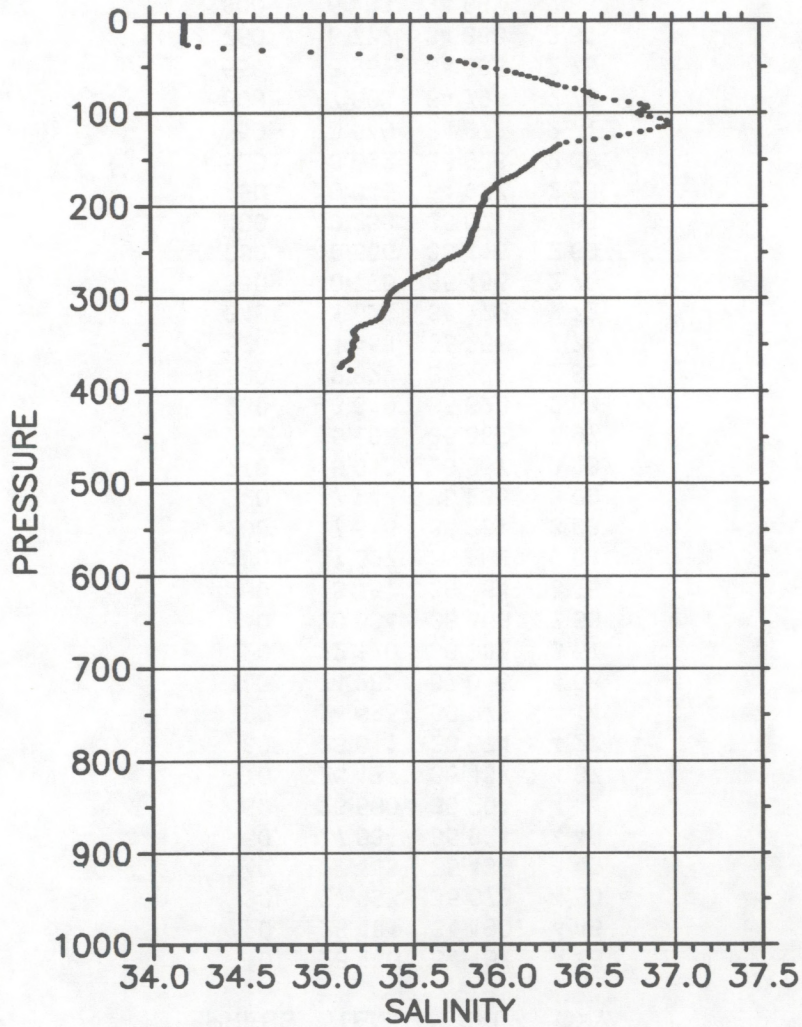
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 095 STATION SV 02
13.42 N 61.08 W JD 160 14:41 GMT



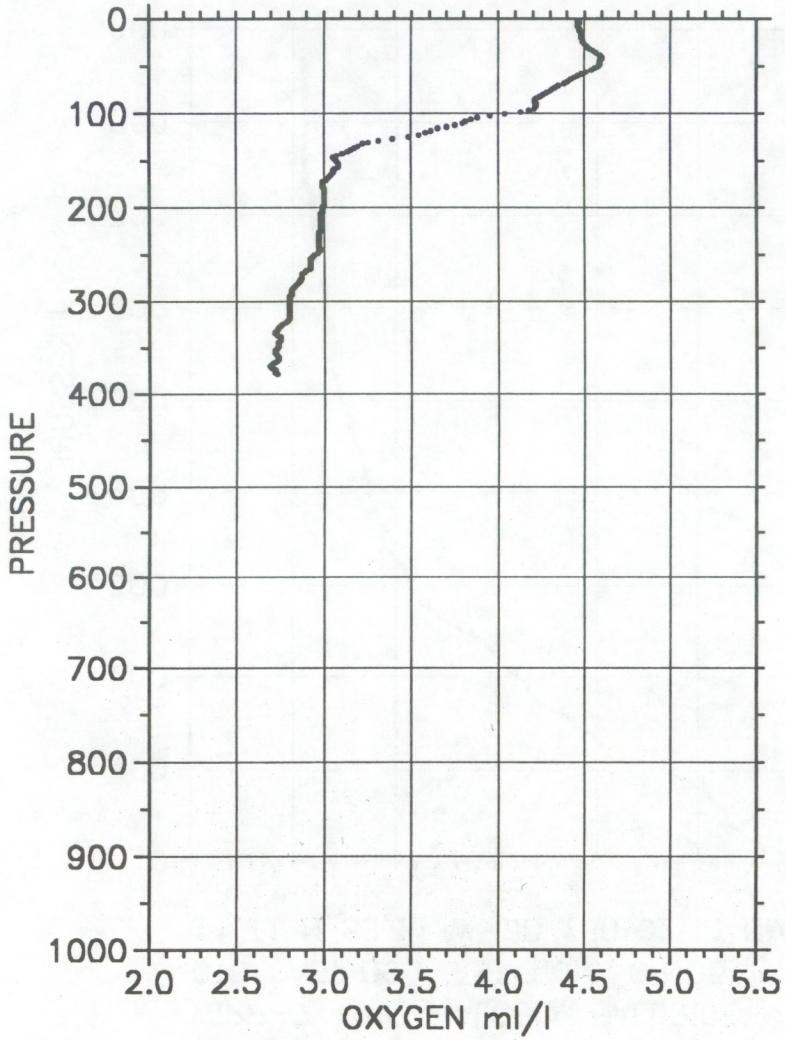
PRESS	TEMP	SAL	OXY
10.	28.466	34.164	4.45
20.	28.481	34.190	4.46
30.	27.957	35.078	4.50
40.	27.483	35.439	4.49
50.	27.031	35.921	4.49
60.	26.560	36.201	4.44
70.	26.127	36.437	4.37
80.	25.611	36.674	4.27
90.	24.695	36.973	4.14
100.	24.282	37.015	4.08
120.	22.170	36.987	3.57
140.	20.634	36.863	3.53
160.	18.457	36.364	3.16
180.	17.597	36.266	3.04
200.	17.516	36.251	3.08
220.	17.247	36.235	3.09
240.	16.612	36.067	3.08
260.	15.295	35.882	2.97
280.	13.810	35.622	2.88
300.	12.822	35.481	2.82
320.	11.453	35.256	2.76
340.	11.022	35.172	2.72
360.	10.775	35.156	2.70
380.	10.566	35.115	2.69
400.	10.268	35.077	2.68
450.	9.040	34.927	2.66
500.	8.992	34.926	2.68
550.	8.546	34.872	2.71
600.	7.903	34.794	2.72
650.	6.961	34.695	2.76
750.	6.772	34.668	2.80
800.	6.433	34.667	2.86
900.	5.235	34.768	3.52
943.	5.195	34.780	3.61

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 096 STATION SV 01
13.38 N 61.11 W JD 160 15:50 GMT



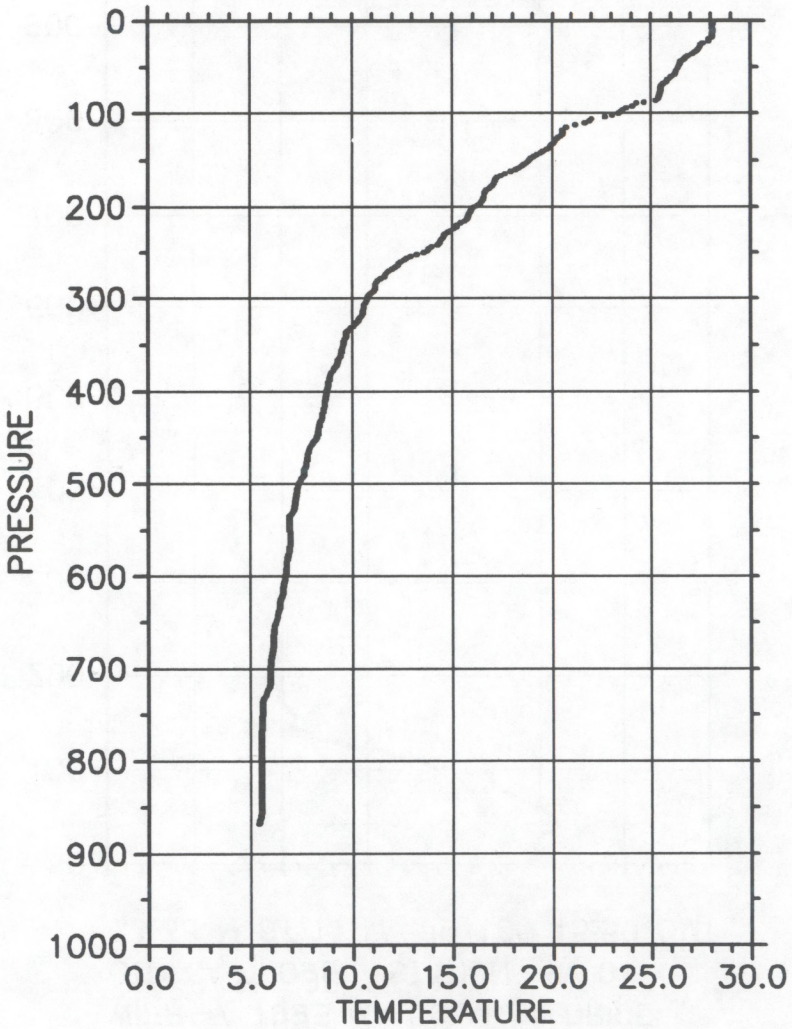


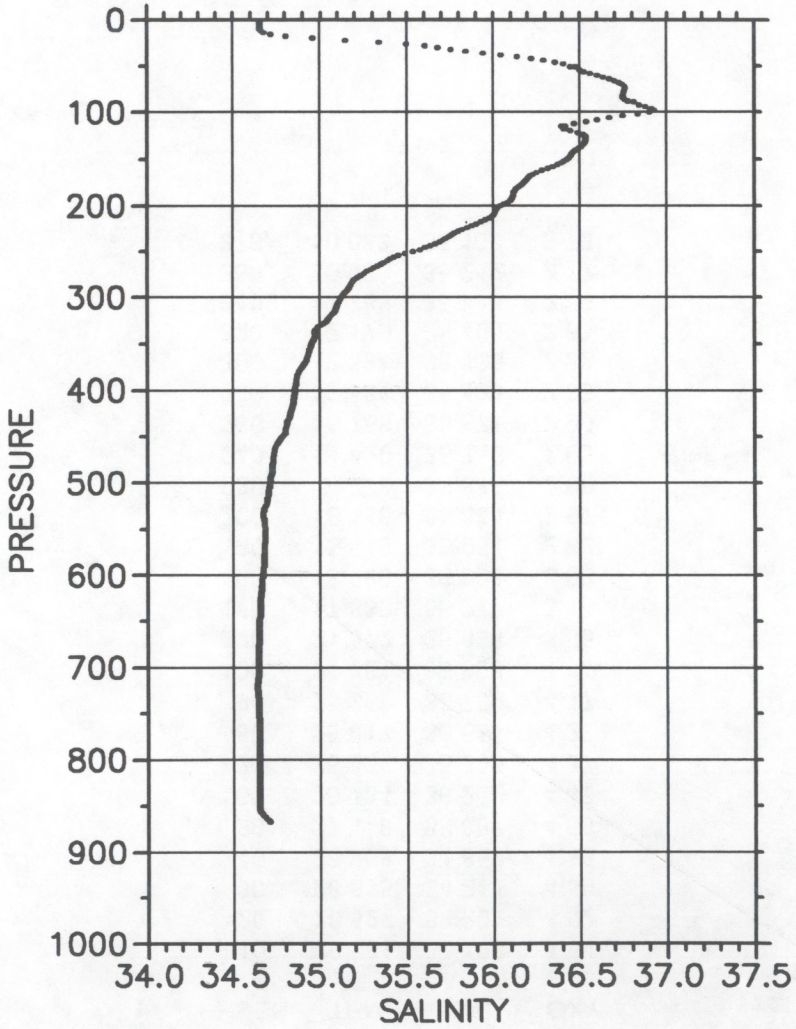
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 096 STATION SV 01
13.38 N 61.11 W JD 160 15:50 GMT



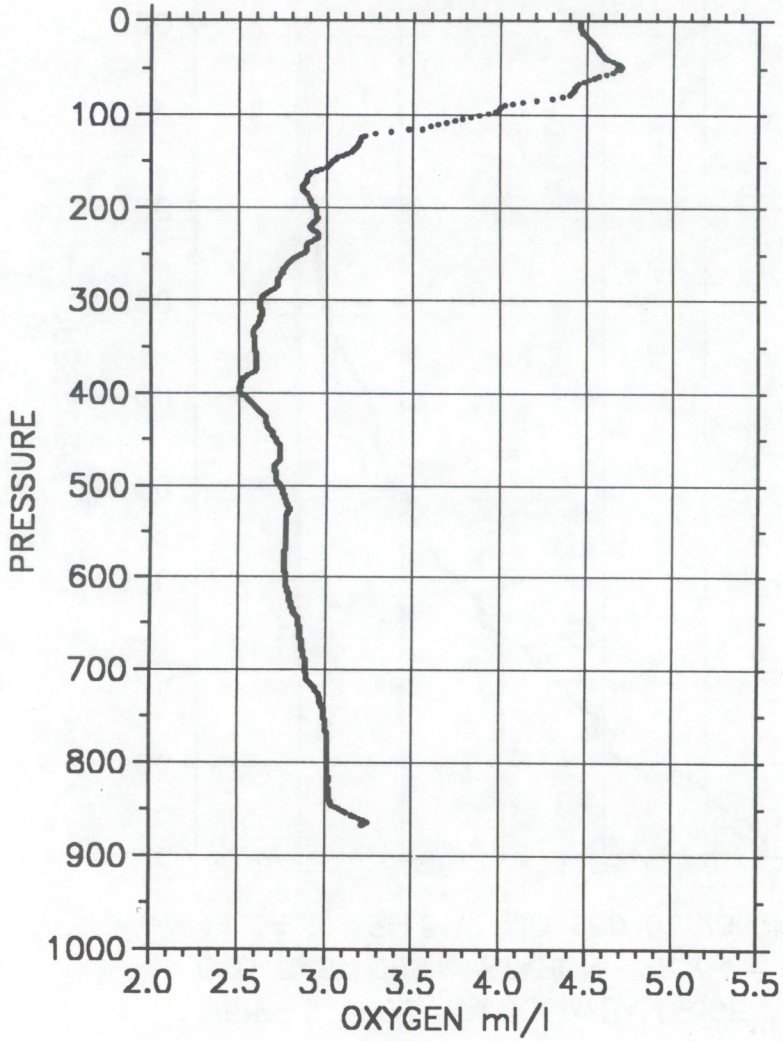
PRESS	TEMP	SAL	OXY
10.	28.531	34.198	4.54
20.	28.527	34.201	4.52
30.	28.515	34.211	4.50
40.	28.268	34.859	4.48
50.	27.179	35.887	4.56
60.	26.734	36.222	4.47
70.	26.264	36.396	4.37
80.	25.817	36.551	4.27
90.	25.369	36.759	4.17
100.	24.781	36.808	4.14
120.	21.372	36.838	3.55
140.	17.839	36.277	3.14
160.	16.389	36.098	3.03
180.	15.419	35.951	2.98
200.	15.118	35.894	2.97
220.	14.778	35.843	2.96
240.	14.429	35.756	2.95
260.	13.756	35.671	2.90
280.	12.581	35.493	2.85
300.	12.334	35.465	2.82
320.	12.176	35.404	2.83
340.	11.785	35.348	2.80
360.	10.903	35.212	2.77
378.	10.633	35.168	2.73

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 098 STATION GR 05
11.71 N 62.11 W JD 160 02:11 GMT



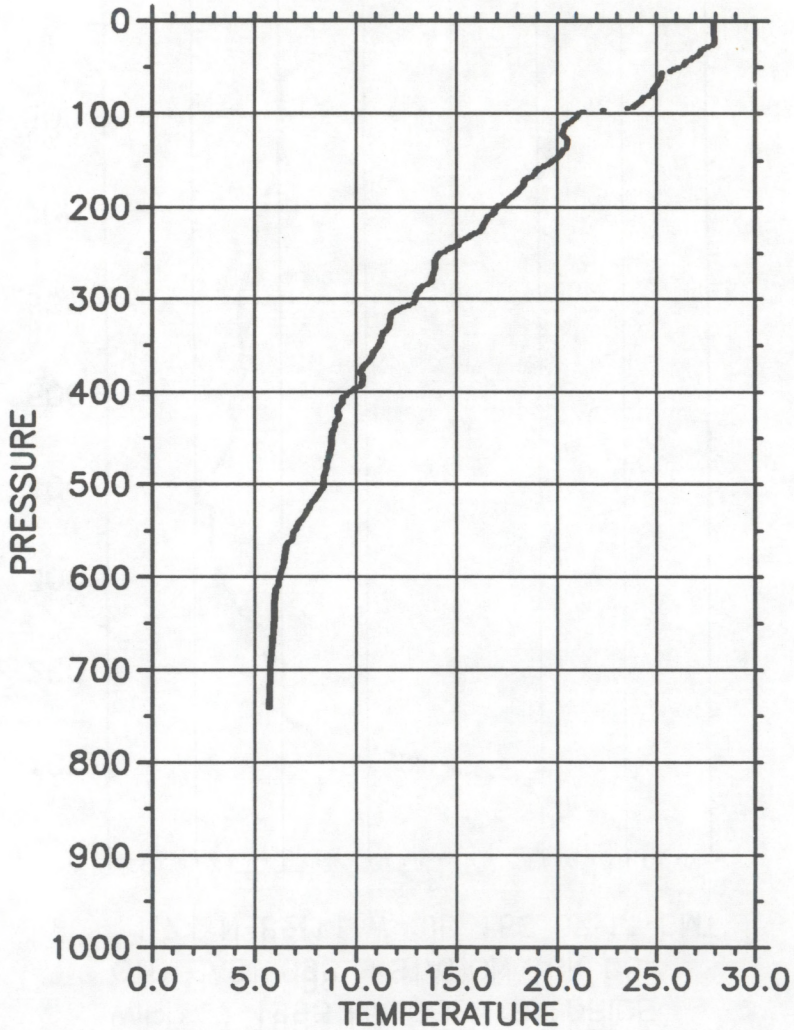


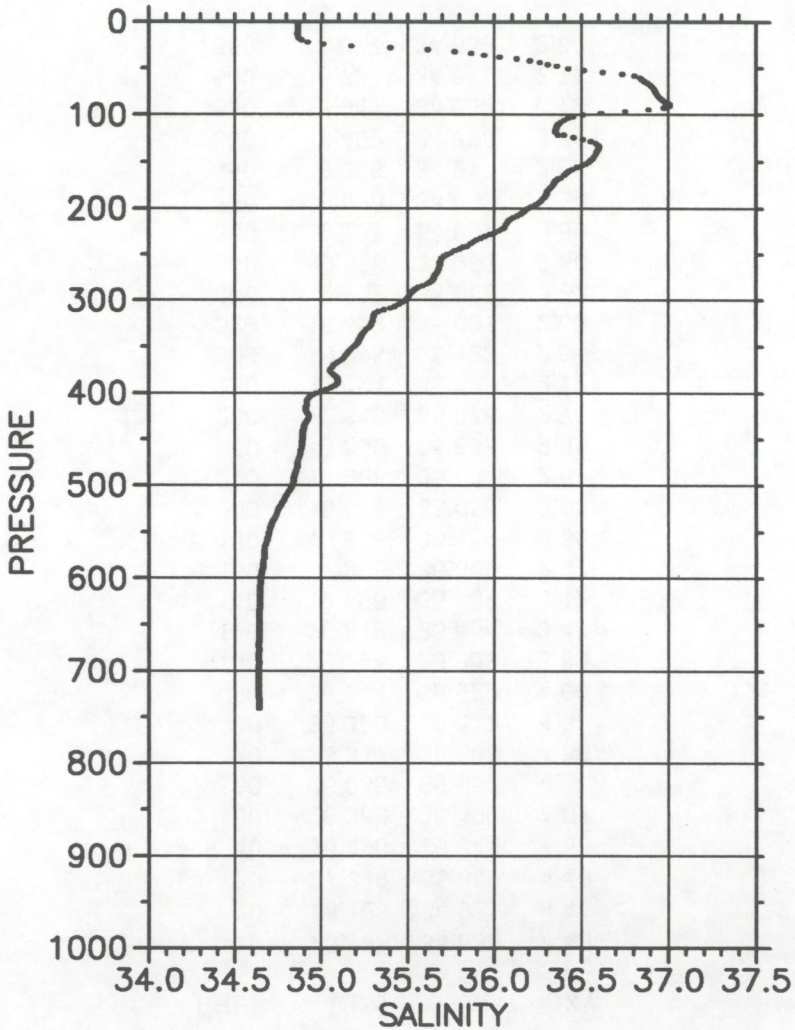
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 098 STATION GR 05
11.71 N 62.11 W JD 160 02:11 GMT



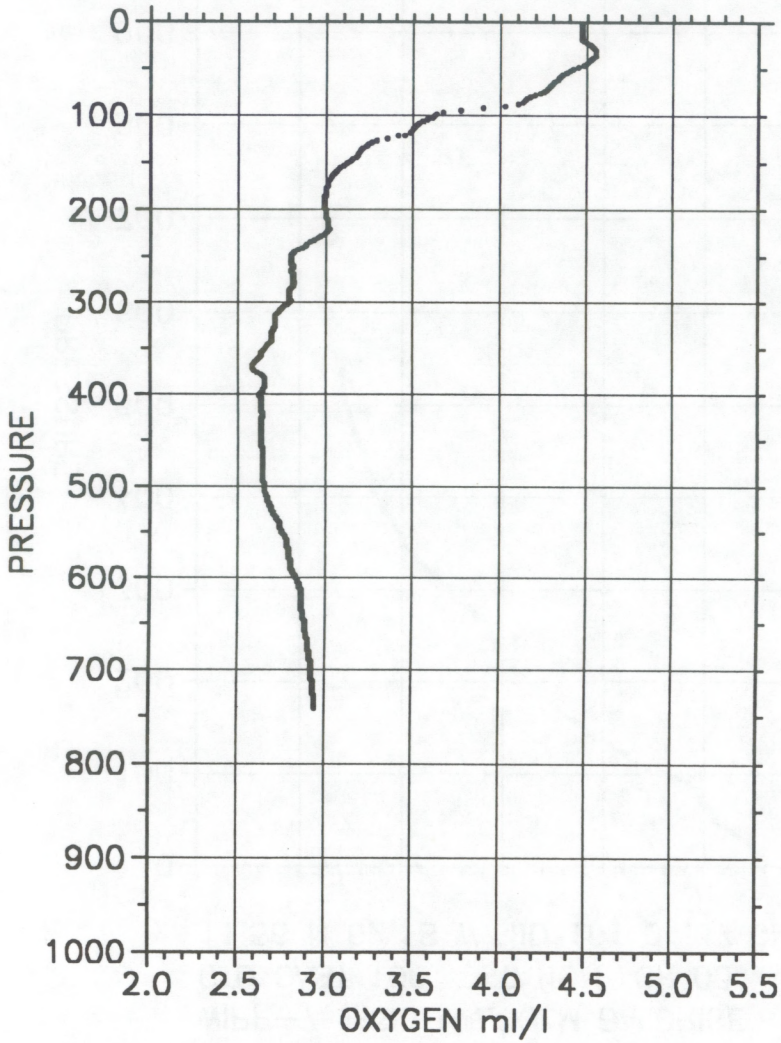
PRESS	TEMP	SAL	OXY
10.	28.193	34.656	4.49
20.	28.128	34.961	4.44
30.	27.319	35.850	4.49
40.	26.496	36.342	4.53
50.	26.368	36.499	4.64
60.	26.035	36.657	4.56
70.	25.537	36.803	4.38
80.	25.390	36.812	4.32
90.	23.914	36.920	4.00
100.	23.294	36.963	3.89
120.	20.518	36.454	3.48
140.	19.496	36.489	3.12
160.	17.995	36.309	2.97
180.	16.856	36.159	2.85
200.	16.078	36.056	2.91
220.	14.968	35.832	2.89
240.	13.869	35.635	2.85
260.	12.315	35.376	2.78
280.	11.194	35.195	2.72
300.	10.715	35.123	2.64
320.	10.409	35.067	2.62
340.	9.732	34.980	2.62
360.	9.568	34.951	2.60
380.	9.137	34.892	2.60
400.	8.838	34.866	2.54
450.	8.366	34.817	2.65
500.	7.492	34.728	2.71
550.	6.941	34.684	2.79
600.	6.787	34.672	2.77
650.	6.377	34.659	2.80
700.	5.996	34.647	2.87
750.	5.537	34.650	2.98
800.	5.527	34.649	3.02
850.	5.530	34.648	3.02
867.	5.452	34.691	3.11

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 099 STATION GR 04
11.64 N 62.15 W JD 160 03:28 GMT



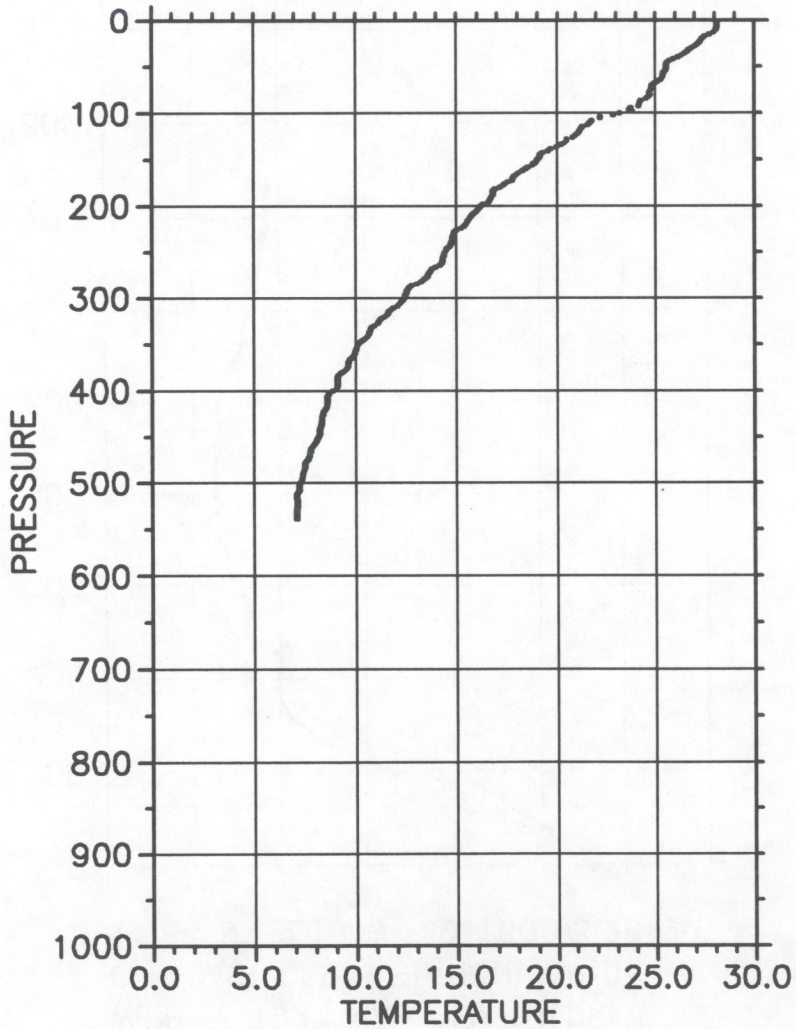


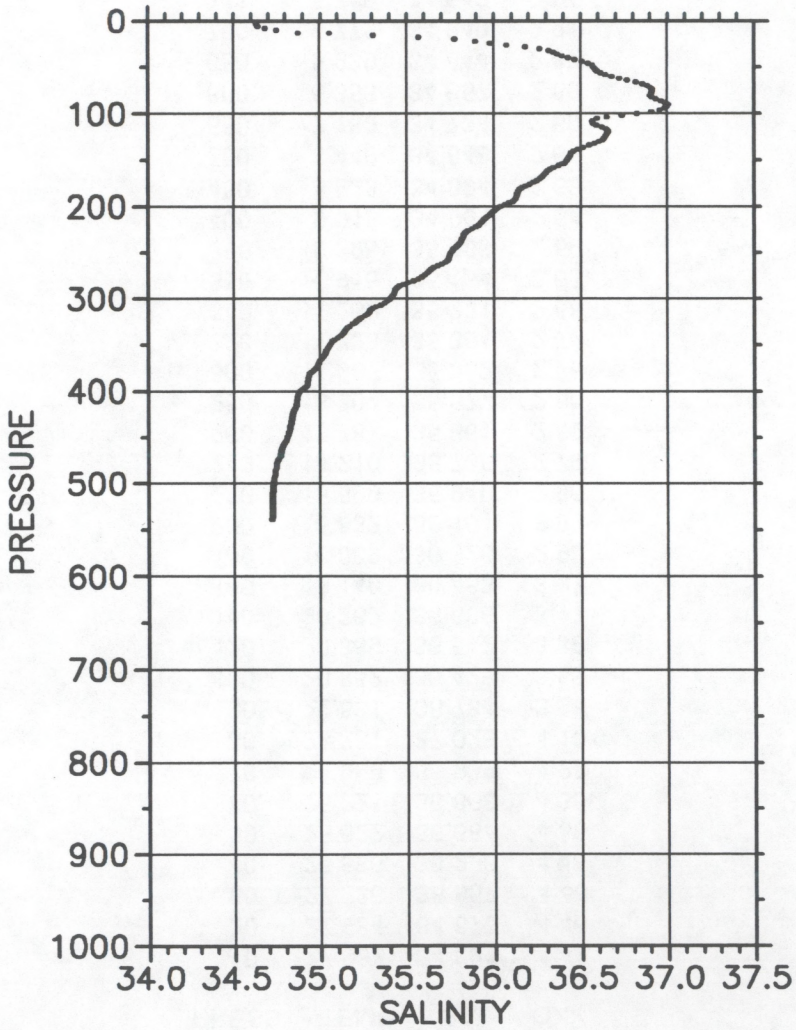
WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 099 STATION GR 04
11.64 N 62.15 W JD 160 03:28 GMT



PRESS	TEMP	SAL	OXY
10.	27.987	34.821	4.45
20.	27.984	34.870	4.46
30.	27.236	35.857	4.48
40.	26.526	36.296	4.46
50.	25.622	36.684	4.36
60.	25.321	36.868	4.30
70.	24.969	36.939	4.22
80.	24.281	37.023	4.10
90.	22.831	36.784	3.98
100.	20.852	36.428	3.56
120.	20.369	36.512	3.39
140.	20.262	36.608	3.17
160.	19.140	36.463	3.07
180.	18.089	36.326	2.98
200.	16.832	36.161	2.97
220.	15.599	35.940	2.96
240.	14.210	35.738	2.79
260.	13.787	35.661	2.80
280.	13.307	35.577	2.80
300.	11.987	35.352	2.75
320.	11.723	35.304	2.72
340.	11.269	35.221	2.68
360.	10.916	35.134	2.65
380.	10.396	35.103	2.59
400.	9.915	34.991	2.64
450.	8.923	34.894	2.63
500.	8.449	34.848	2.64
550.	7.180	34.724	2.69
600.	6.353	34.657	2.80
650.	5.939	34.644	2.87
700.	5.775	34.640	2.91
741.	5.718	34.642	2.94

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 100 STATION GR 03
11.56 N 62.18 W JD 161 04:37 GMT





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CTD CAST 100 STATION GR 03
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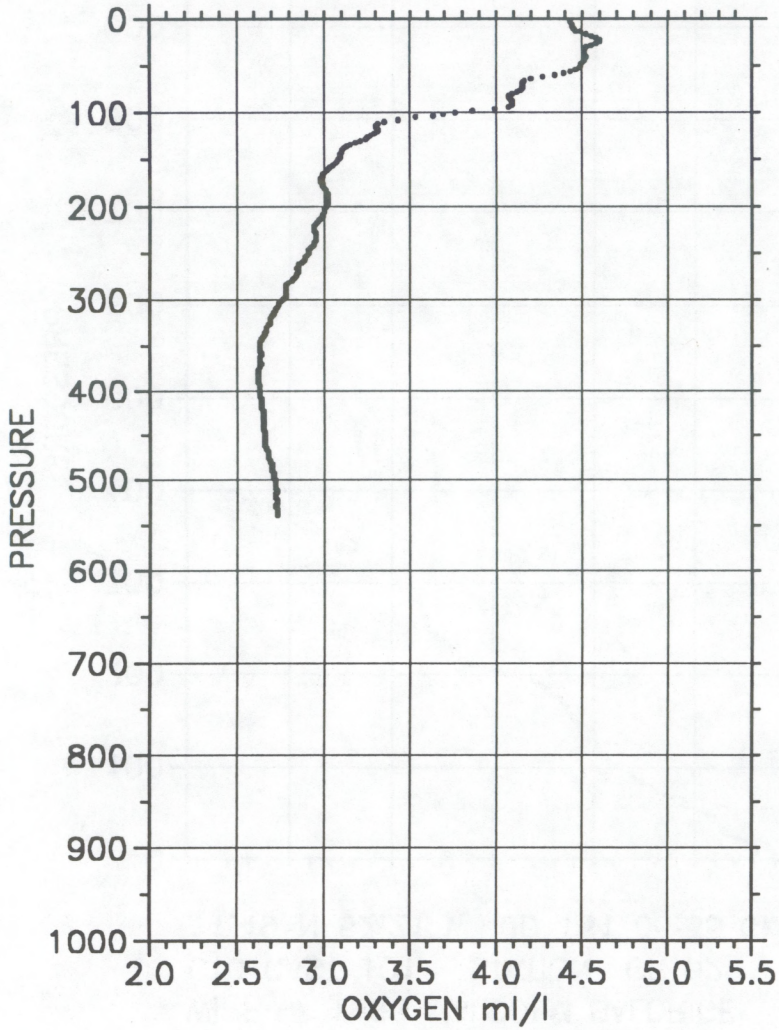
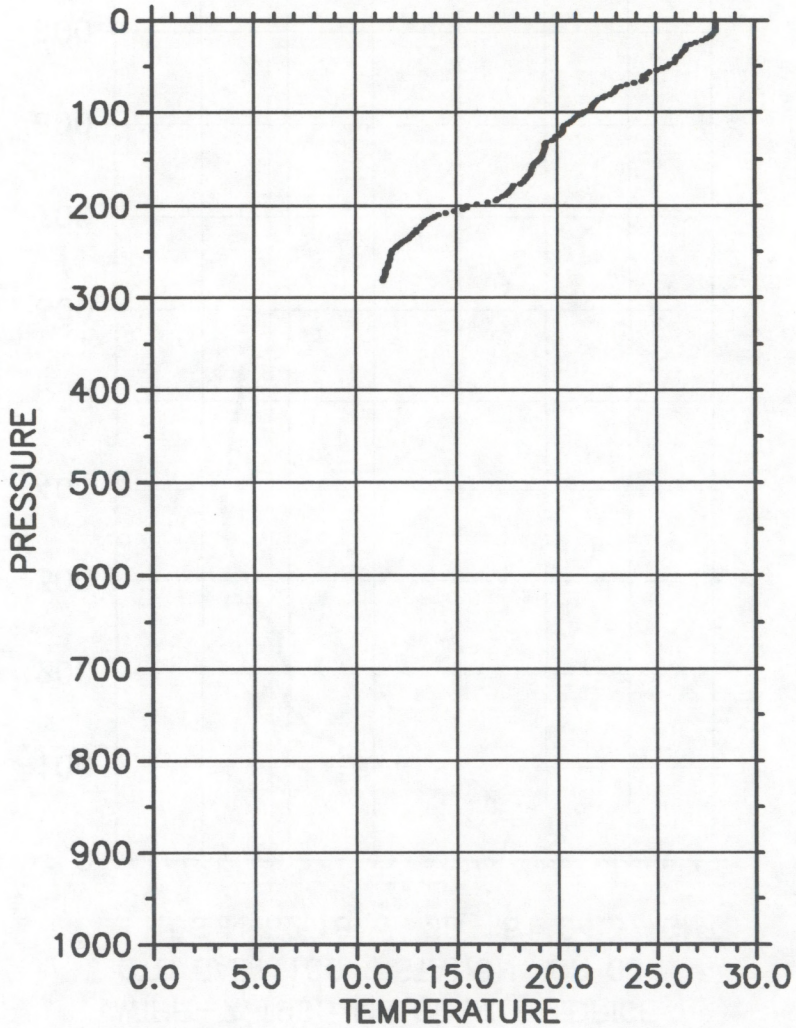
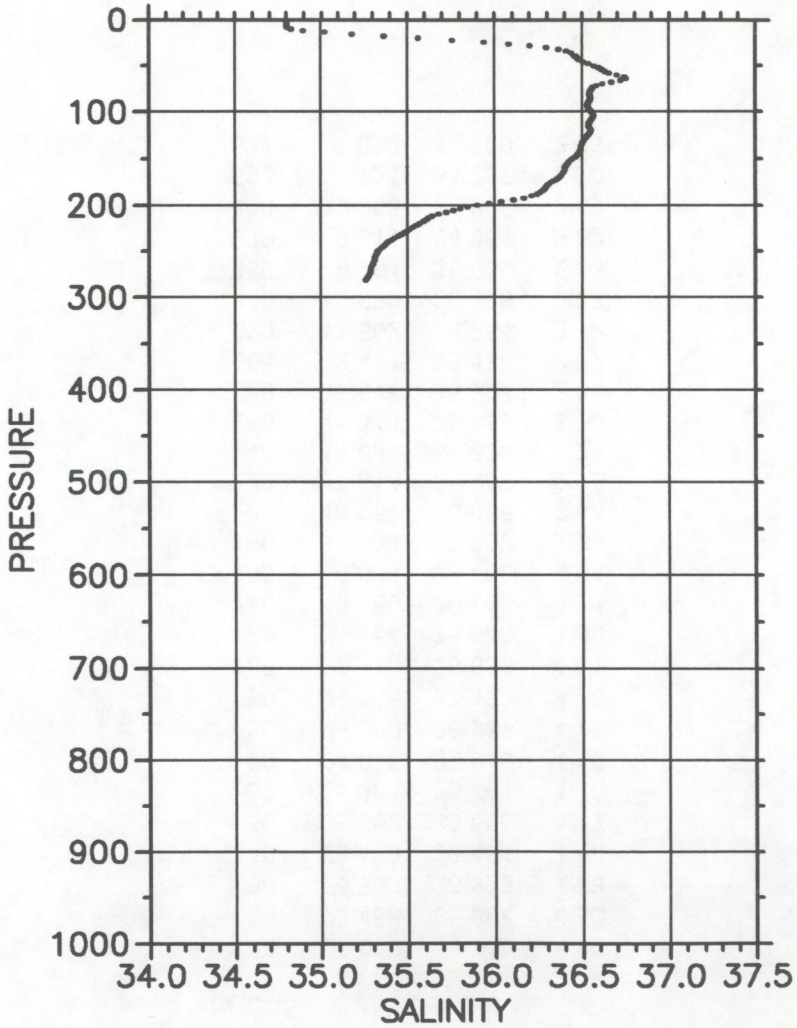


PRESS	TEMP	SAL	OXY
10.	28.036	34.922	4.46
20.	27.468	35.804	4.53
30.	26.762	36.323	4.53
40.	26.139	36.461	4.48
50.	25.562	36.606	4.47
60.	25.381	36.741	4.40
70.	24.816	36.940	4.16
80.	24.560	36.969	4.11
90.	24.198	37.137	4.08
100.	23.179	36.829	4.01
120.	21.154	36.686	3.30
140.	19.986	36.535	3.18
160.	18.608	36.400	3.04
180.	17.366	36.239	2.94
200.	16.367	36.068	2.98
220.	15.613	35.950	2.98
240.	14.824	35.826	2.93
260.	14.349	35.755	2.90
280.	13.544	35.607	2.83
300.	12.471	35.434	2.77
320.	11.592	35.264	2.72
340.	10.629	35.136	2.67
360.	9.994	35.039	2.63
380.	9.514	34.961	2.62
400.	9.063	34.896	2.62
500.	7.221	34.727	2.70
539.	7.082	34.720	2.73

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 101 STATION GR 02
11.49 N 62.21 W JD 161 05:35 GMT





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CTD CAST 101 STATION GR 02
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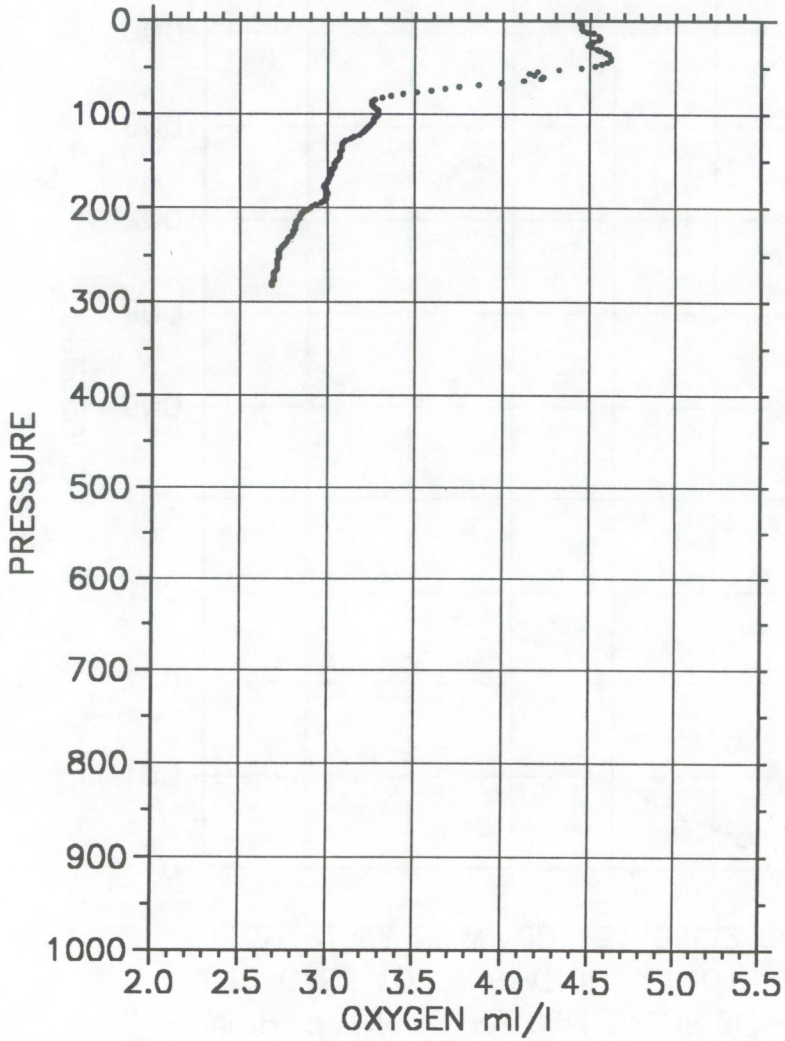
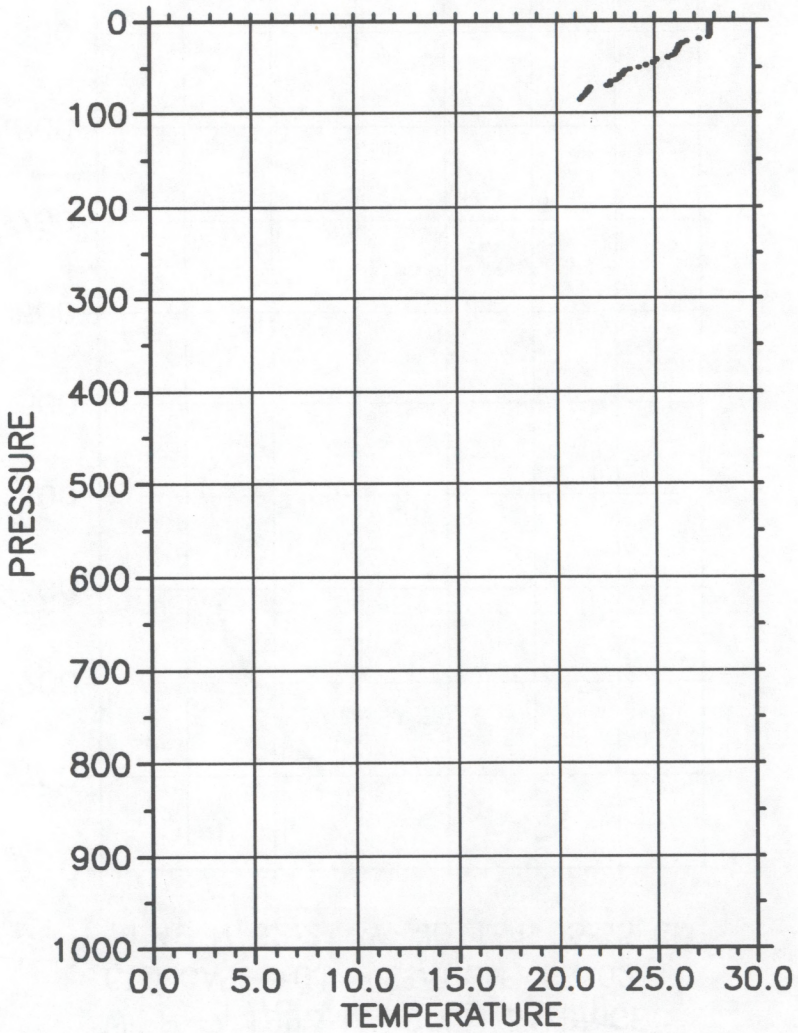
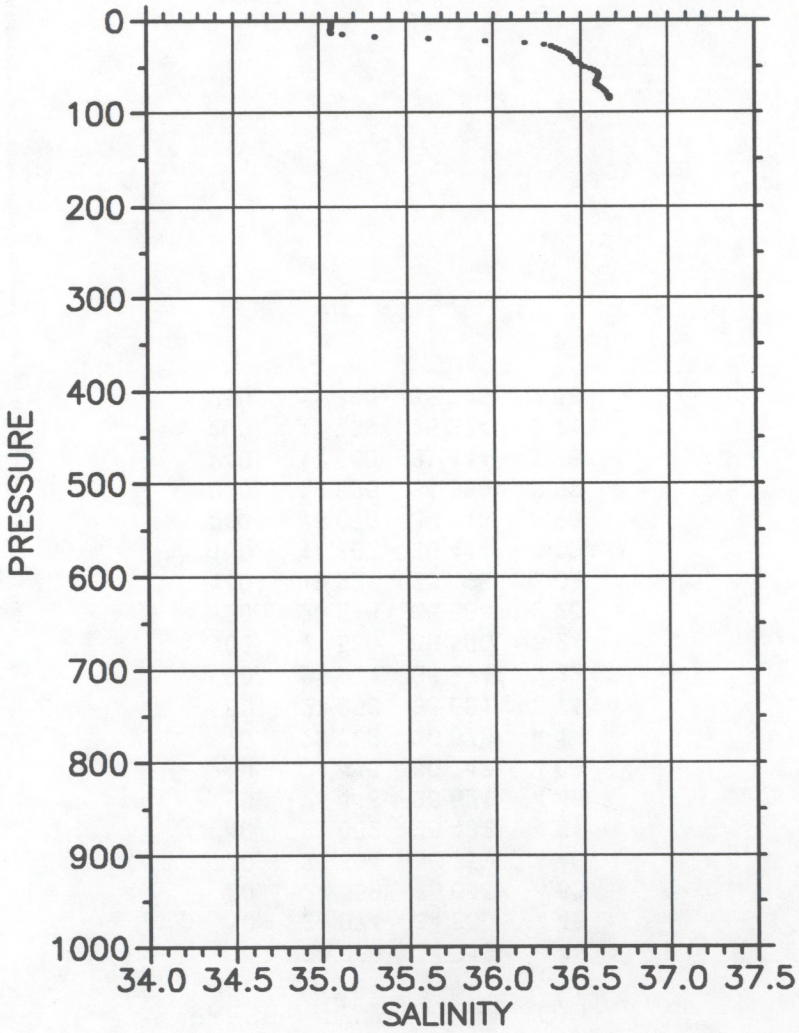


PRESS	TEMP	SAL	OXY
4.	28.066	34.713	4.41
10.	28.074	34.800	4.45
20.	27.559	35.645	4.53
30.	26.594	36.353	4.48
40.	26.062	36.482	4.61
50.	25.448	36.621	4.48
60.	24.416	36.747	4.06
70.	23.792	36.678	4.14
80.	22.958	36.581	3.71
90.	21.974	36.574	3.32
100.	21.580	36.560	3.24
120.	20.216	36.564	3.20
140.	19.221	36.496	3.04
160.	18.702	36.414	3.02
200.	16.070	36.016	2.96
220.	13.625	35.630	2.82
240.	12.566	35.444	2.78
260.	11.739	35.324	2.71
280.	11.390	35.275	2.68

WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 102 STATION GR 01
11.38 N 62.25 W JD 161 06:32 GMT





WIPP-7 1993 MALCOLM BALDRIGE
CTD CAST 102 STATION GR 01
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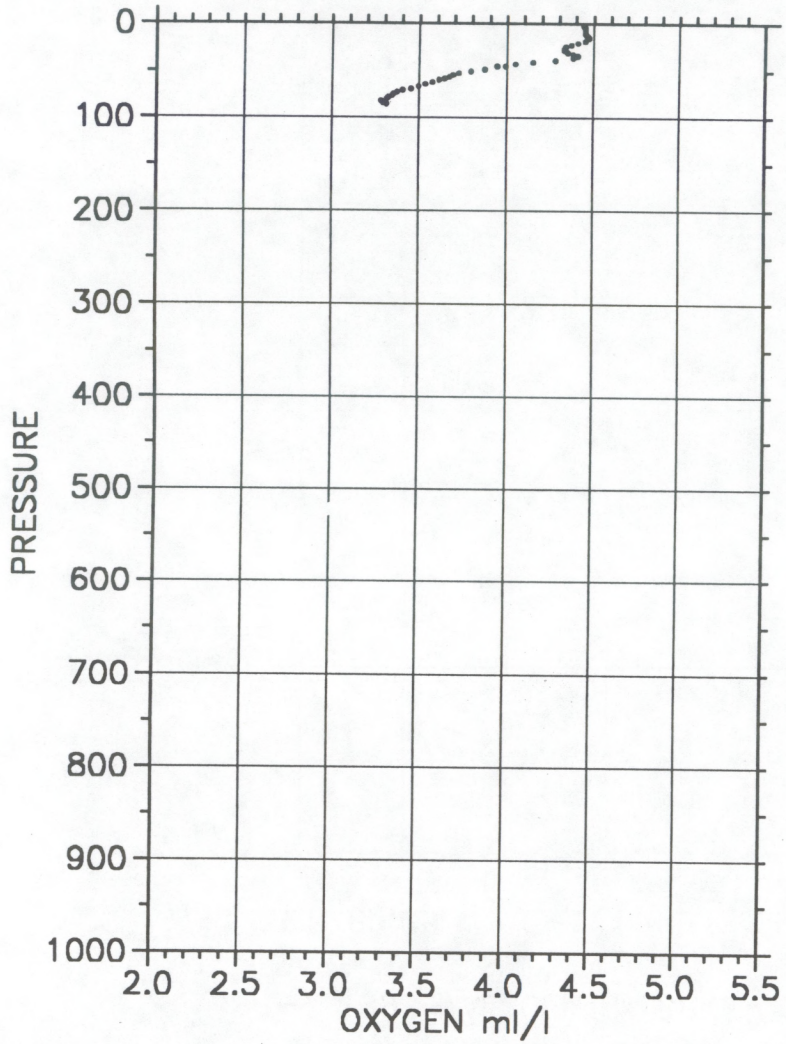


PRESS	TEMP	SAL	OXY
10.	27.836	35.064	4.46
30.	26.308	36.304	4.34
40.	26.042	36.449	4.43
60.	23.452	36.615	3.68
70.	22.751	36.601	3.51
80.	21.640	36.643	3.34
84.	21.354	36.652	3.31

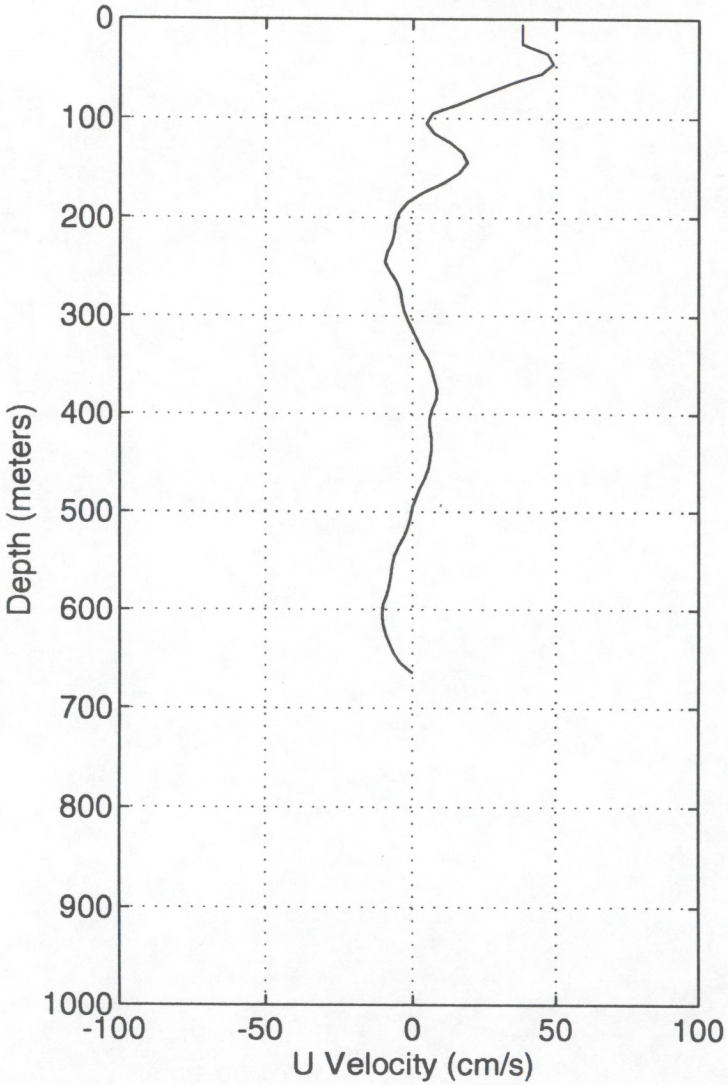
Appendix B for WI - 07

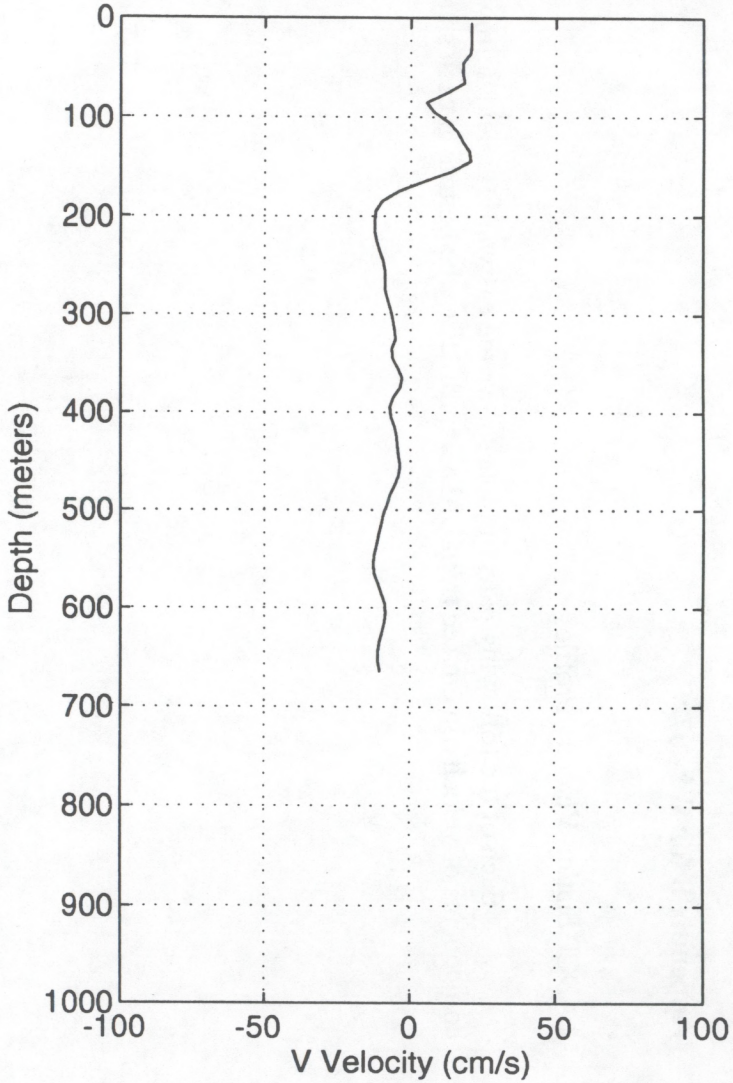
LADCP Station Velocity Profiles

Each of the following pairs of plots shows the eastward (U) and northward (V) components of velocity in cm/sec from LADCP profiles to the bottom at each station.

Lowered ADCP WIPP-7 DO-5 Cast #82

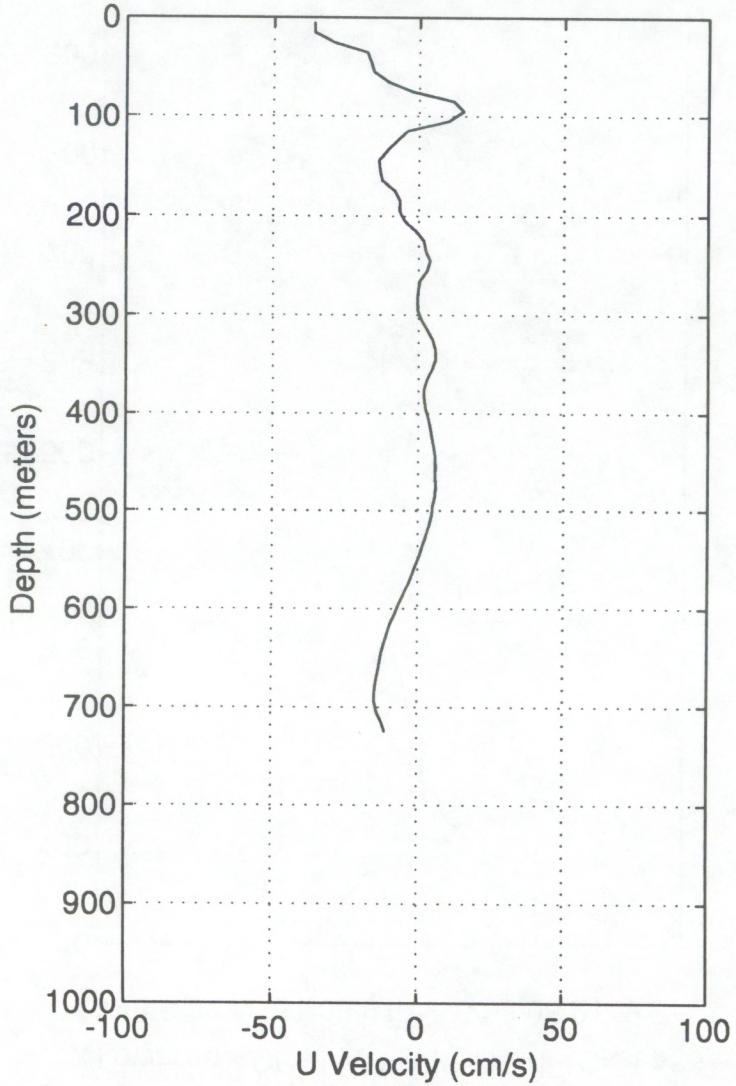
15 12.35 N 61 16.45 W 6/08/93 1639 Z

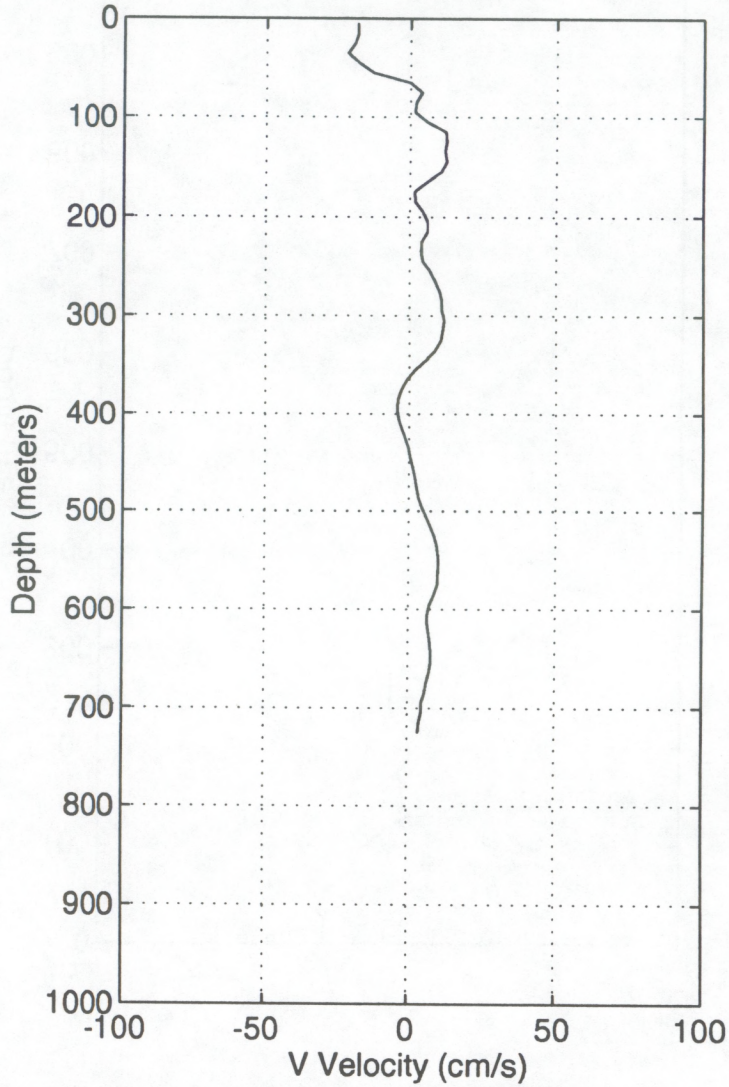




Lowered ADCP WIPP-7 DO-2 Cast #85

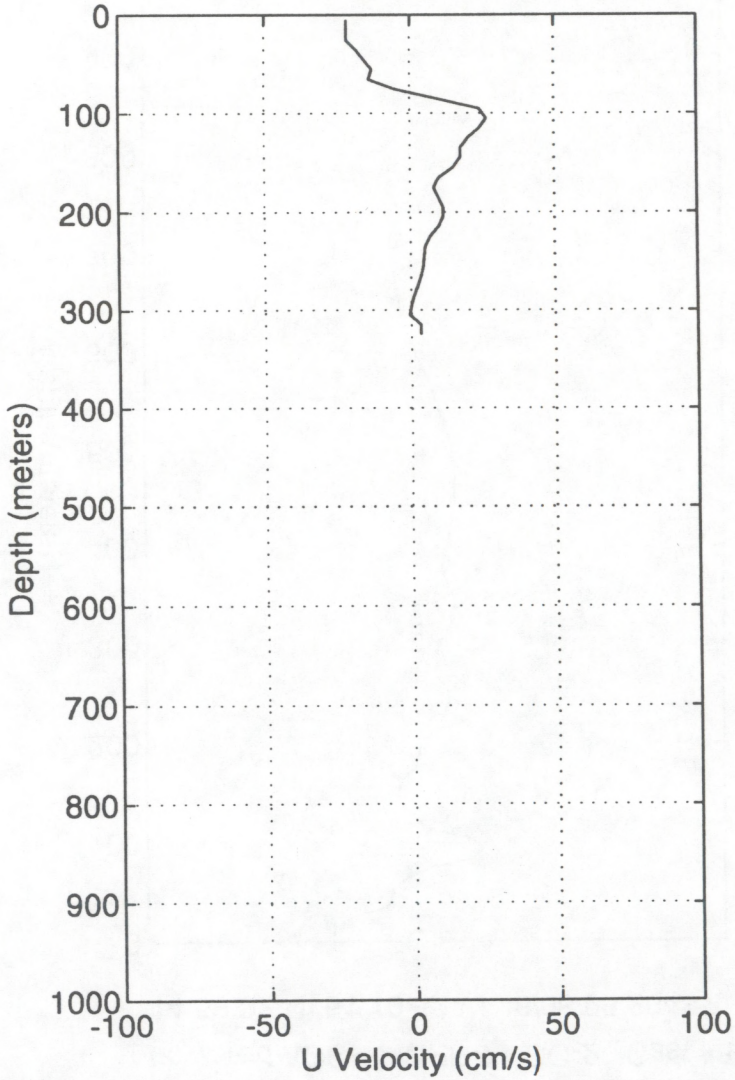
14 59.32 N 61 10.52 W 6/08/93 2041 Z

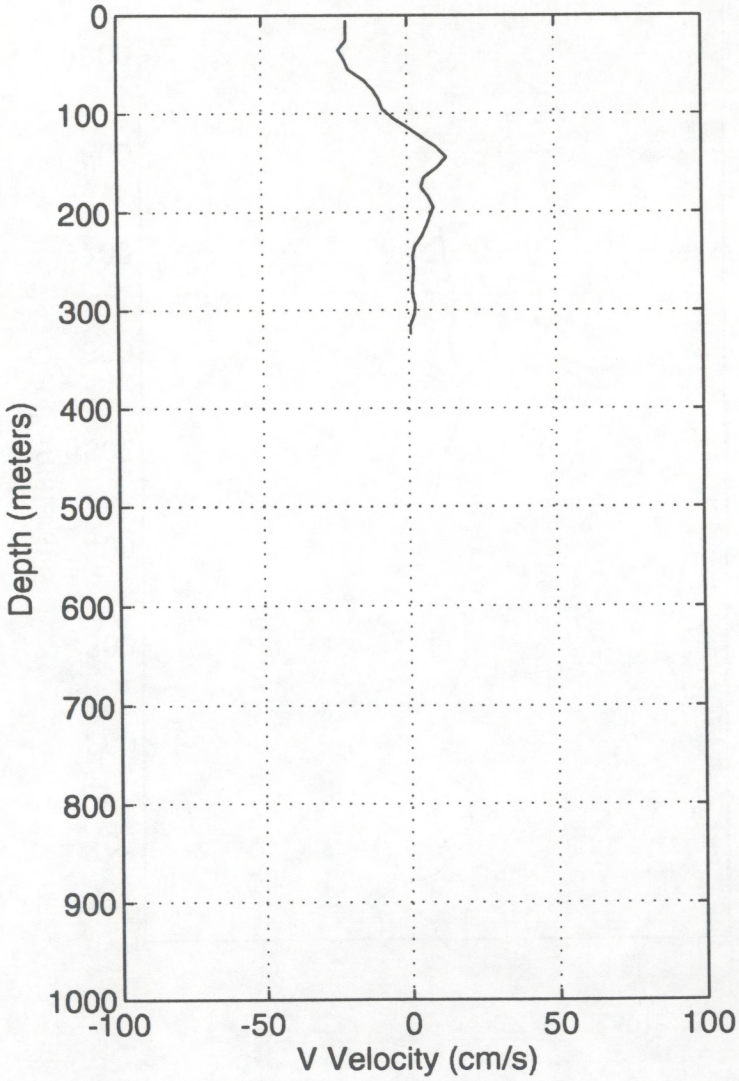




Lowered ADCP WIPP-7 DO-1 Cast #86

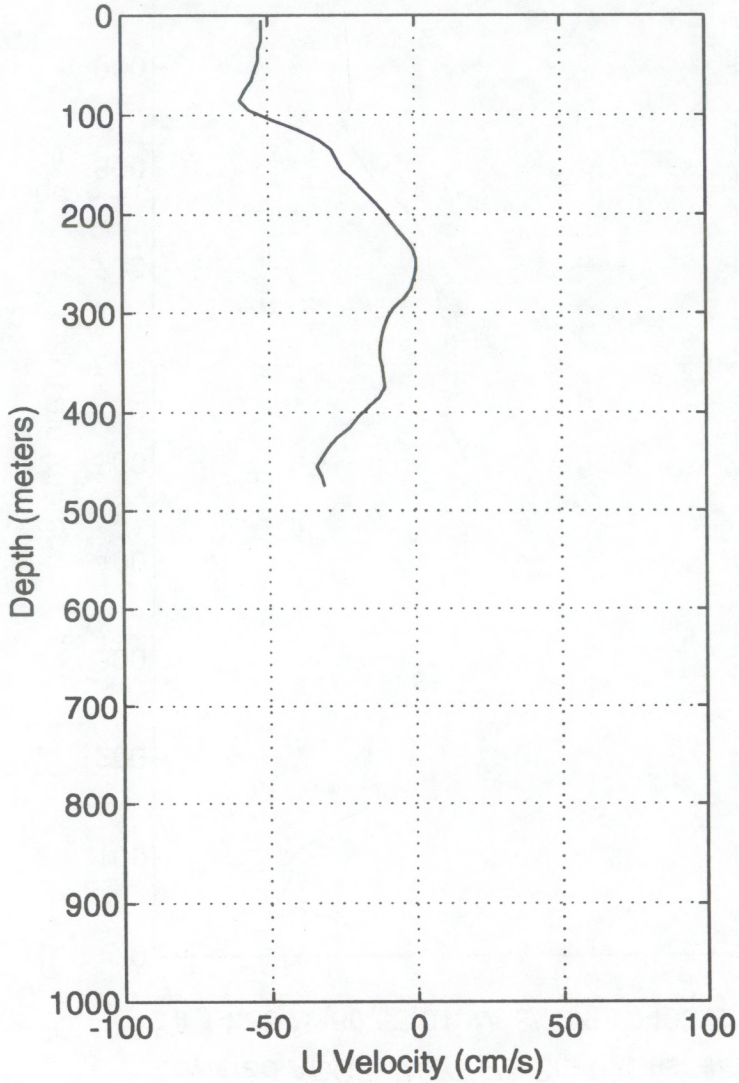
14 56.32 N 61 08.91 W 6/08/93 2149 Z

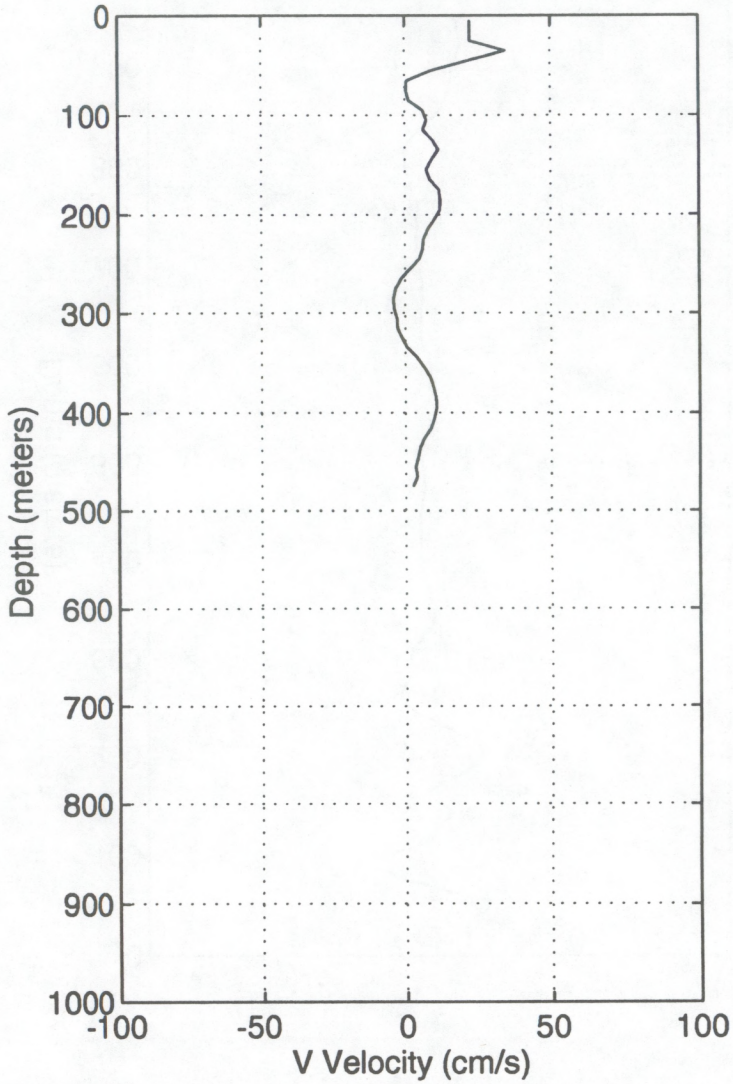




Lowered ADCP WIPP-7 SL-5 Cast #87

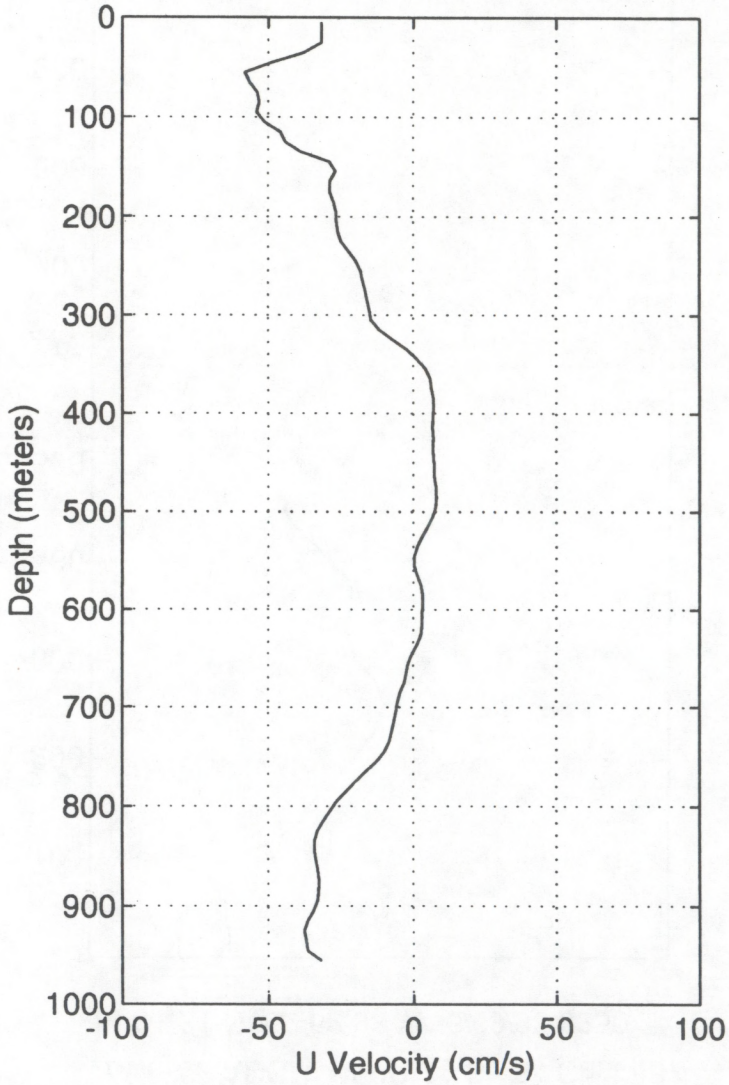
14 21.31 N 60 52.93 W 6/09/93 0250 Z

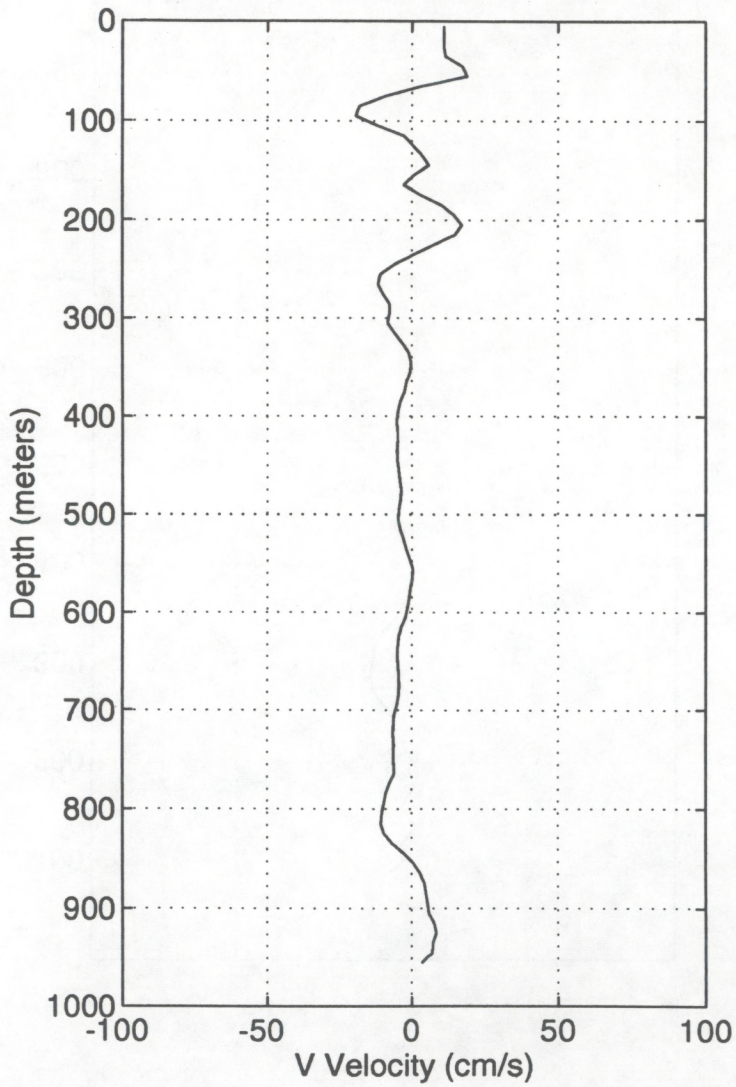




Lowered ADCP WIPP-7 SL-4 Cast #88

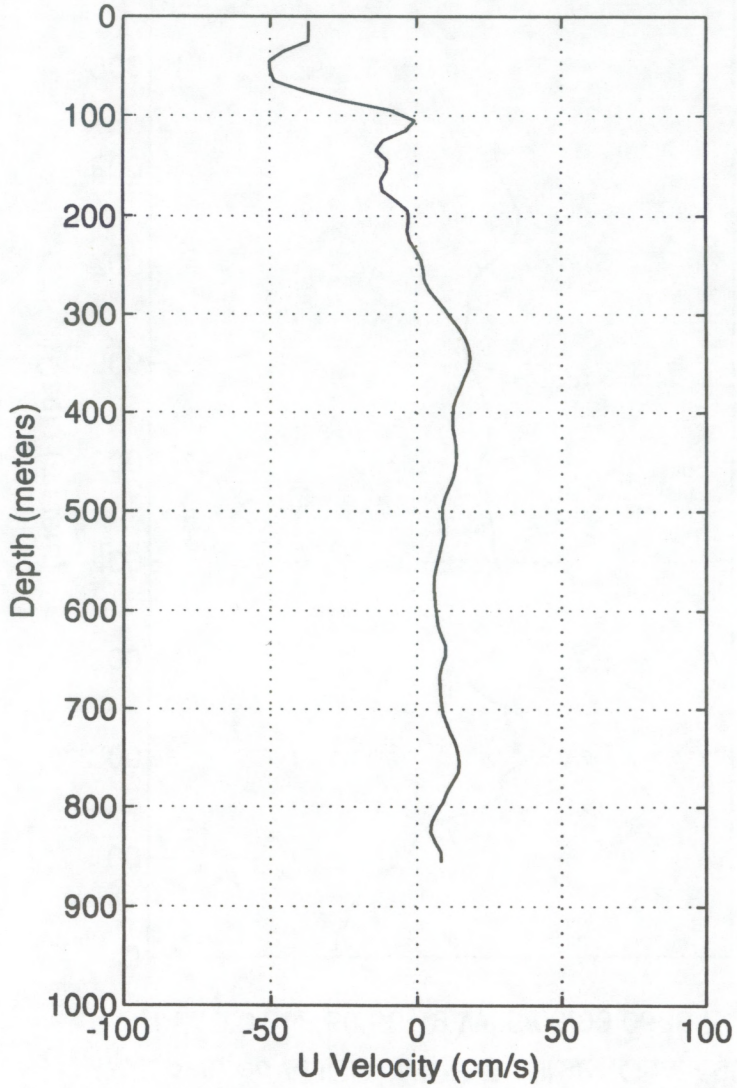
14 14.38 N 60 53.01 W 6/09/93 0403 Z

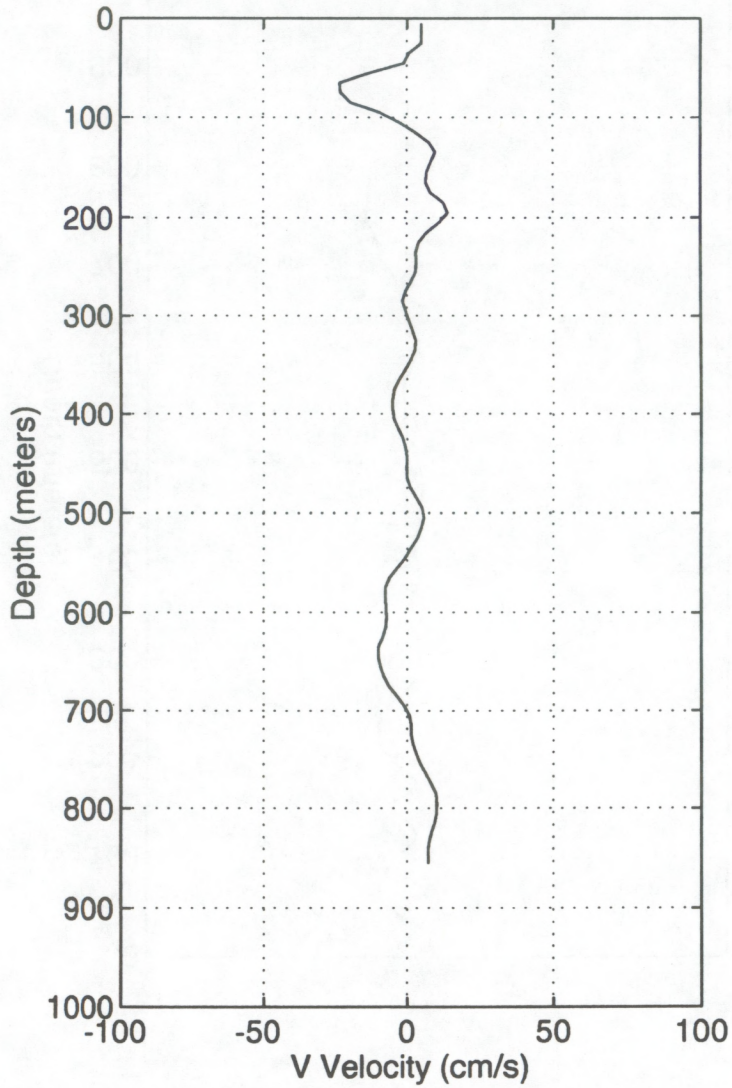




Lowered ADCP WIPP-7 SL-3 Cast #89

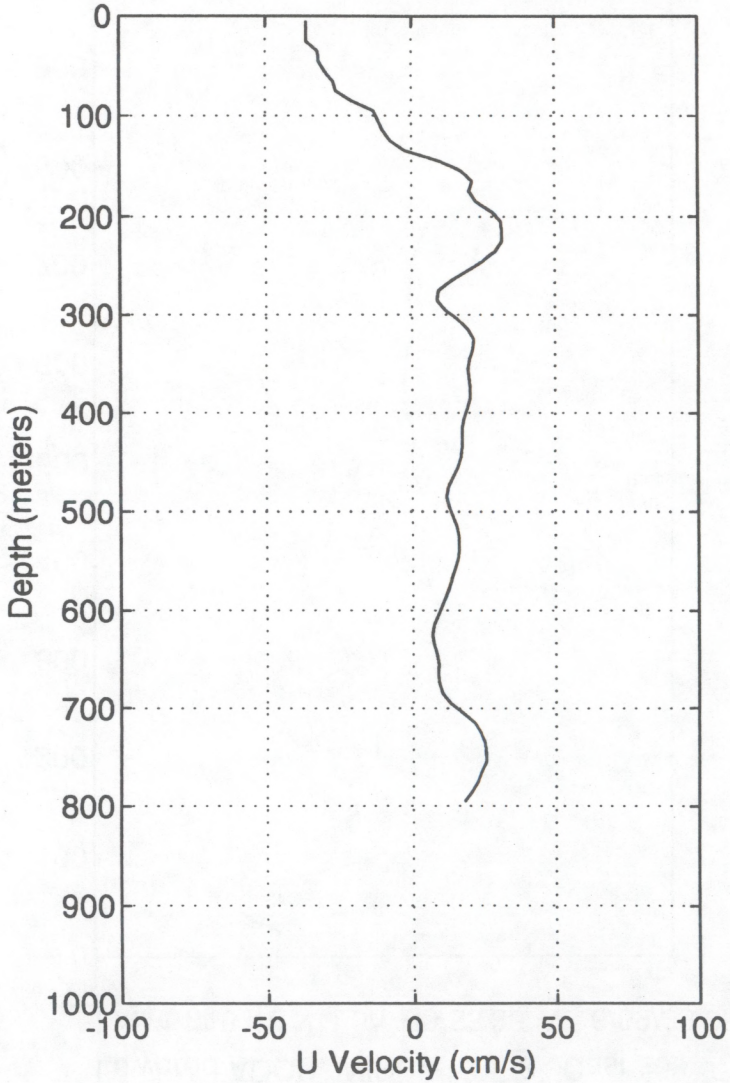
Lat: 14 15.42 N Lon: 60 53.30 W 6/09/93 0528 Z

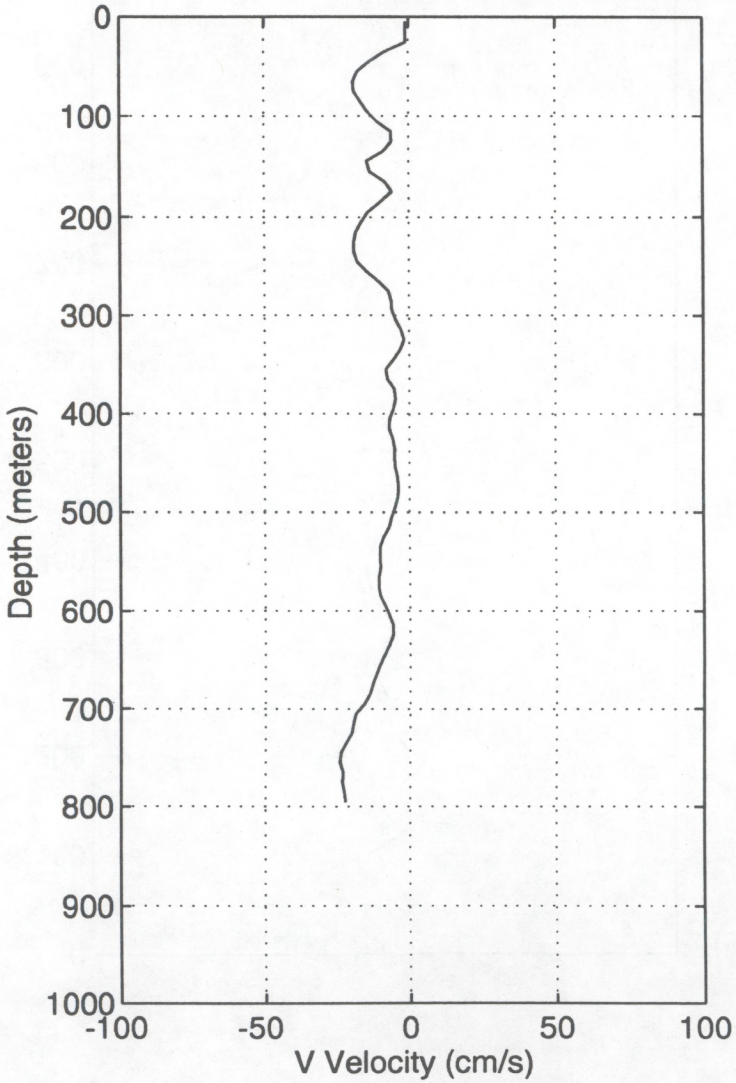




Lowered ADCP WIPP-7 SL-2 Cast #90

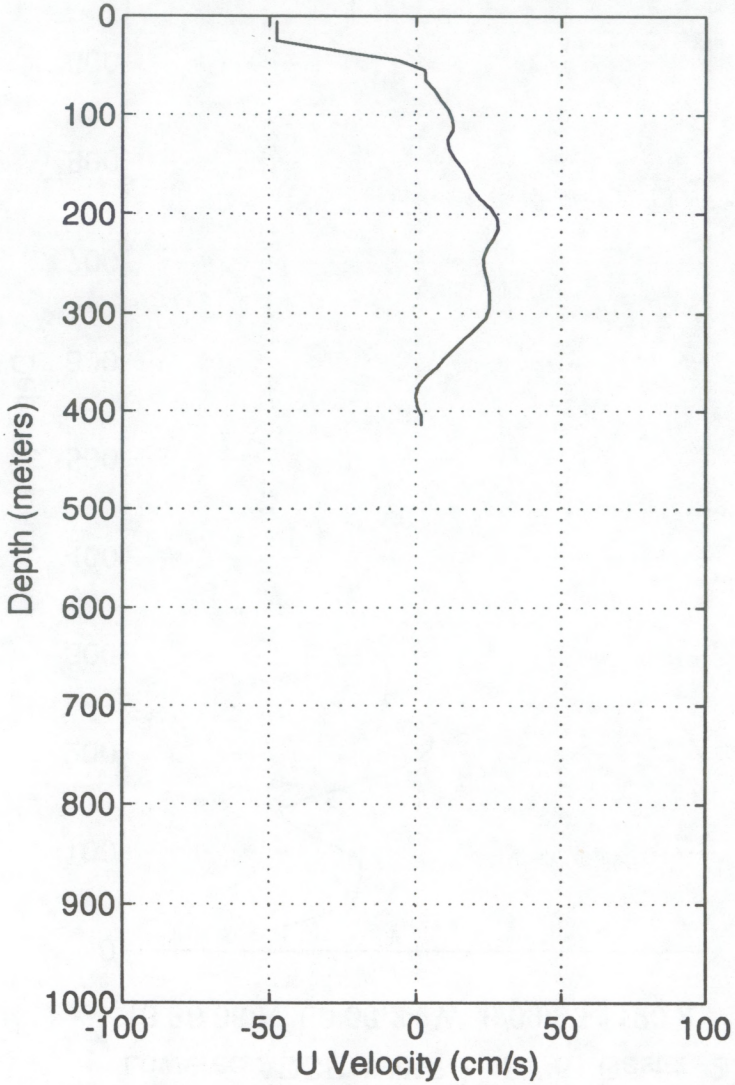
14 13.01 N 60 53.49 W 6/09/93 0636 Z

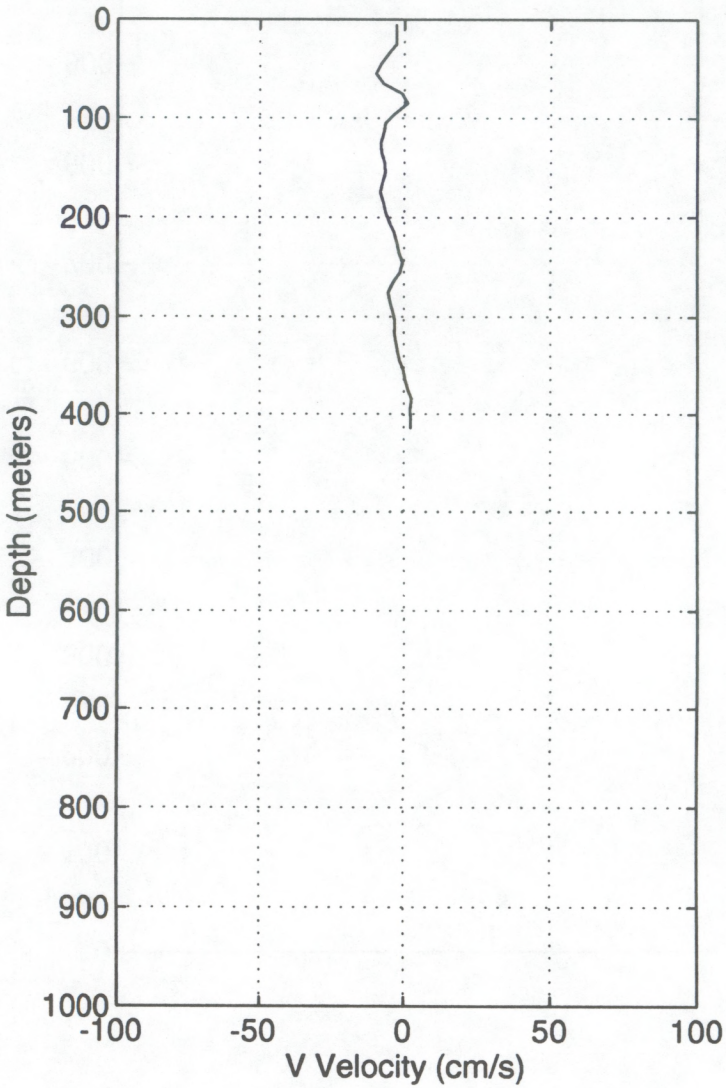




Lowered ADCP WIPP-7 SL-1 Cast #91

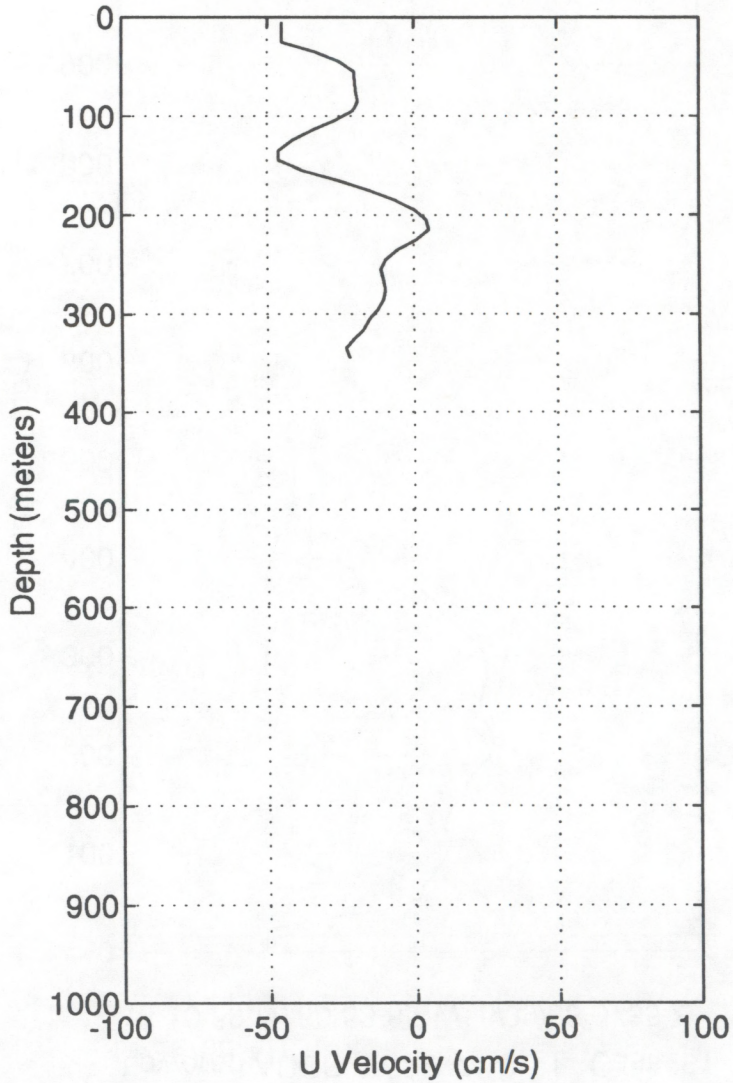
14 10.69 N 60 53.85 W 6/09/93 0735 Z

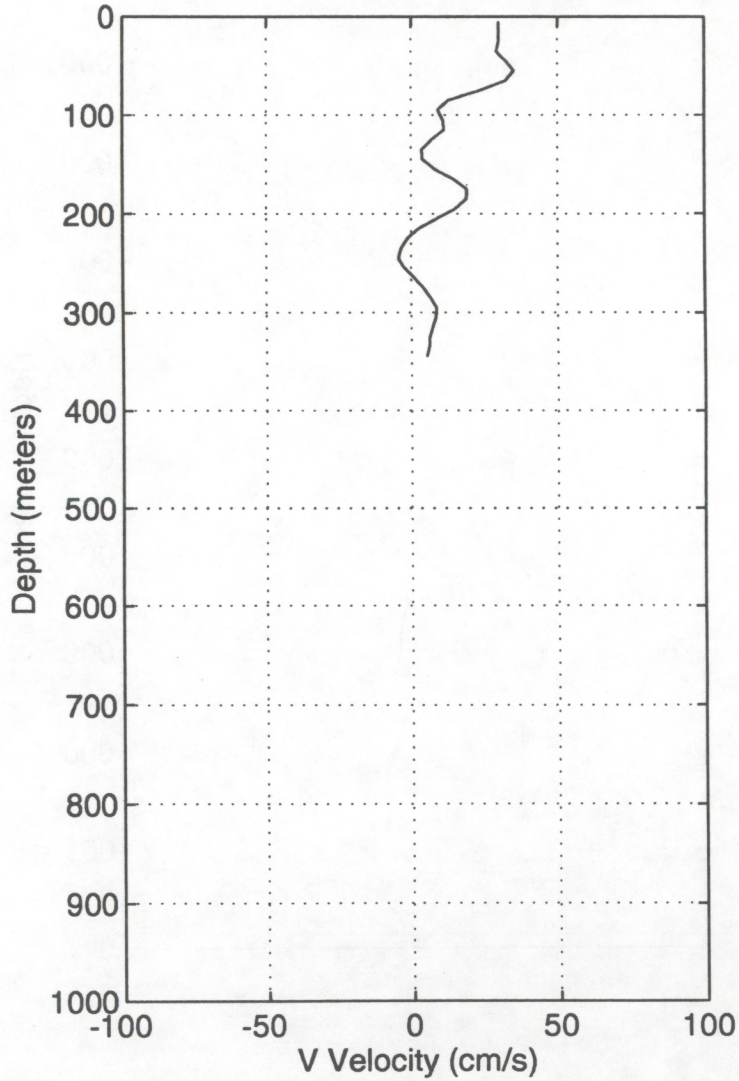




Lowered ADCP WIPP-7 SV-5 Cast #92

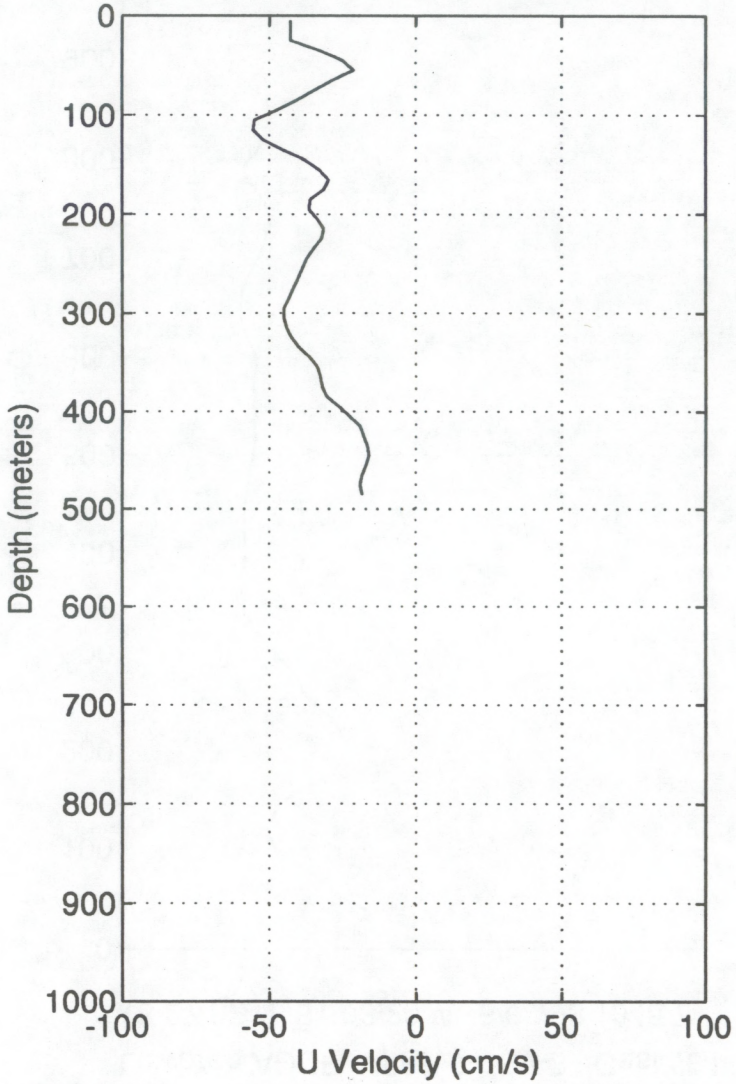
13 36.86 N 60 56.24 W 6/09/93 1120 Z

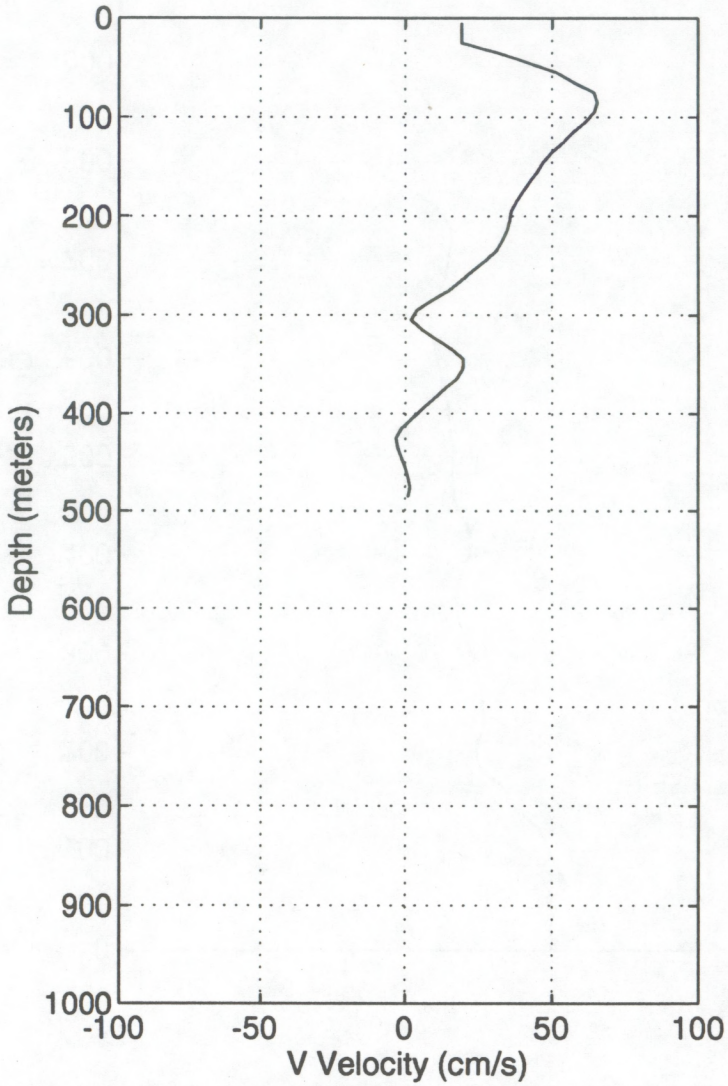




Lowered ADCP WIPP-7 SV-4 Cast #93

13 30.44 N 61 01.19 W 6/09/93 1228 Z





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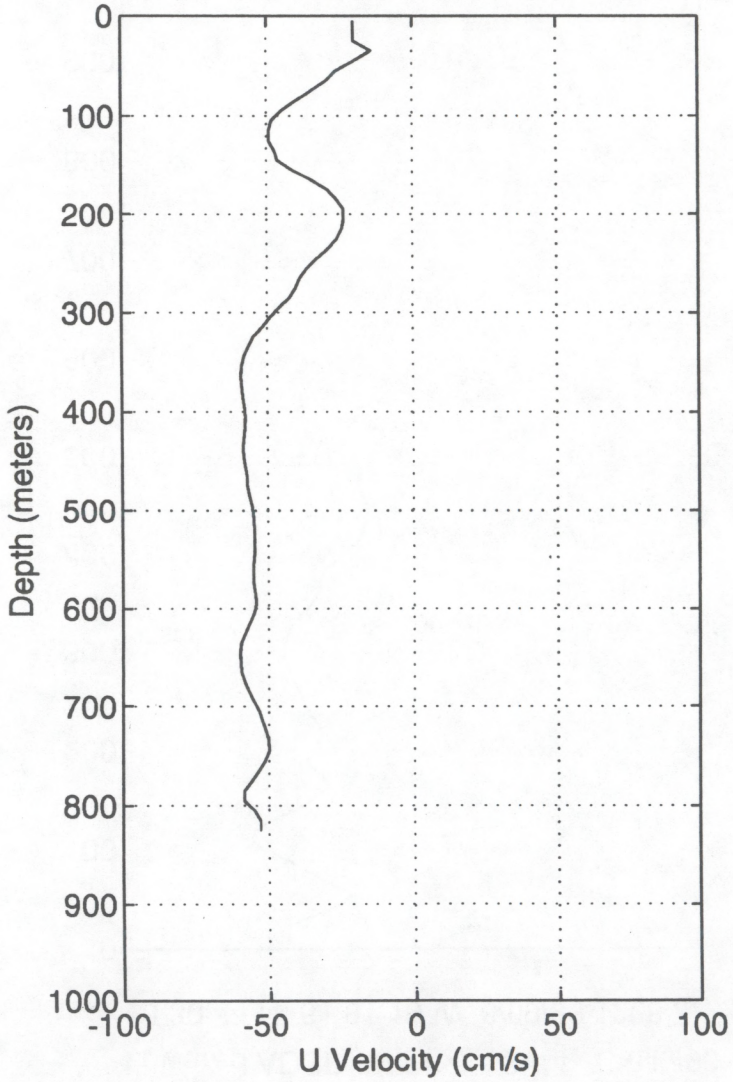
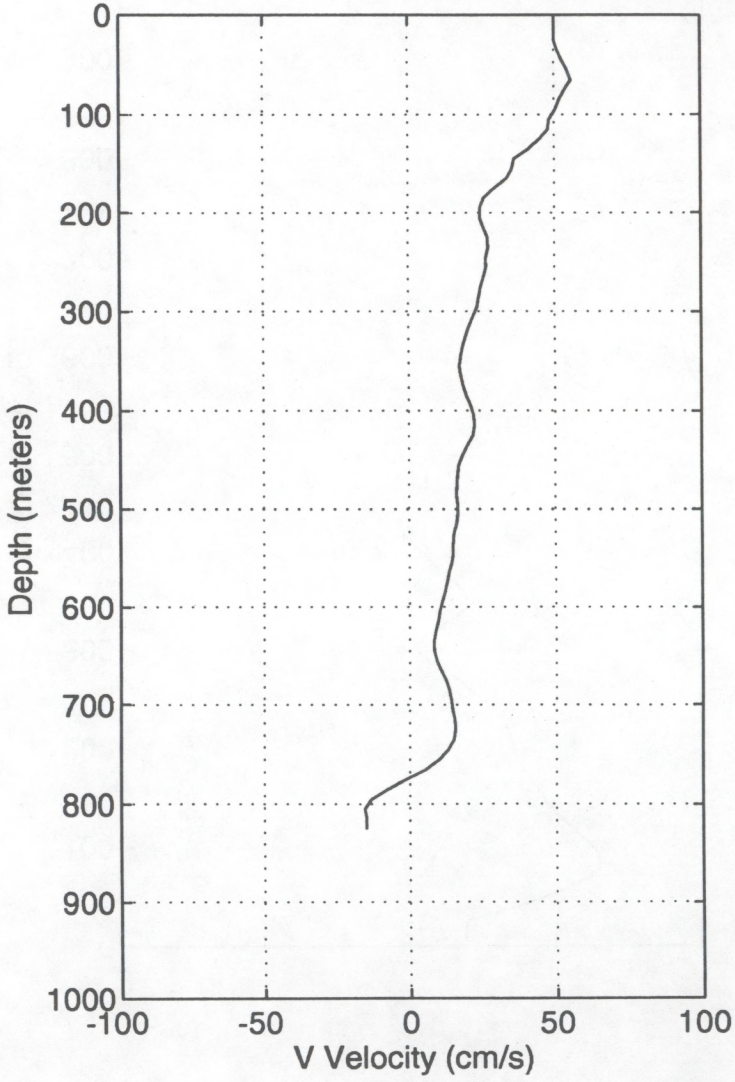
13 27.87 N 61 03.20 W 6/09/93 1348 Z





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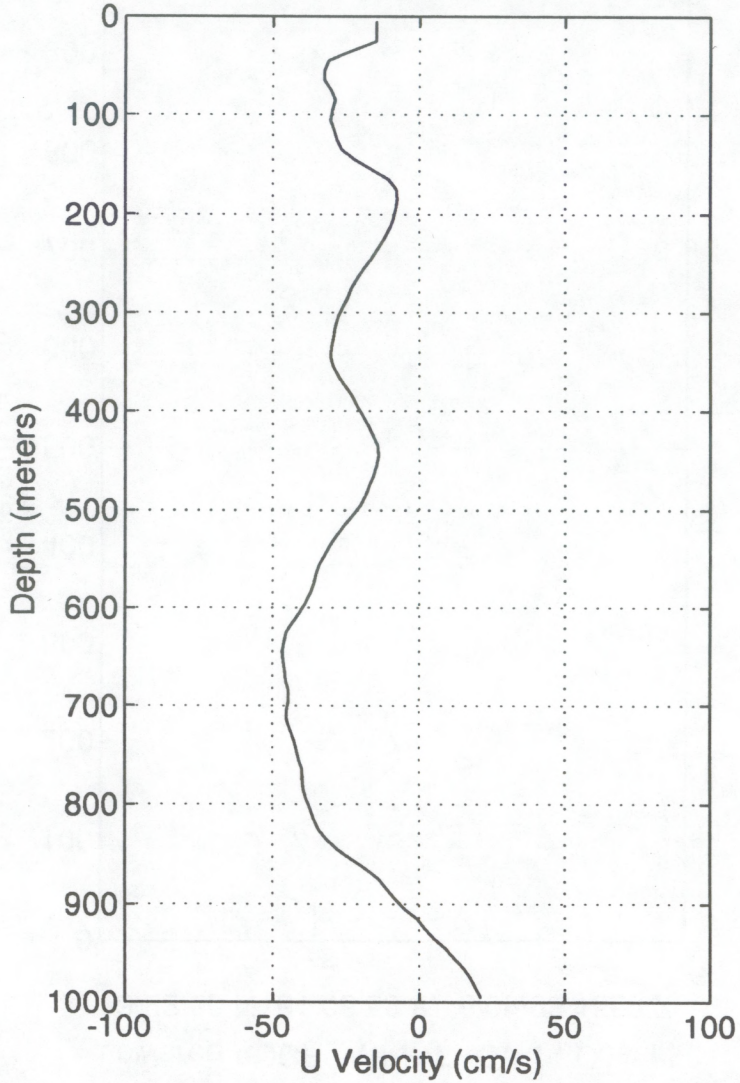
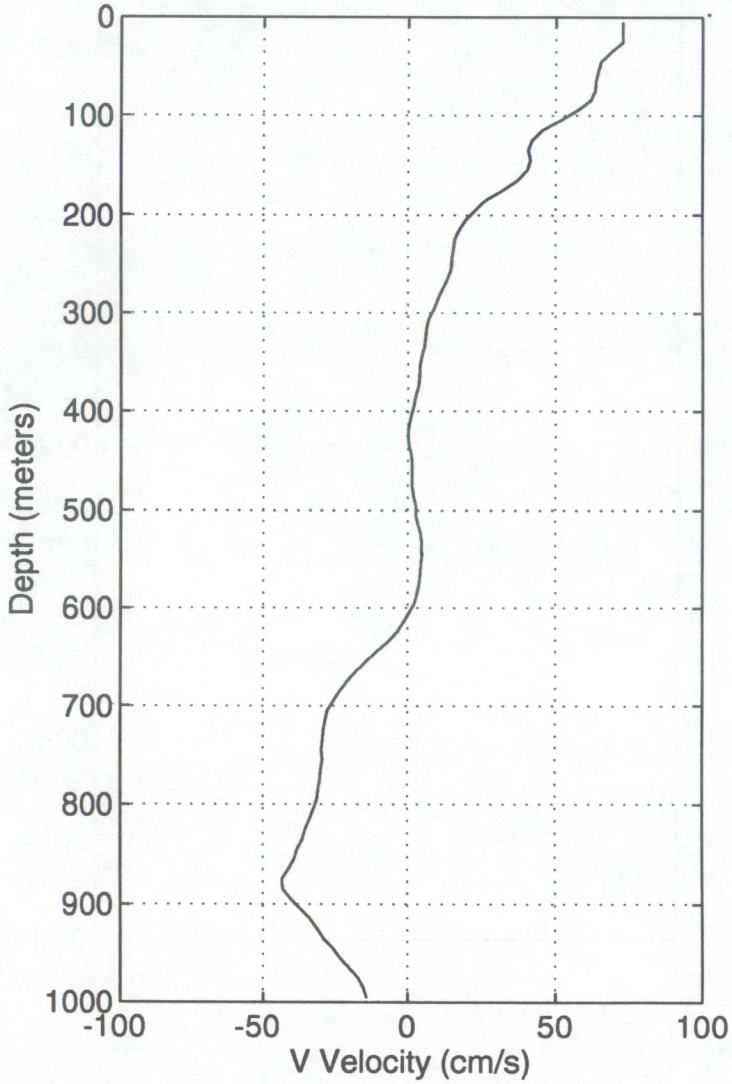
13 25.21 N 61 04.92 W 6/09/93 1500 Z





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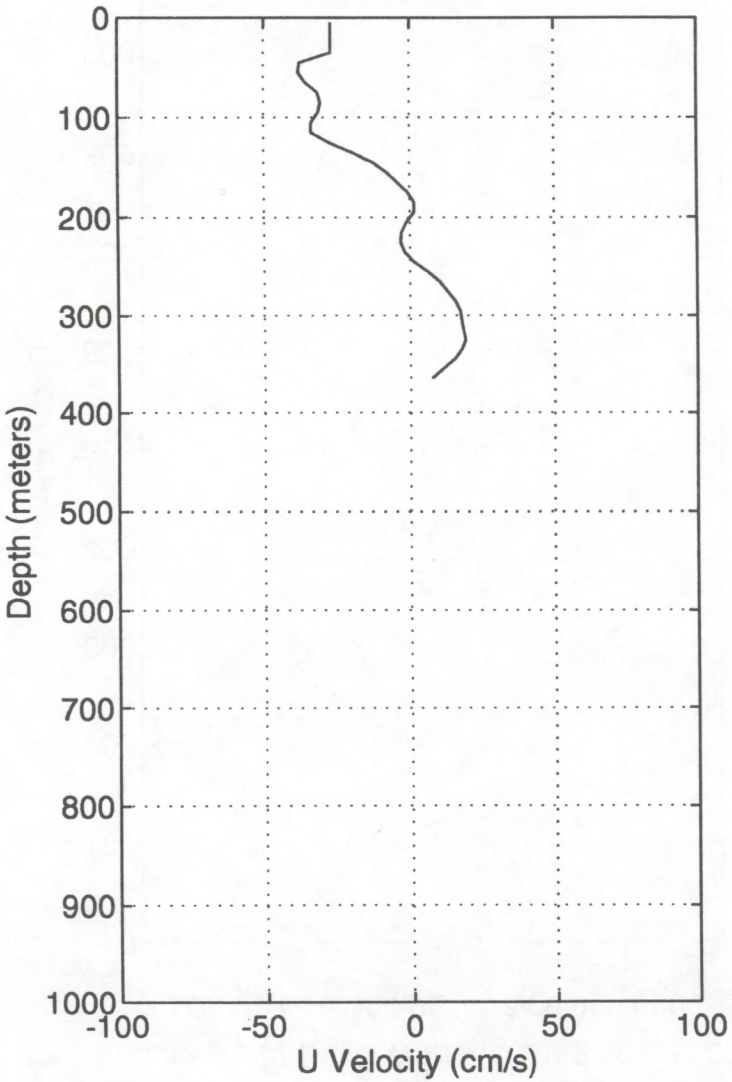
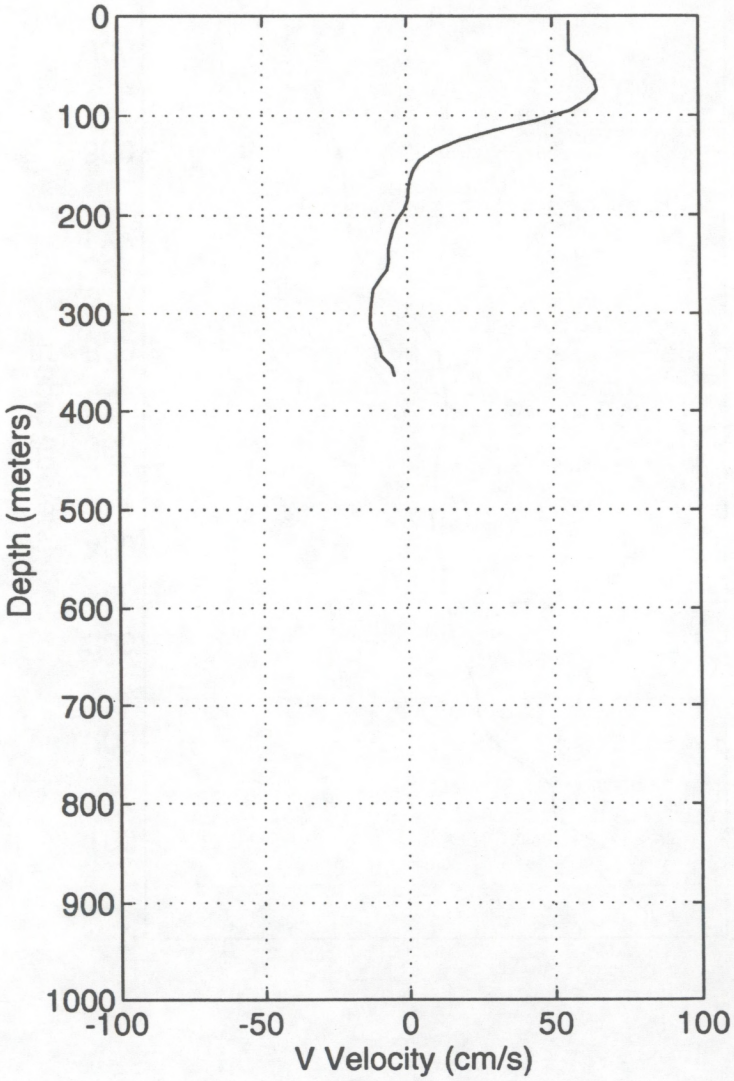
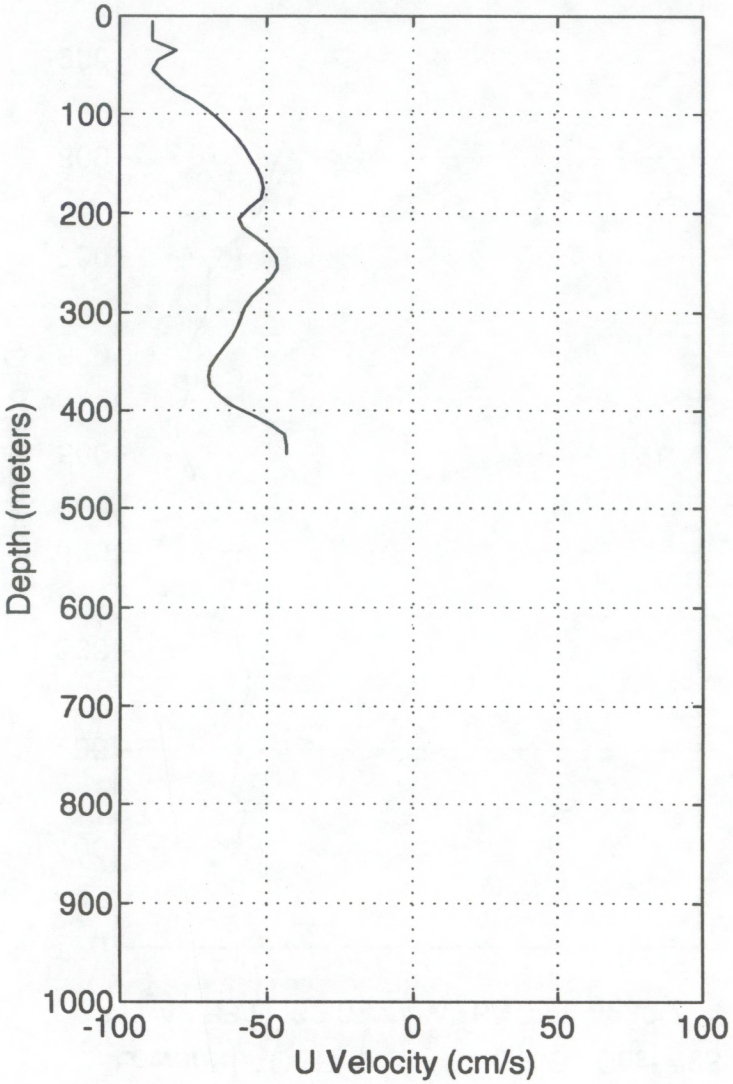
13 22.58 N 61 06.59 W 6/09/93 1559 Z

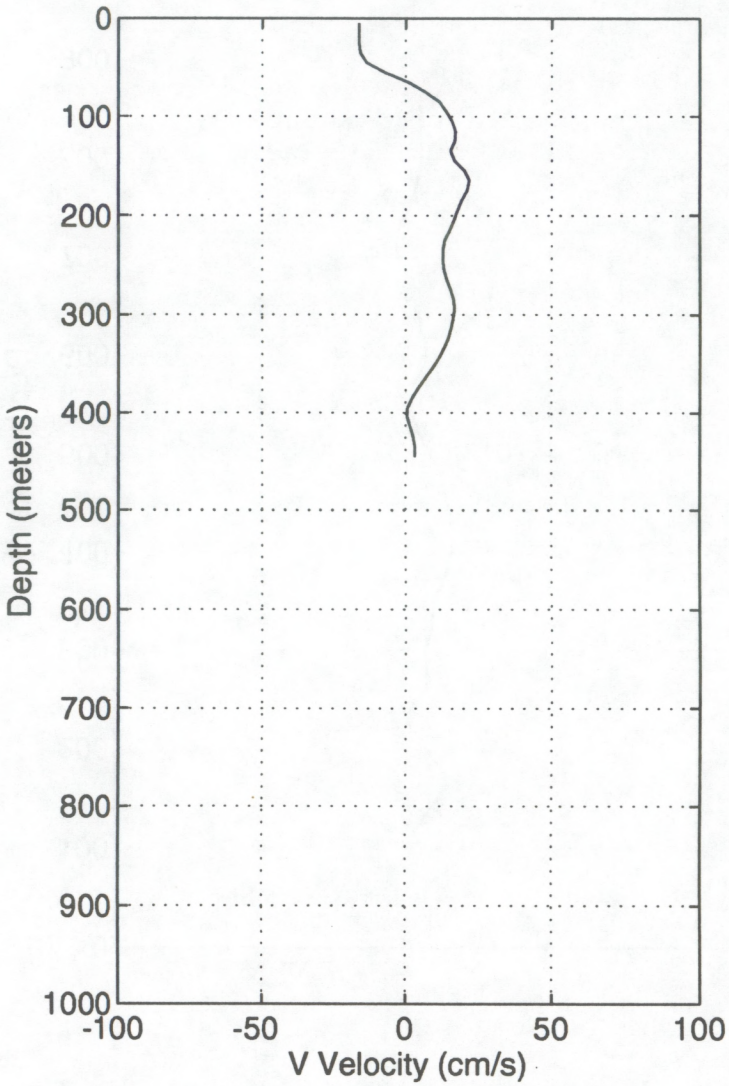




Lowered ADCP WIPP-7 GR-6 Cast #97

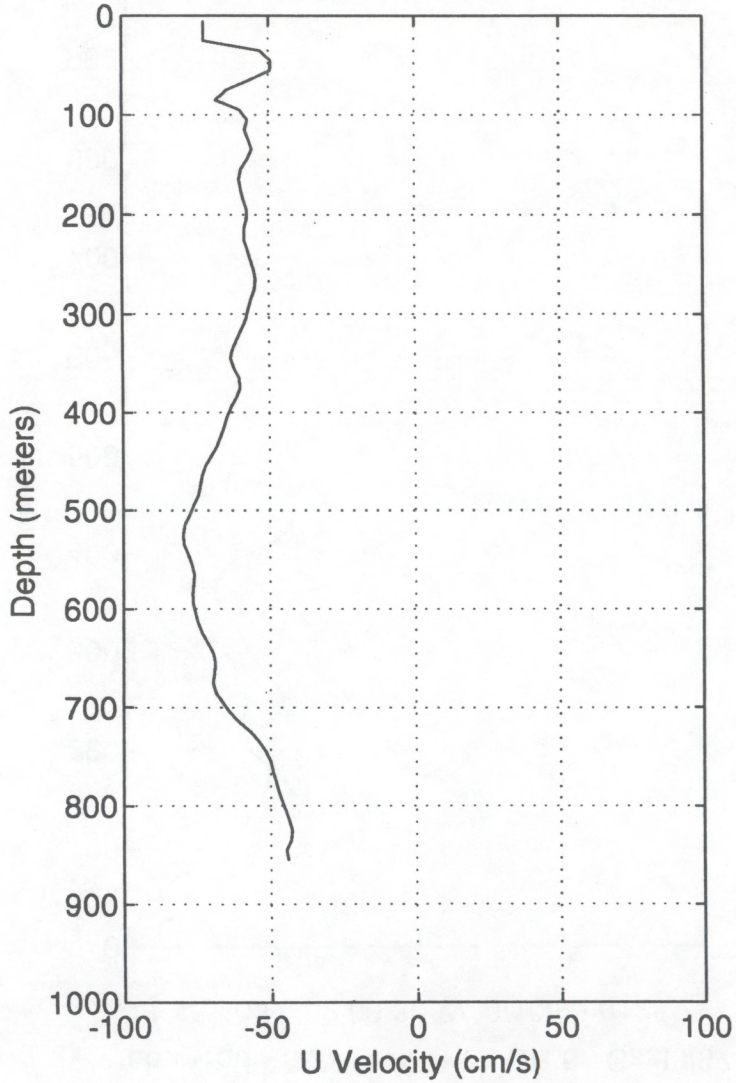
11 45.40 N 62 06.30 W 6/10/93 0125 Z

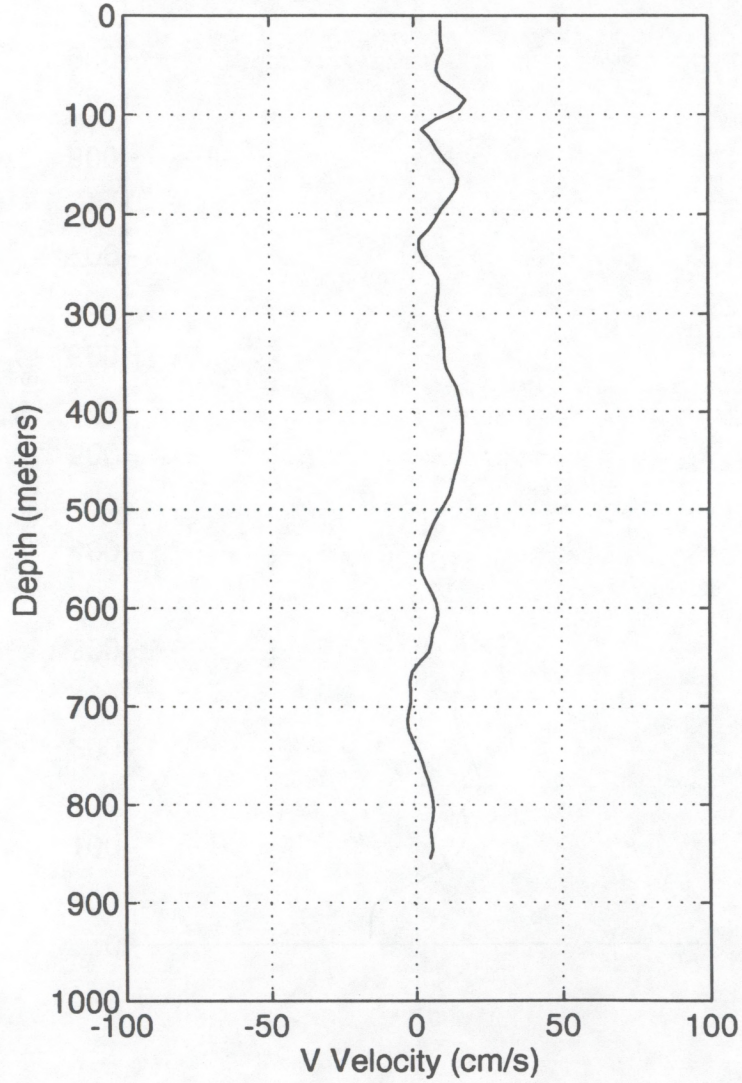




Lowered ADCP WIPP-7 GR-5 Cast #98

11 42.63 N 62 07.44 W 6/10/93 0230 Z





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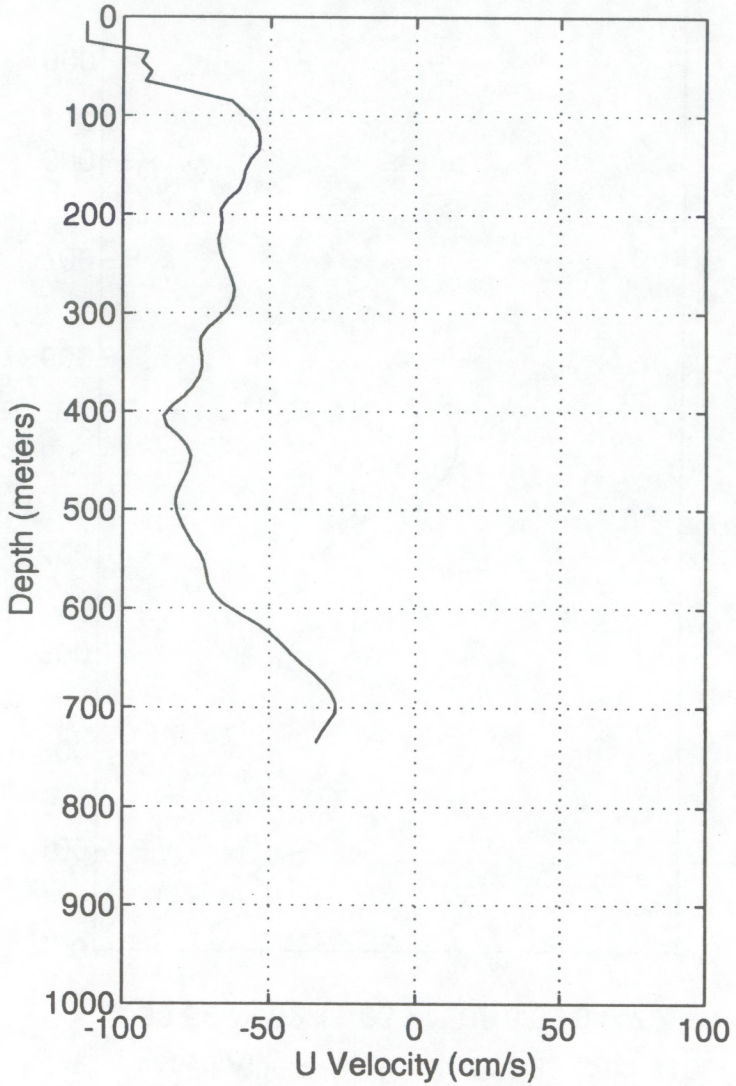
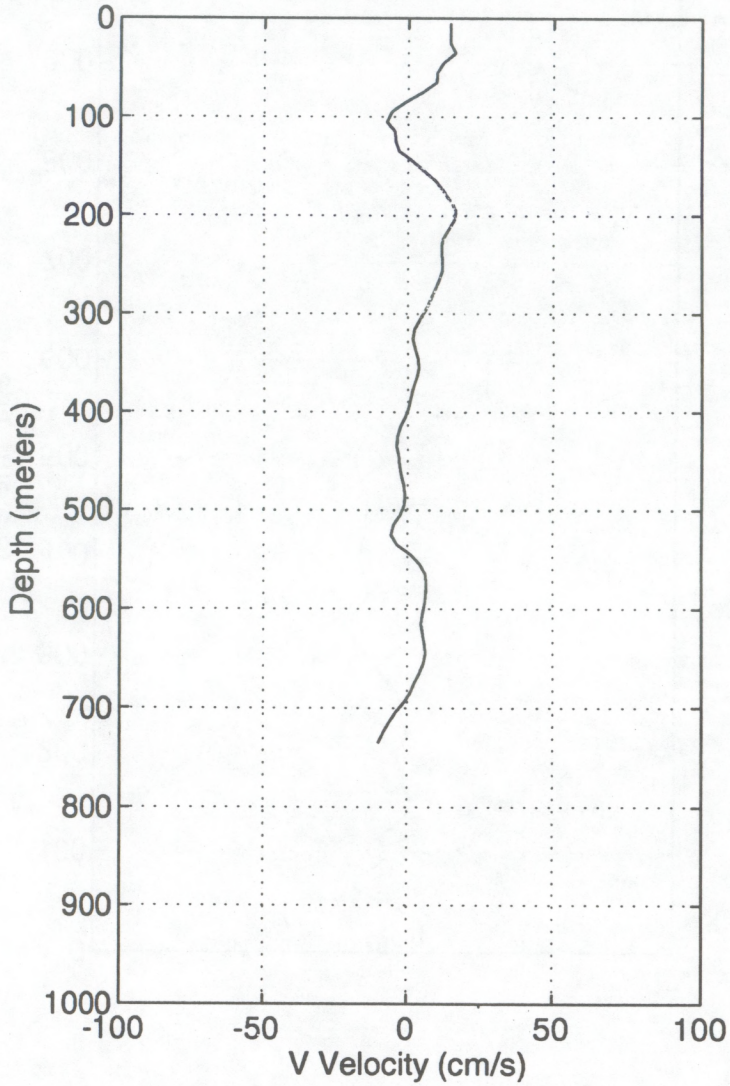
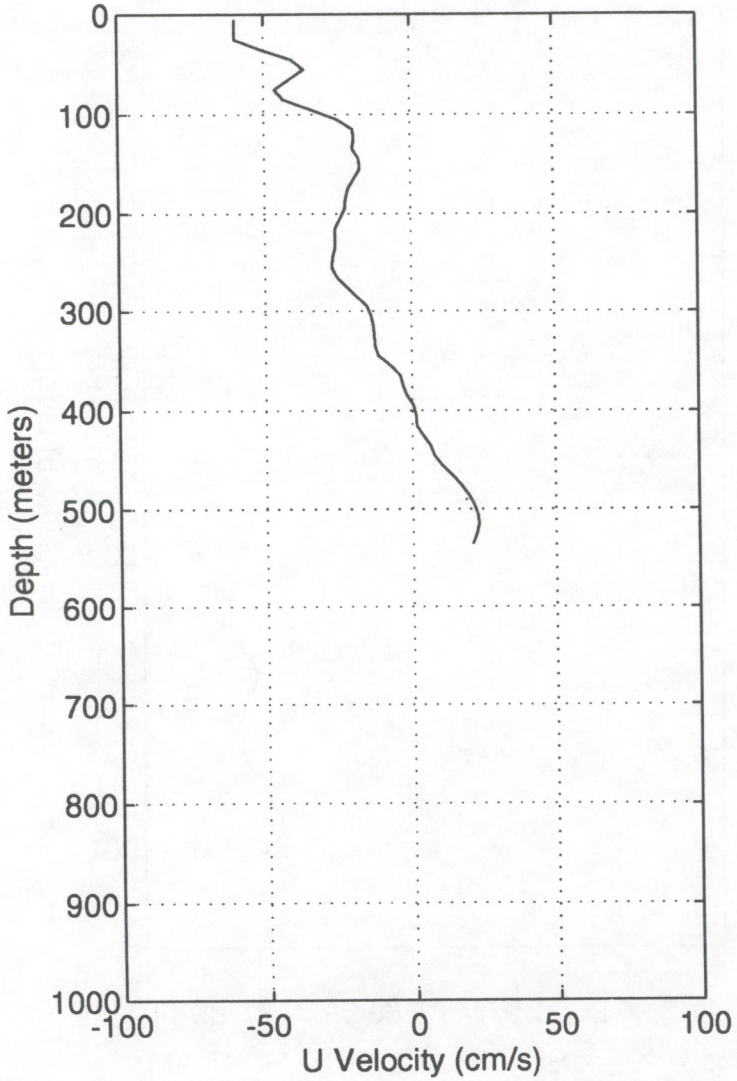
11 38.12 N 62 09.19 W 6/10/93 0343 Z

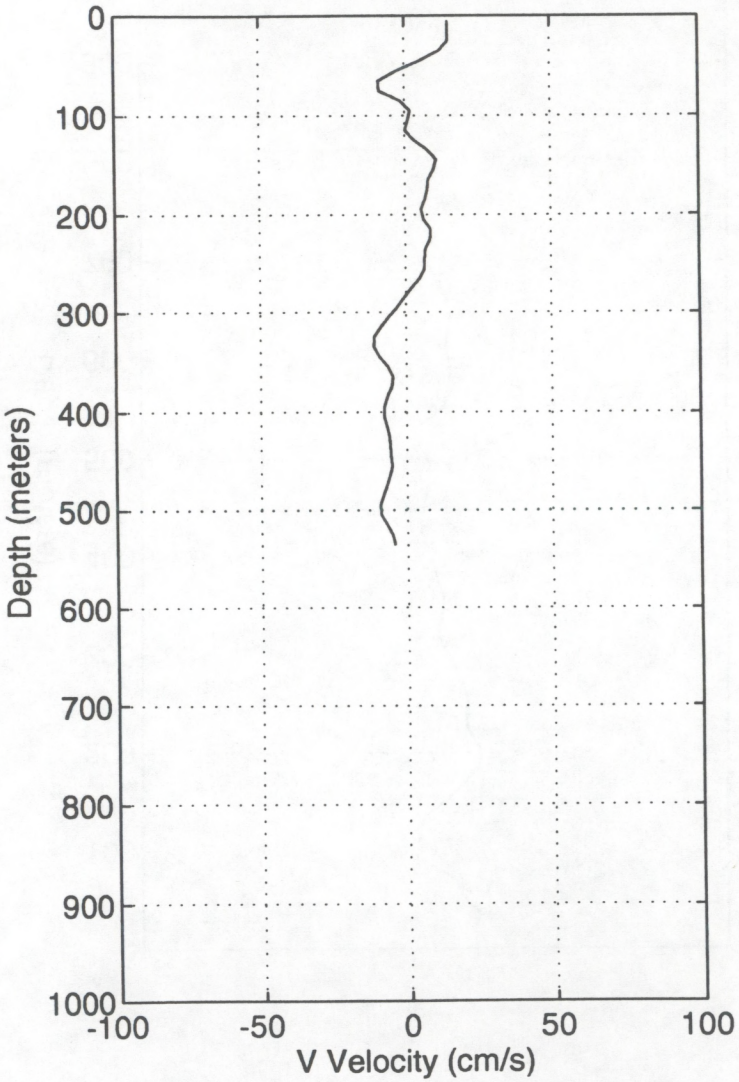




Lowered ADCP WIPP-7 GR-3 Cast #100

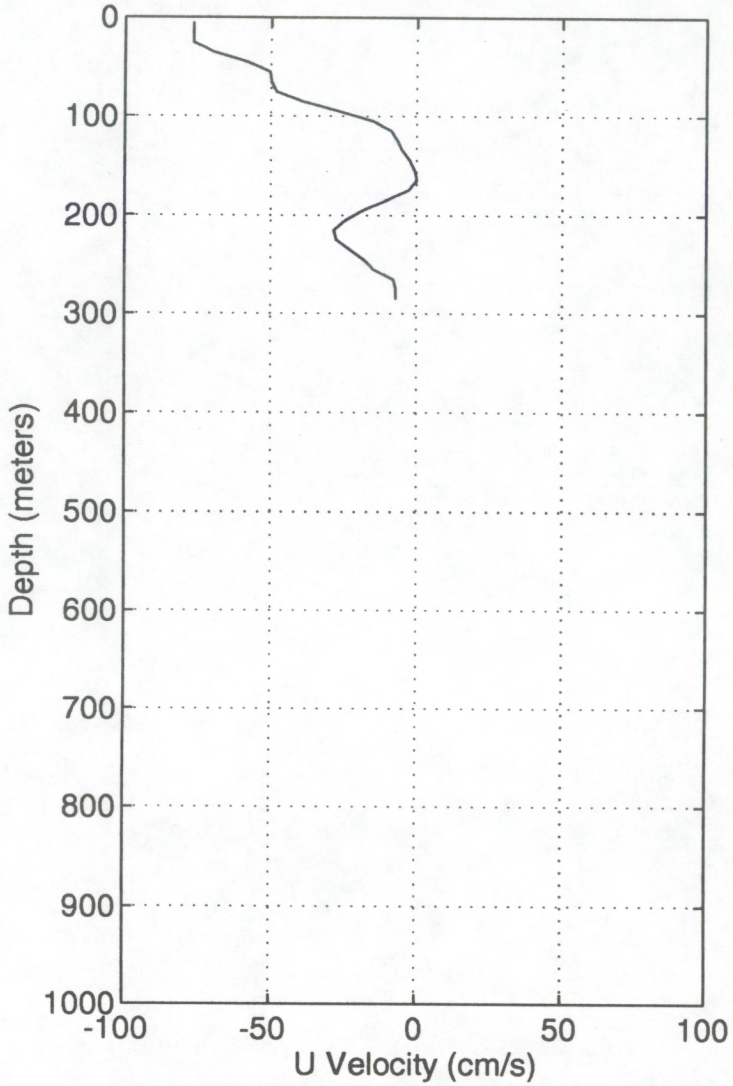
11 33.52 N 62 11.03 W 6/10/93 0447 Z

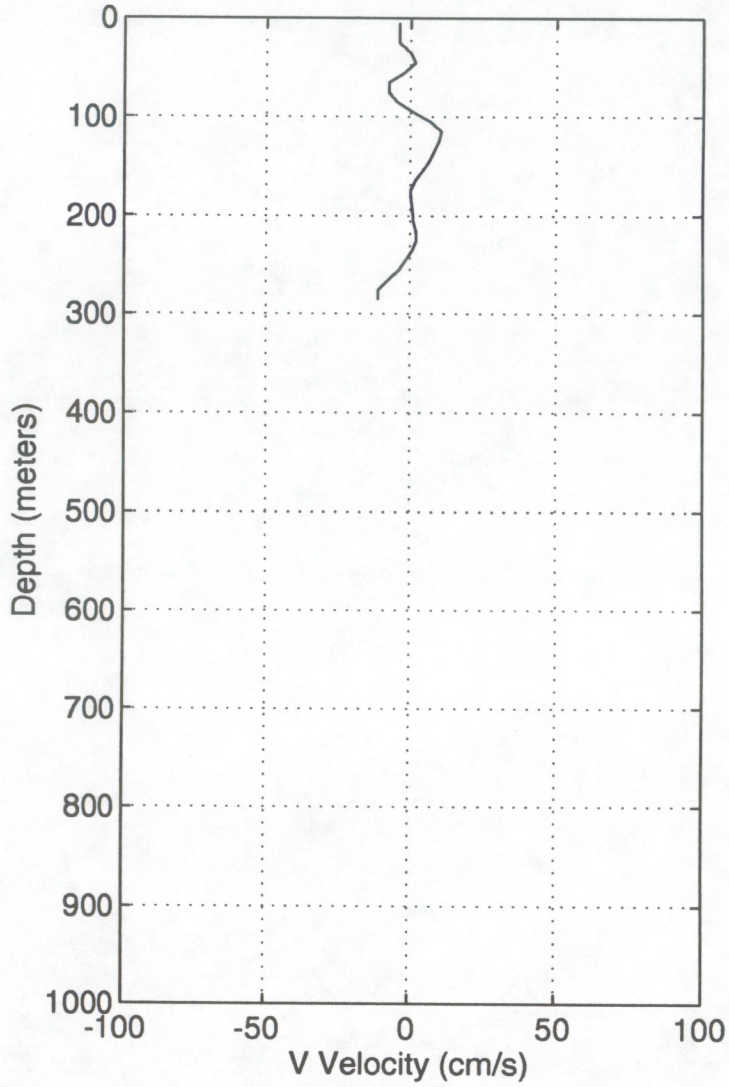




Lowered ADCP WIPP-7 GR-2 Cast #101

11 29.35 N 62 12.77 W 6/10/93 0543 Z



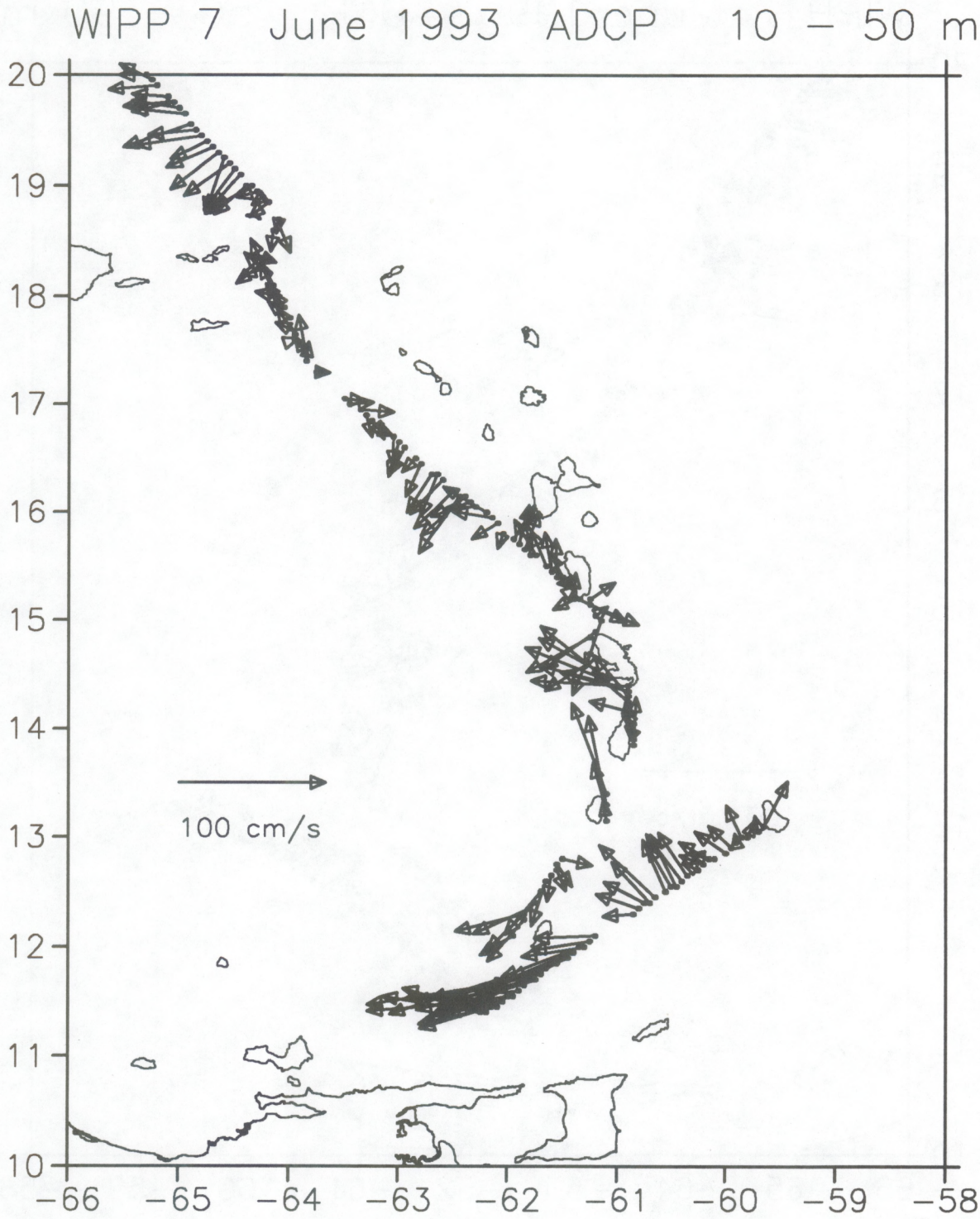


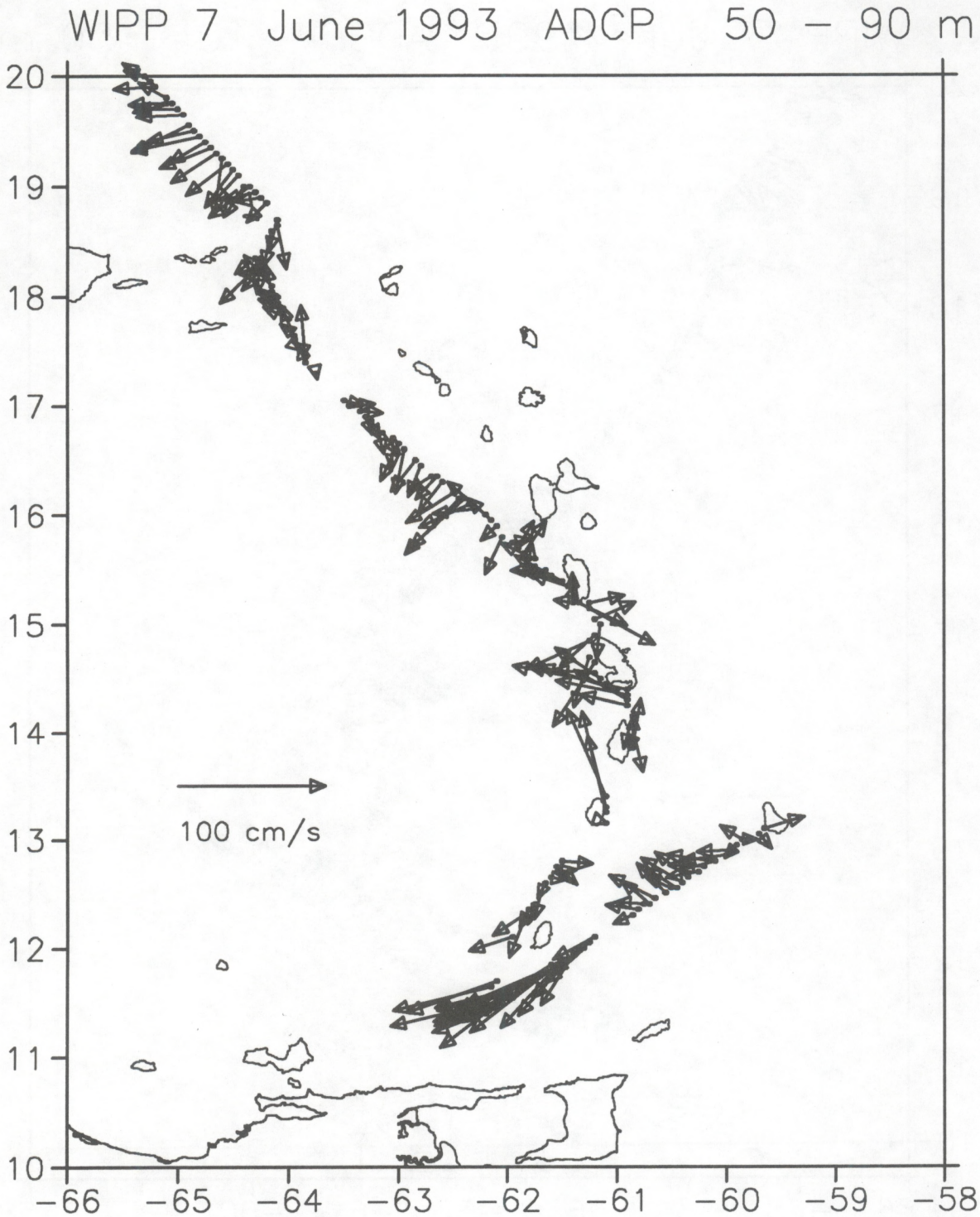
Appendix C for WI - 07

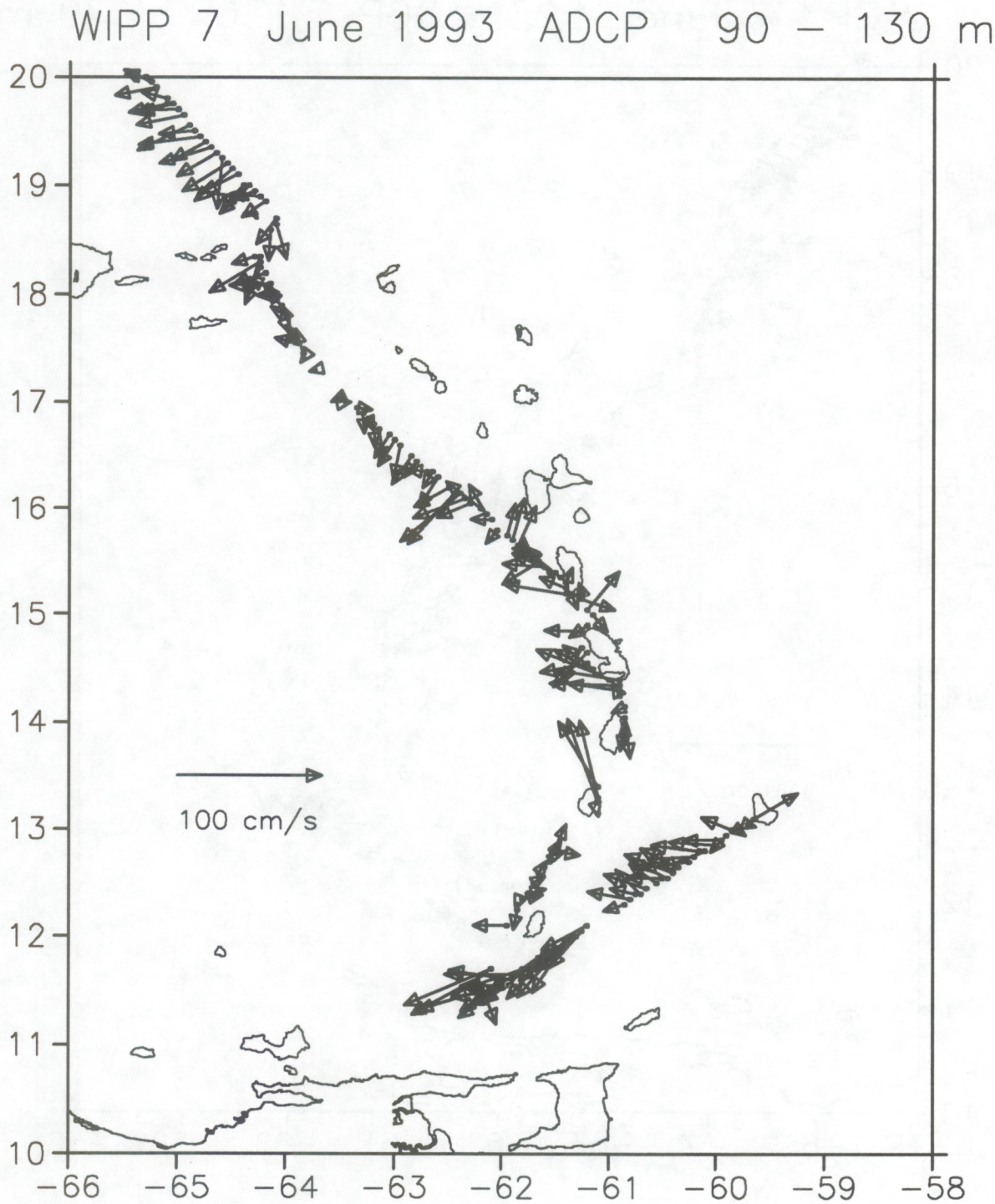
Hull Mounted ADCP Current Vector Plots

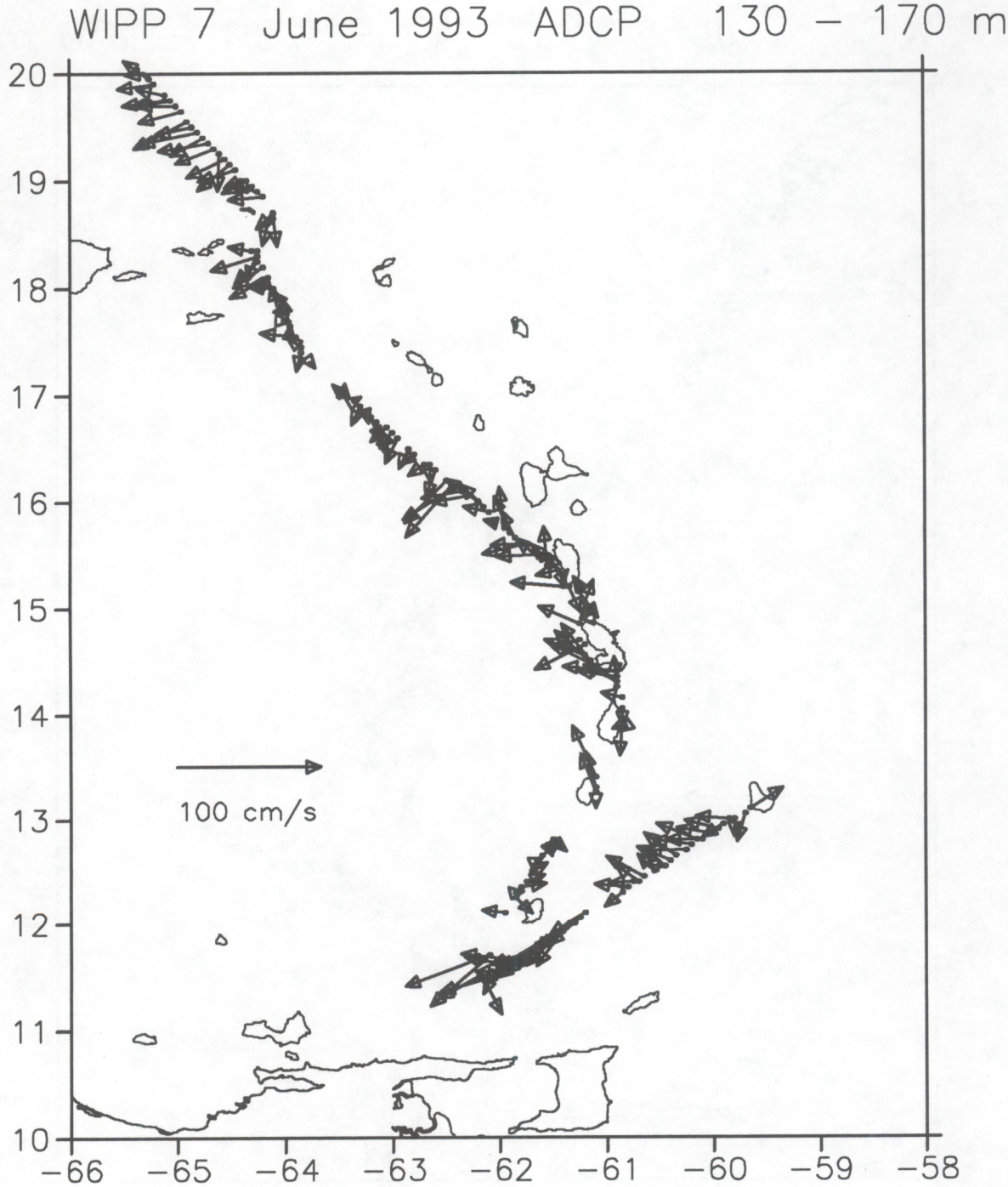
Data were collected underway using a 150 kHz RD Instruments acoustic Doppler current profiler (ADCP) mounted in the ship's hull at approximately 5 meters depth. Five minute ensembles of data were collected, edited, averaged, and referenced with GPS-derived ship course and speed information to yield absolute velocity profiles to depths of up to four hundred meters over the ship's track line.

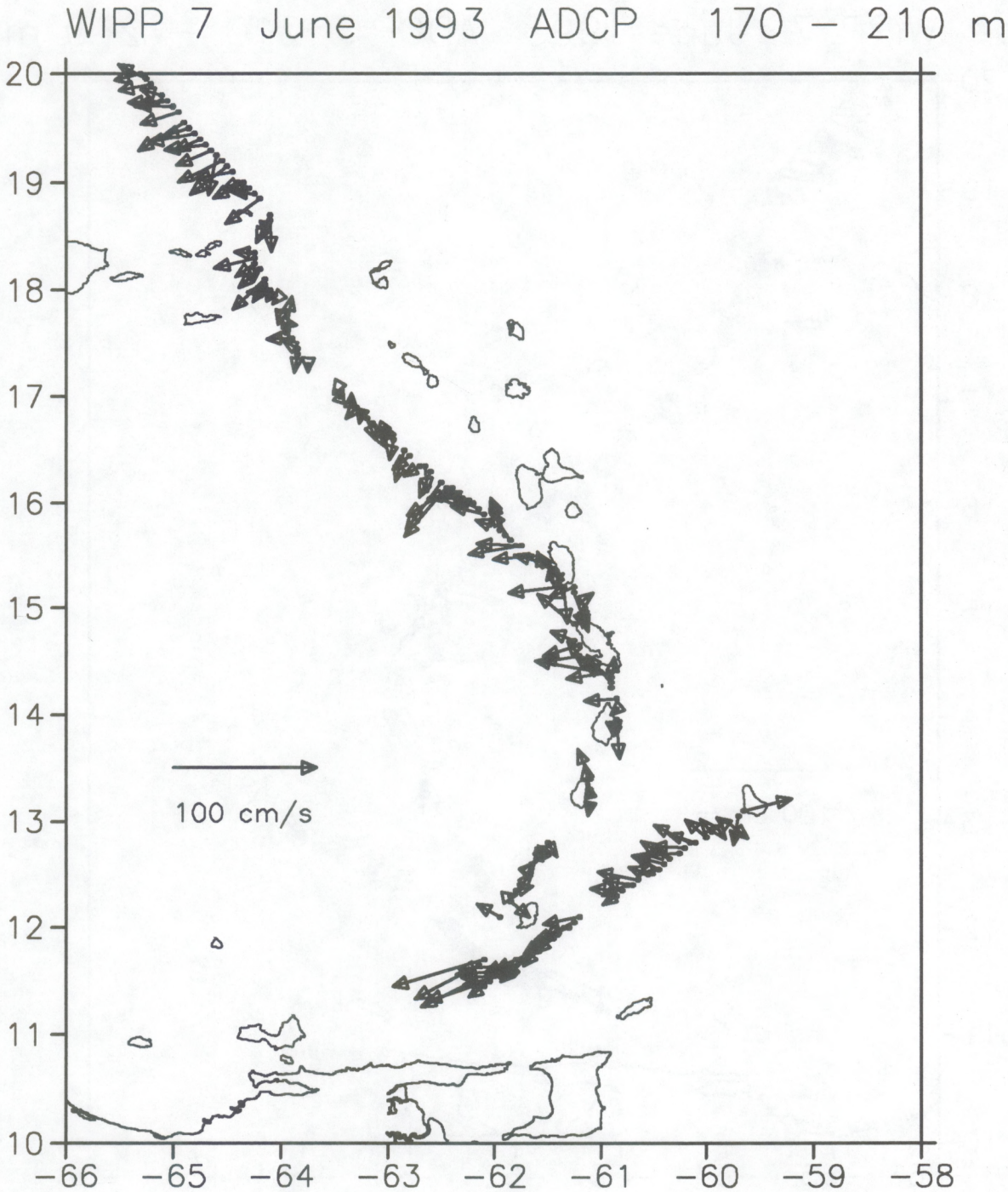
Data from the cruise are presented in plan view vector plots. The maps are based on fifteen minute averages of the shear and navigation ensembles averaged over vertical ranges.

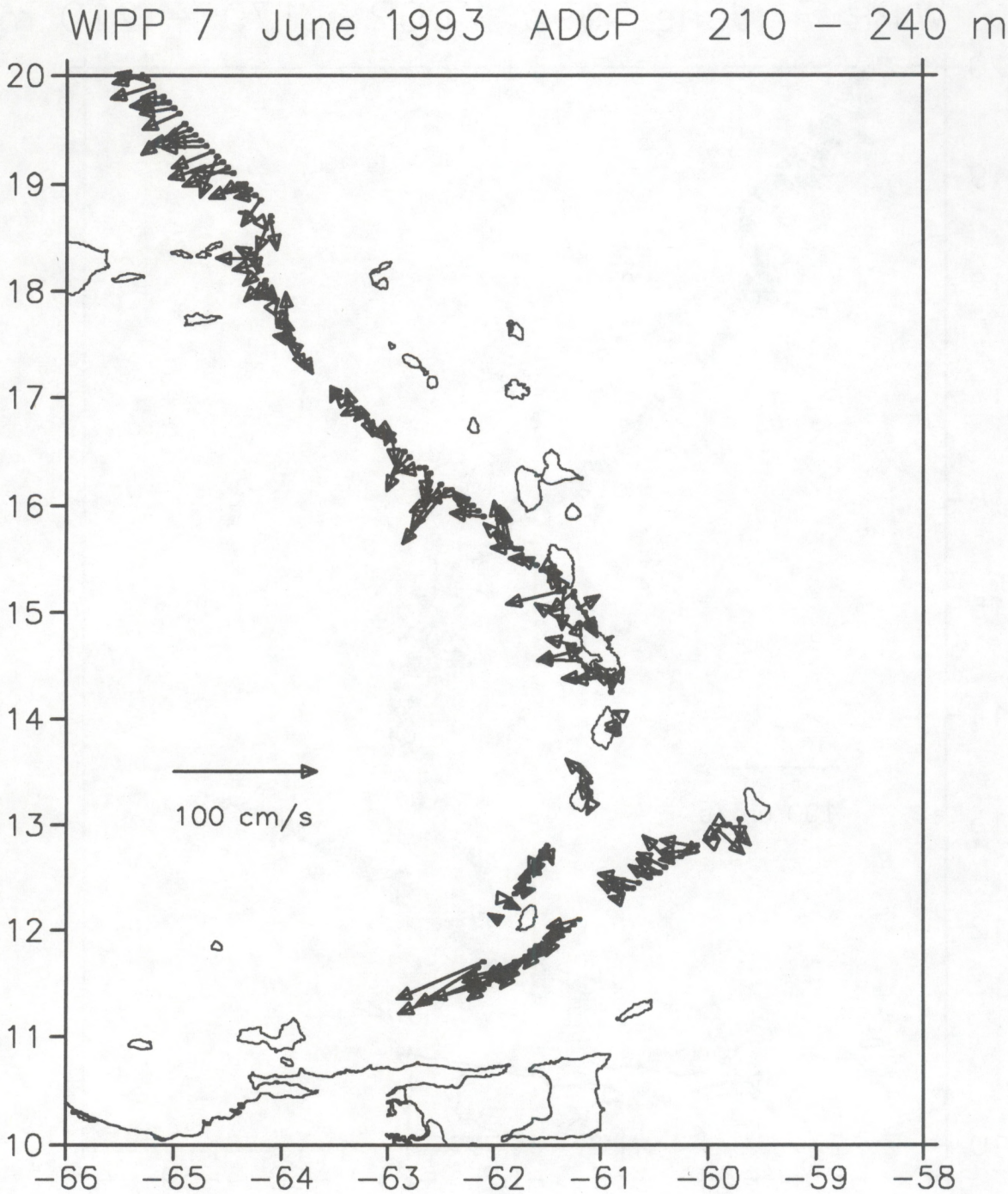

WIPP 7 June 1993 ADCP 10 – 50 m
20
19
18
17
16
15
14
13
12
11
10
100 cm/s
−66
−65
−64
−63
−62
−61
−60
−59
−58

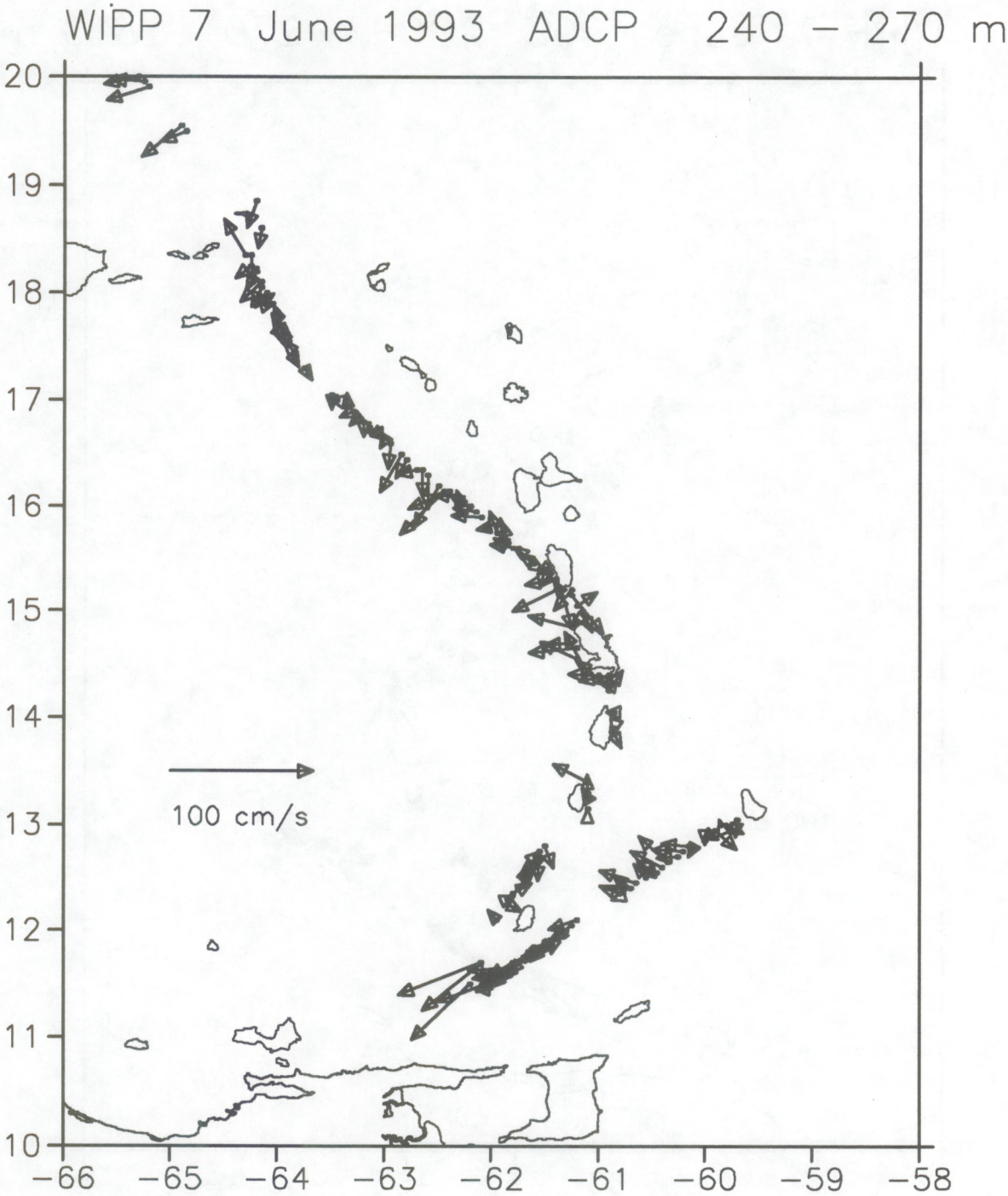

WIPP 7 June 1993 ADCP 50 – 90 m
20
19
18
17
16
15
14
13
12
11
10
100 cm/s
−66
−65
−64
−63
−62
−61
−60
−59
−58

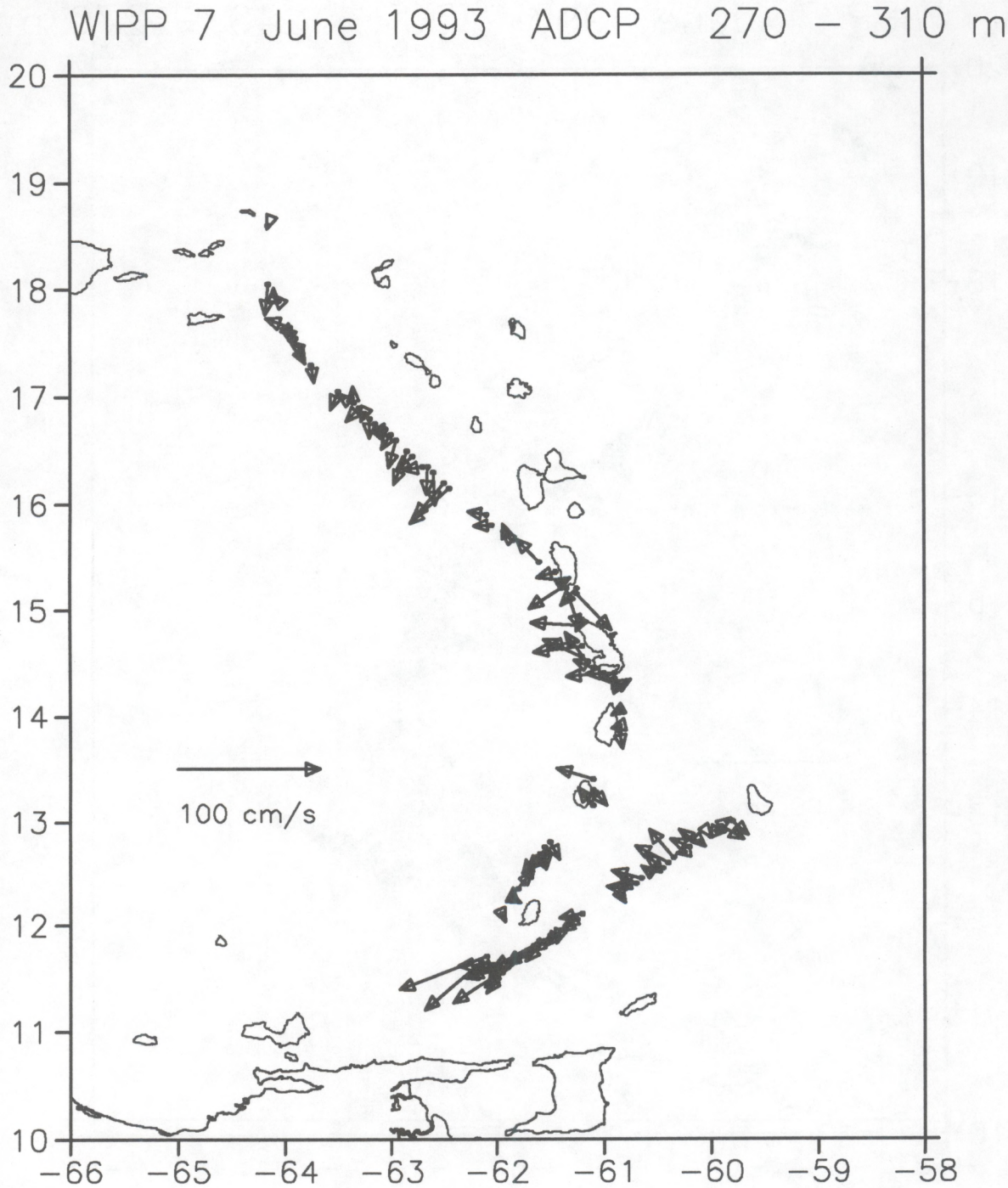

WIPP 7 June 1993 ADCP 90 – 130 m
20
19
18
17
16
15
14
13
12
11
10
100 cm/s
−66
−65
−64
−63
−62
−61
−60
−59
−58

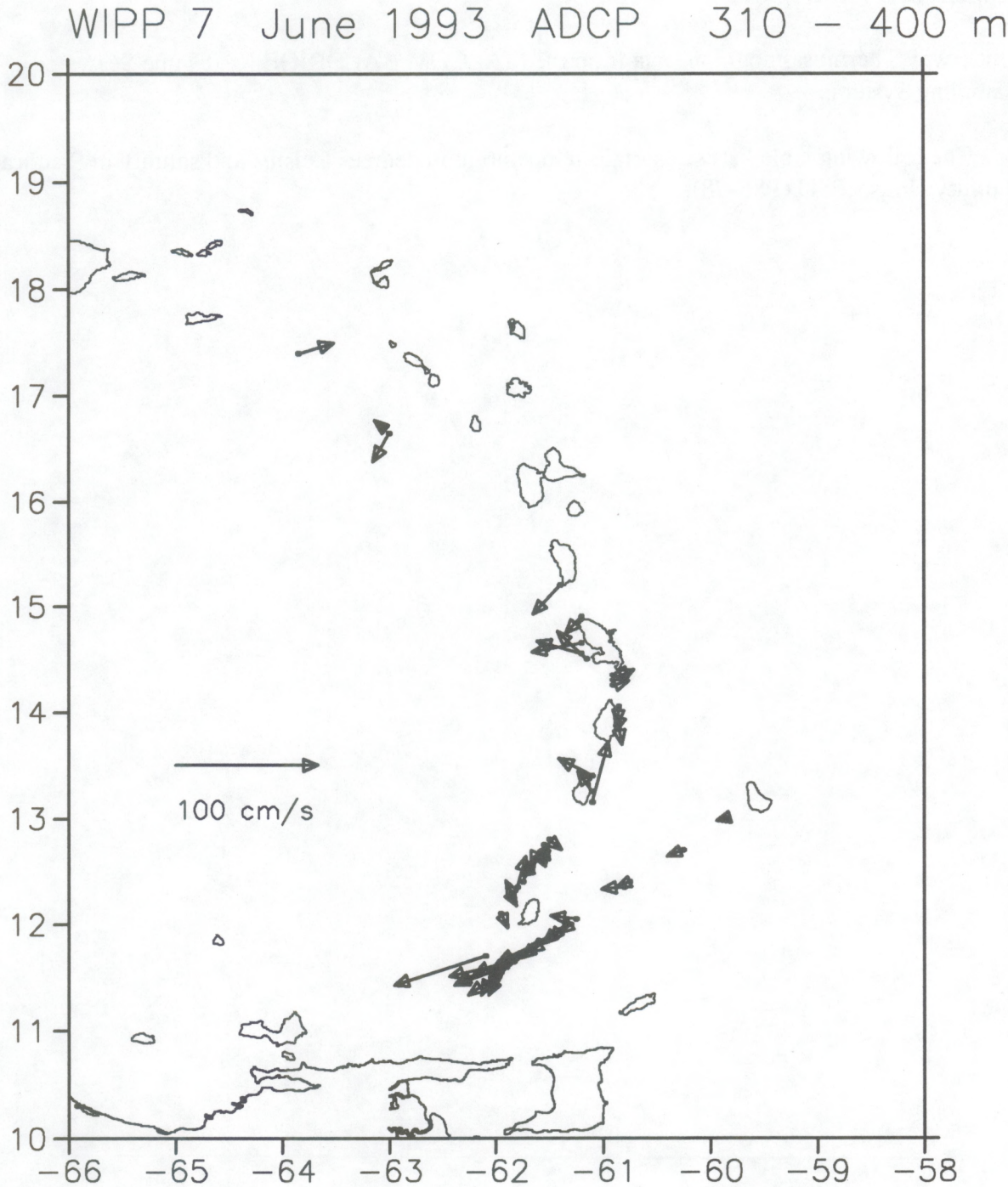

WIPP 7 June 1993 ADCP 130 – 170 m
20
19
18
17
16
15
14
13
12
11
10
100 cm/s
−66
−65
−64
−63
−62
−61
−60
−59
−58


WIPP 7 June 1993 ADCP 170 – 210 m
20
19
18
17
16
15
14
13
12
11
10
100 cm/s
−66
−65
−64
−63
−62
−61
−60
−59
−58


WIPP 7 June 1993 ADCP 210 – 240 m
20
19
18
17
16
15
14
13
12
11
10
100 cm/s
−66
−65
−64
−63
−62
−61
−60
−59
−58


WIPP 7 June 1993 ADCP 240 – 270 m
20
19
18
17
16
15
14
13
12
11
10
100 cm/s
−66
−65
−64
−63
−62
−61
−60
−59
−58


WIPP 7 June 1993 ADCP 270 – 310 m
20
19
18
17
16
15
14
13
12
11
10
100 cm/s
−66
−65
−64
−63
−62
−61
−60
−59
−58


WIPP 7 June 1993 ADCP 310 – 400 m
20
19
18
17
16
15
14
13
12
11
10
100 cm/s
−66
−65
−64
−63
−62
−61
−60
−59
−58

Appendix D for WI - 07

Underway Thermosalinograph Data from the MALCOM BALDRIGE Real Time Seawater Sampling System:

The following table lists sea surface temperature in degrees Celsius and salinity in Practical Salinity Units - PSU (PSS-78).

Julian Day/ UTC	Latitude	Longitude	SST Deg. C	Salinity PSU
159 14:30	15 18.634 N	61 23.572 W	30.27	34.81
159 15:00	15 15.123 N	61 24.987 W	30.32	34.76
159 15:31	15 11.287 N	61 21.549 W	28.29	34.67
159 16:01	15 13.308 N	61 17.096 W	28.29	34.63
159 16:31	15 12.344 N	61 16.425 W	28.29	34.69
159 17:02	15 11.726 N	61 16.205 W	28.29	34.73
159 17:32	15 08.630 N	61 15.186 W	28.19	35.12
159 18:02	15 08.673 N	61 15.137 W	28.22	35.11
159 18:28	15 07.231 N	61 14.513 W	28.30	35.06
159 18:58	15 03.654 N	61 12.385 W	28.27	35.04
159 19:28	15 03.716 N	61 12.655 W	28.30	35.04
159 19:59	15 02.182 N	61 11.503 W	28.33	34.99
159 20:29	14 59.445 N	61 10.475 W	28.33	35.04
159 20:59	14 59.206 N	61 10.893 W	28.24	35.10
159 21:30	14 56.291 N	61 08.481 W	28.20	35.16
159 22:00	14 56.266 N	61 09.029 W	28.22	35.17
159 22:30	14 54.158 N	61 09.782 W	28.19	35.10
159 23:00	14 50.870 N	61 16.055 W	28.39	34.58
159 23:31	14 43.858 N	61 14.859 W	28.36	34.61
160 00:01	14 37.183 N	61 12.462 W	28.39	34.32
160 00:31	14 31.222 N	61 09.726 W	28.45	34.08
160 01:02	14 26.390 N	61 06.302 W	28.45	34.01
160 01:32	14 24.424 N	61 00.245 W	28.48	34.08
160 02:02	14 22.362 N	60 54.229 W	28.40	34.00
160 02:28	14 21.322 N	60 52.000 W	28.56	34.09
160 02:58	14 21.320 N	60 52.975 W	28.54	34.09
160 03:28	14 18.392 N	60 52.264 W	28.57	34.07
160 03:59	14 18.364 N	60 52.982 W	28.56	34.07
160 04:29	14 18.343 N	60 53.275 W	28.56	34.07
160 04:59	14 15.503 N	60 52.917 W	28.58	34.10
160 05:30	14 15.434 N	60 53.320 W	28.59	34.10
160 06:00	14 14.525 N	60 52.769 W	28.56	34.09
160 06:30	14 13.003 N	60 53.454 W	28.55	34.11
160 07:01	14 12.717 N	60 53.740 W	28.55	34.12
160 07:31	14 10.701 N	60 53.859 W	28.54	34.15
160 08:01	14 10.052 N	60 53.468 W	28.53	34.14
160 08:32	14 05.699 N	60 49.630 W	28.53	34.14
160 09:02	13 59.083 N	60 49.838 W	28.50	34.17
160 09:32	13 52.558 N	60 49.885 W	28.53	34.23
160 09:58	13 47.066 N	60 49.832 W	28.45	34.22
160 10:28	13 41.451 N	60 53.109 W	28.46	34.18
160 10:58	13 37.181 N	60 56.301 W	28.44	34.39

Julian Day/ UTC	Latitude	Longitude	SST Deg C	Salinity PSU
160 11:29	13 36.891 N	60 56.349 W	28.49	34.42
160 11:59	13 31.983 N	60 59.505 W	28.45	34.19
160 12:29	13 30.460 N	61 01.254 W	28.44	34.16
160 12:59	13 28.003 N	61 03.241 W	28.43	34.20
160 13:30	13 27.733 N	61 02.904 W	28.46	34.22
160 14:00	13 28.054 N	61 03.457 W	28.46	34.22
160 14:30	13 24.786 N	61 04.409 W	28.51	34.16
160 15:01	13 25.210 N	61 04.952 W	28.52	34.17
160 15:31	13 23.775 N	61 05.124 W	28.52	34.18
160 16:01	13 22.612 N	61 06.587 W	28.59	34.18
160 16:32	13 19.839 N	61 06.315 W	28.60	34.16
160 17:02	13 13.844 N	61 04.417 W	28.62	34.16
160 17:32	13 06.619 N	61 06.439 W	28.69	34.45
160 17:58	13 04.689 N	61 11.297 W	28.40	34.47
160 18:28	13 02.645 N	61 18.112 W	28.37	34.58
160 18:58	12 58.143 N	61 22.802 W	28.40	34.66
160 19:29	12 51.977 N	61 26.334 W	28.37	34.75
160 19:59	12 46.180 N	61 30.358 W	28.39	34.75
160 20:29	12 40.265 N	61 34.524 W	28.36	34.72
160 21:00	12 34.273 N	61 38.772 W	28.38	34.62
160 21:30	12 28.249 N	61 43.125 W	28.48	34.54
160 22:00	12 22.176 N	61 47.461 W	28.57	34.40
160 22:31	12 16.028 N	61 51.813 W	28.08	34.96
160 23:01	12 09.737 N	61 55.499 W	28.19	34.86
160 23:31	12 03.927 N	61 59.583 W	28.26	34.62
161 00:02	11 57.826 N	62 03.222 W	28.25	34.66
161 00:32	11 51.229 N	62 04.292 W	28.25	34.54
161 01:02	11 45.616 N	62 05.311 W	28.35	34.60
161 01:32	11 45.436 N	62 06.436 W	28.31	34.63
161 01:58	11 42.993 N	62 06.333 W	28.24	34.63
161 02:28	11 42.631 N	62 07.465 W	28.19	34.65
161 02:58	11 41.522 N	62 07.091 W	28.14	34.68
161 03:29	11 38.152 N	62 08.903 W	28.02	34.81
161 03:59	11 38.062 N	62 09.592 W	27.98	34.85
161 04:29	11 33.497 N	62 10.618 W	28.15	34.68
161 05:00	11 33.515 N	62 11.177 W	28.18	34.62
161 05:30	11 29.383 N	62 12.537 W	28.10	34.76
161 06:00	11 28.539 N	62 12.618 W	28.06	34.85
161 06:31	11 23.005 N	62 15.132 W	27.87	35.05
161 07:01	11 24.497 N	62 13.565 W	27.89	35.04
161 07:31	11 27.164 N	62 8.263 W	27.92	34.97
161 08:02	11 30.505 N	62 3.222 W	27.96	34.91

Julian Day/ UTC	Latitude	Longitude	SST Deg C	Salinity PSU
161 08:32	11 33.828 N	61 58.239 W	27.87	34.89
161 09:02	11 37.176 N	61 53.462 W	28.00	34.61
161 09:32	11 40.542 N	61 48.765 W	28.05	34.77
161 09:58	11 43.355 N	61 44.735 W	28.16	34.40
161 10:28	11 46.672 N	61 39.927 W	28.08	34.54
161 10:58	11 49.873 N	61 35.204 W	28.15	34.56
161 11:29	11 53.048 N	61 30.409 W	28.30	34.46
161 11:59	11 56.254 N	61 25.687 W	28.41	34.36
161 12:29	11 59.443 N	61 20.770 W	28.46	34.29
161 13:00	12 02.662 N	61 15.902 W	28.48	34.24
161 13:30	12 05.993 N	61 10.952 W	28.52	34.19
161 13:55	12 08.676 N	61 06.711 W	28.54	34.14
161 14:00	12 09.212 N	61 05.838 W	28.55	34.12
161 14:31	12 12.284 N	61 00.623 W	28.58	34.01
161 15:01	12 15.500 N	60 55.400 W	28.55	33.85
161 15:31	12 19.470 N	60 49.346 W	28.51	33.84
161 16:02	12 22.255 N	60 45.022 W	28.53	34.09
161 16:32	12 25.814 N	60 39.871 W	28.50	34.03
161 17:02	12 29.605 N	60 34.768 W	28.48	34.00
161 17:28	12 32.642 N	60 30.385 W	28.52	34.06
161 17:58	12 36.267 N	60 25.239 W	28.49	34.15
161 18:28	12 39.540 N	60 19.866 W	28.57	33.91
161 18:59	12 42.568 N	60 14.326 W	28.60	33.94
161 19:29	12 46.174 N	60 09.126 W	28.57	33.87
161 19:59	12 49.849 N	60 03.968 W	28.62	33.79
161 20:30	12 53.498 N	59 58.573 W	28.59	33.78
161 21:00	12 57.105 N	59 53.040 W	28.57	33.67
161 21:30	13 00.843 N	59 47.330 W	28.52	33.64
161 22:01	13 04.735 N	59 41.507 W	28.53	33.39
161 22:16	13 06.656 N	59 38.594 W	28.50	33.53

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