

Cruise Report, TN179C (TN179 Leg 3)

Eastern Bering Sea, 12-28 May 2005

Participants:

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FOCI cruise TN179C was a CTD and bongo survey in the eastern Bering Sea. The cruise was funded by NOAA NPCREP (North Pacific Climate Regime and Ecosystem Productivity). It was the first survey in what we hope will be a three-year program to study the effect of ice on productivity in the Bering Sea.

Figure 1 displays the CTD stations occupied during the cruise. We did bongo net tows on every other station of the cross-shelf lines and every third station of a transect down the 70-m contour. You may notice from the 70m transect plots that we were estimating the position of the 70m contour from sparse data, and will have to correct the position of some of the stations in future cruises.

This cruise report will include preliminary plots of the physical data from the ship's SeaChest salinity and temperature measurements and transect plots of temperature, salinity, density, fluorescence and oxygen concentration. However, since the samples from the bongo tows have not been counted, we won't present biological data, except for the brief observation that there was significant phytoplankton in all the tows, but we didn't see large numbers of zooplankton.

Ice covered the northeastern part of the region during the cruise, and we were therefore not able to get to the eastern end of line SL (St. Lawrence), which was proposed to have stations to roughly the 30m contour. We had also planned to occupy a transect in Bristol Bay if time allowed. However, the extra time needed to navigate in the ice around St. Matthew Island, the decision to search for a missing mooring near St. Matthew Island, and a storm that cancelled operations for 30 hours meant that we did not have time for the line.

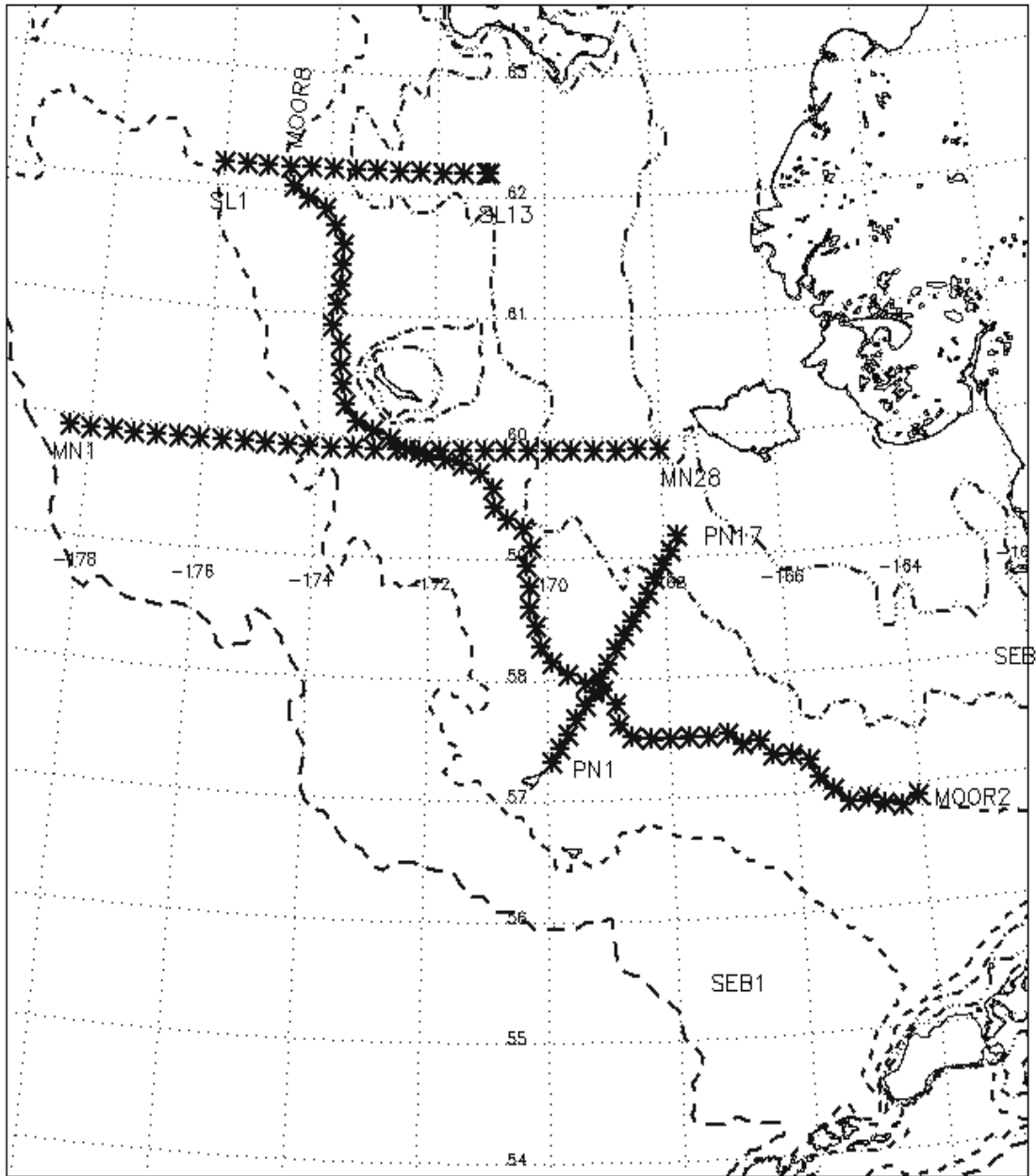


Figure 1: Location of CTD and bongo stations for the cruise. Transect names are SL (St. Lawrence), MN (St. Matthew-Nunivak), PN (St. Paul-Nunivak) and 70m (the 70 m contour)

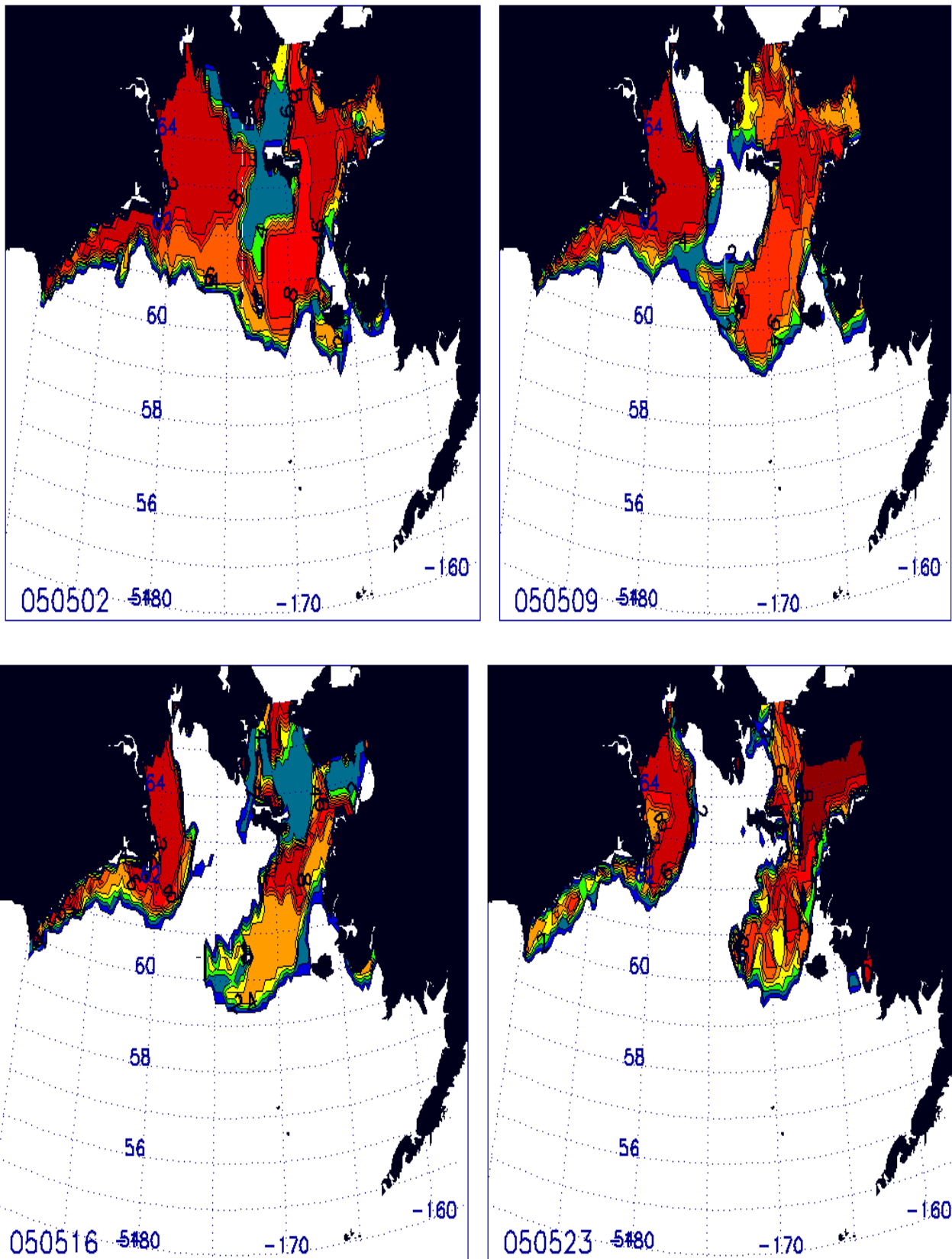


Figure 2: Ice concentration (from the National Ice Center) for May 2, 9, 16, and 23. This year, the ice melted first in the central part of the Bering Sea; this is not always the pattern. We were in the northern Bering during the time shown in the bottom two plots.

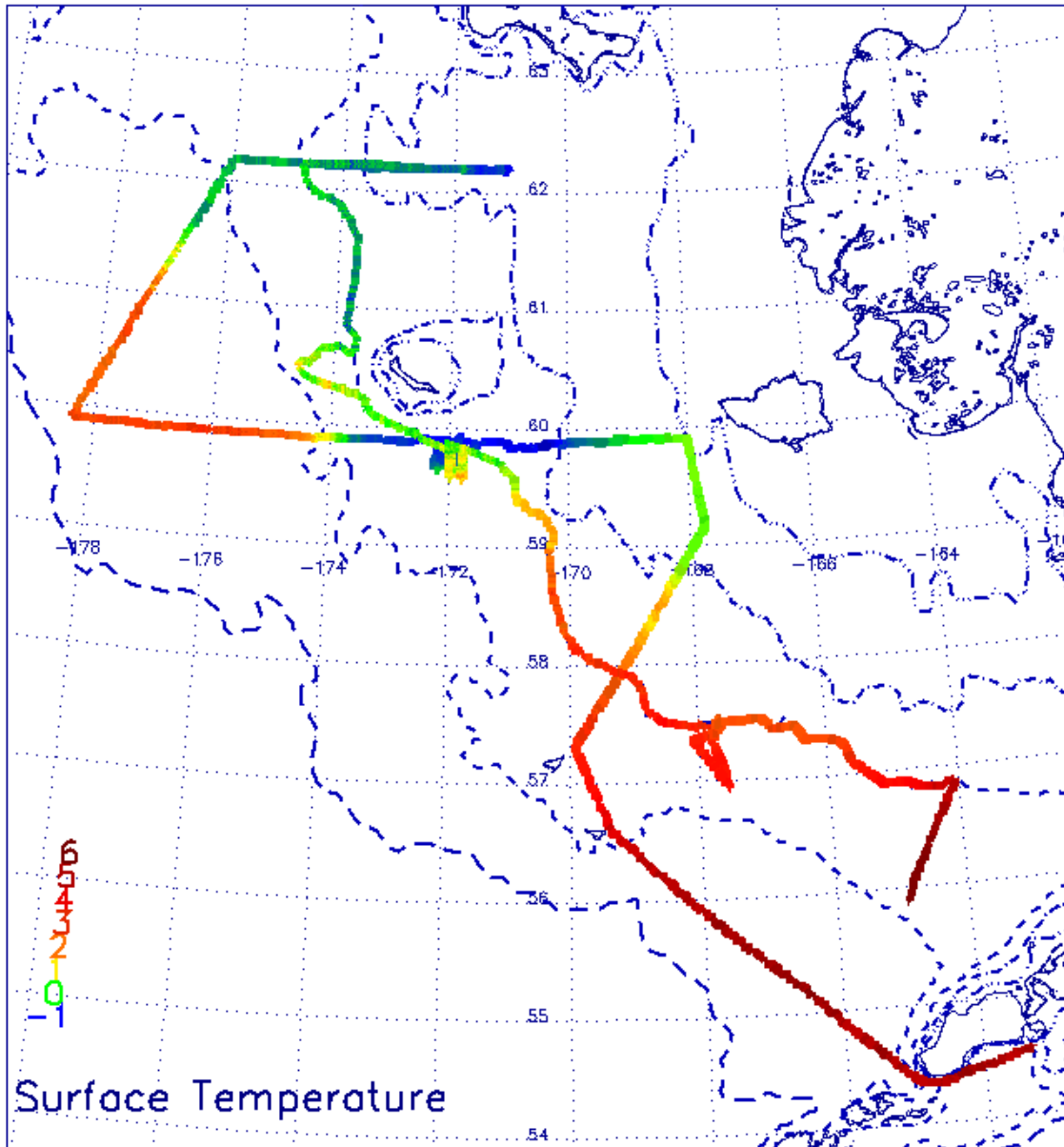


Figure 3: Sea-chest Sea-surface temperature (SST)

The highest SST values, 5.5 to 6C, were in the southern part of the Bering. Water was near the freezing point near the ice by St. Matthew Island and at the east end of line SL. The ice had already cleared in a zone west of 174W but east of about 178W and SST there was relatively high. The excursion you see in the cruise track to the west of St. Matthew was caused by ice too dense for the Thompson to make its way through. Note that the ice was melting there, since the SST is not at the freezing point. The diversions south of St. Matthew Island were made while searching for a missing mooring, and the departure from the 70m line near 57.5N, 168W was made while waiting out a storm.

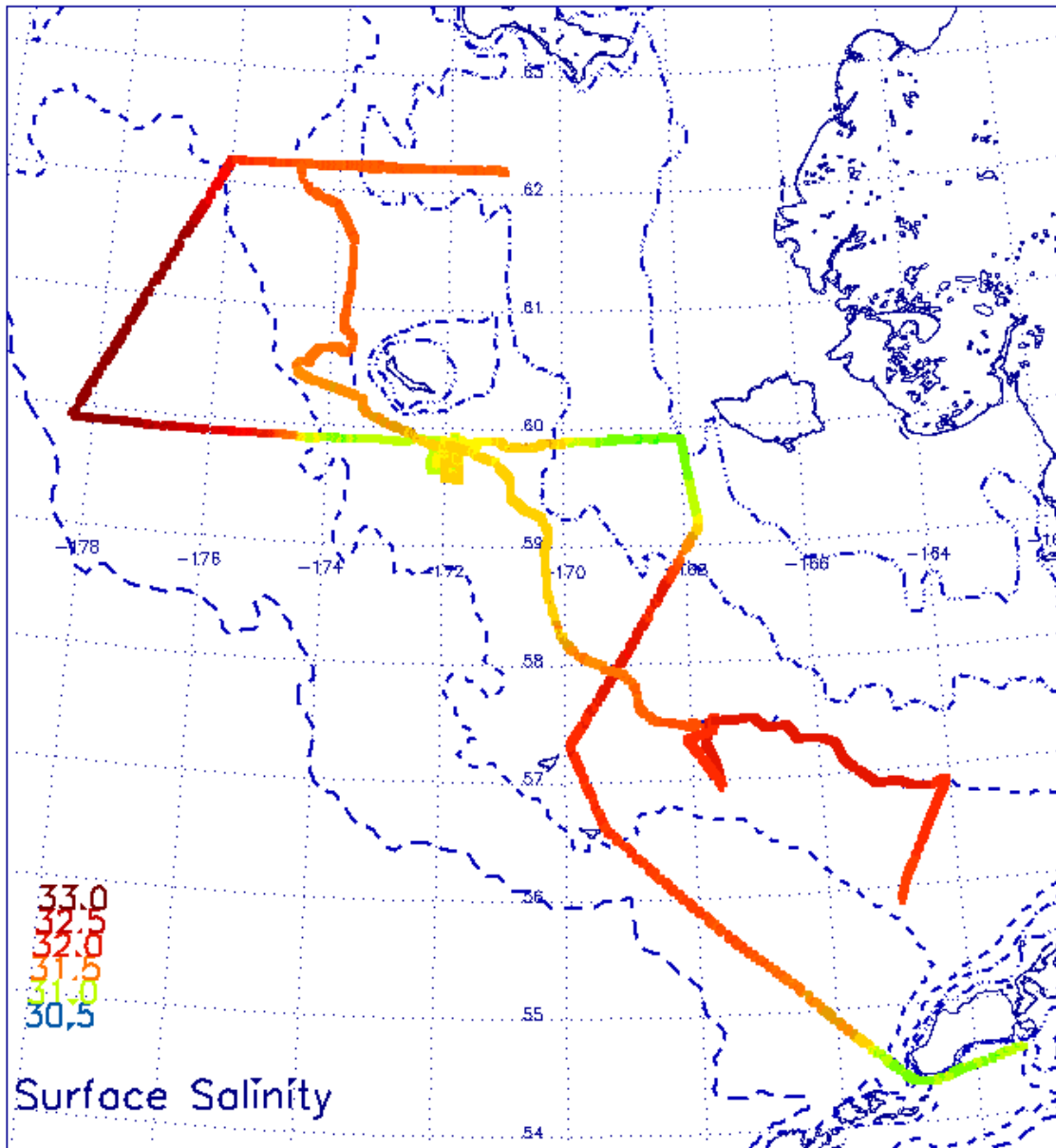


Figure 4: Sea-chest Salinity

Surface salinity varied from 31 to near 33 psu. It was highest in the deep water at the west end of line MN, and lowest near the ice by St. Matthew Island and near Nunivak Island, where ice had been melting. However, it was not as low in the region just west of St. Matthew Island, where ice was also melting.

The next pages show the transects of temperature, salinity, density, and fluorometer (volts) with oxygen lines overplotted on the fluorometer contours.

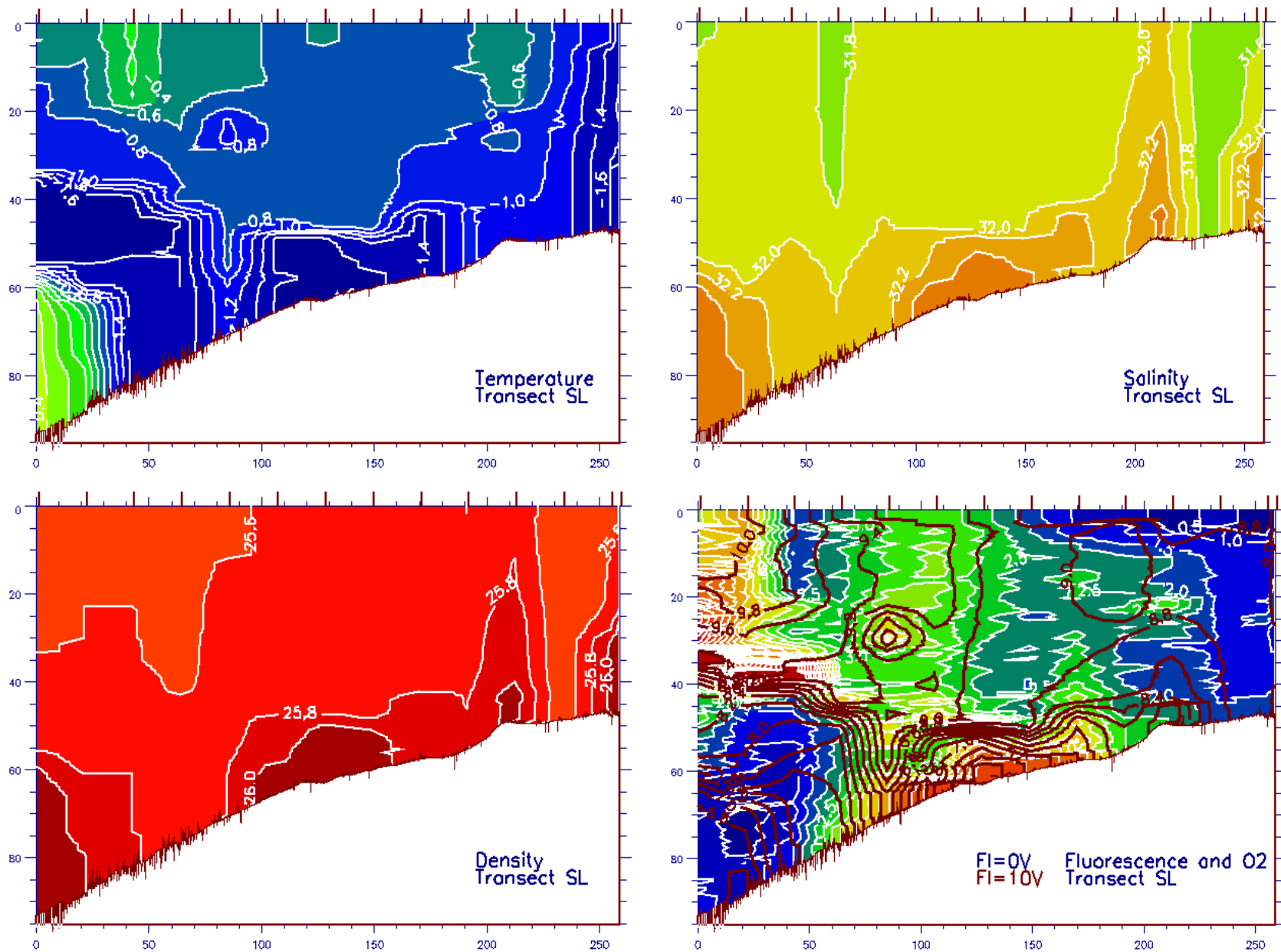


Figure 5: Transect SL, the northernmost transect. The red lines above the plot show station locations. In the fourth plot, oxygen concentration is plotted as red lines on the fluorescence contours.

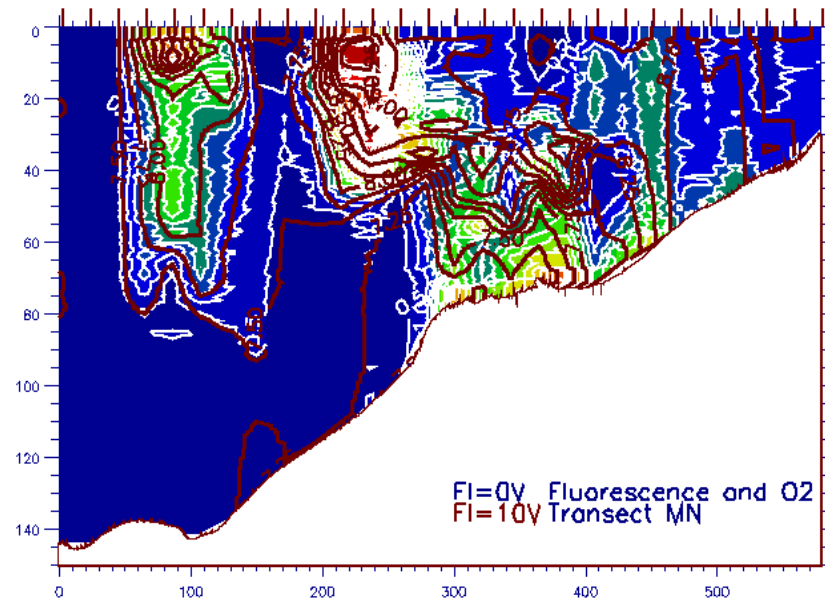
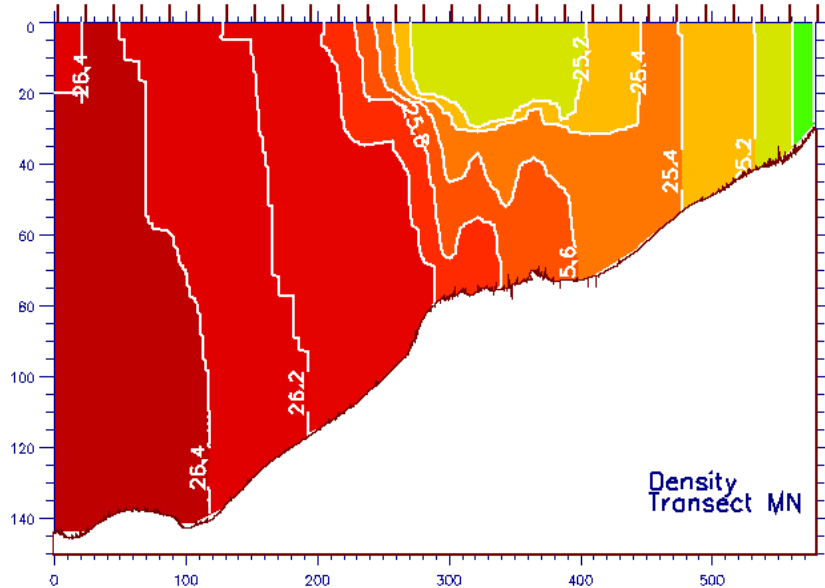
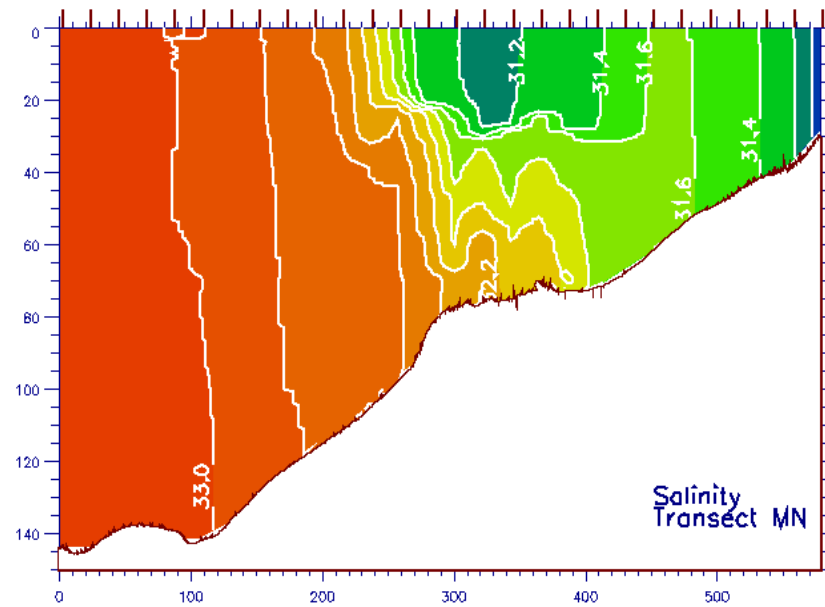
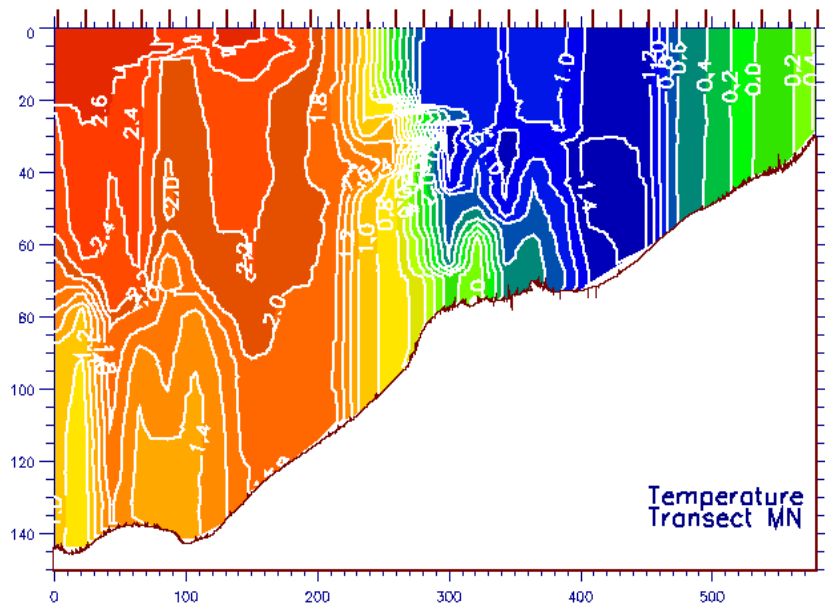


Figure 6: Transect MN (St. Matthew-Nunivak)

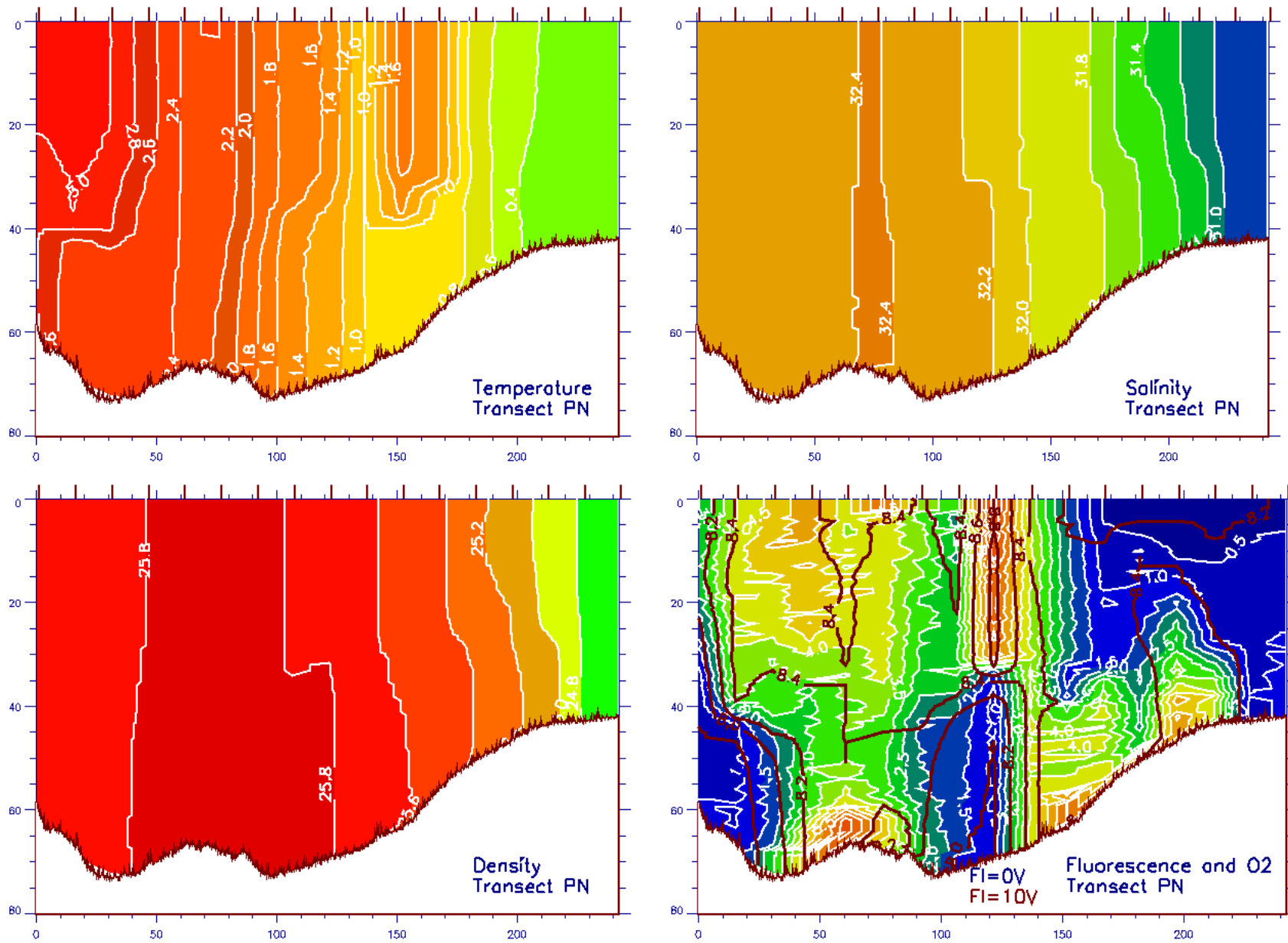


Figure 7: Transect PN (St. Paul-Nunivak)

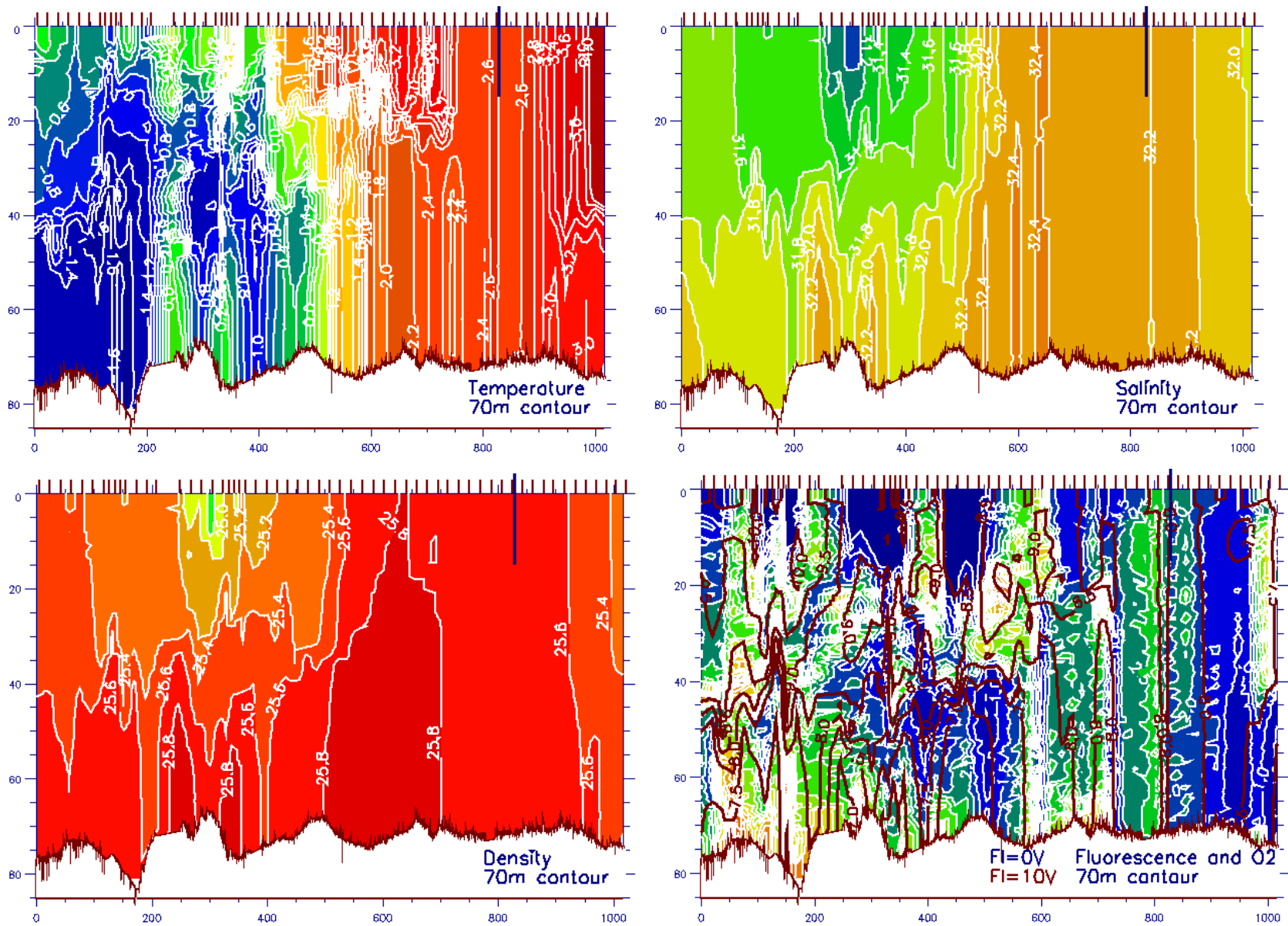


Figure 8 70-m contour. The vertical blue line near 800km marks the position where there was a 30-hour halt in operations because of a storm

The structure seen in the transects is due to 1) the effect of ice and the length of time that has elapsed since ice was last over the area and 2) different advection and mixing in shallower and deeper areas. The southern area (line PN and the southern end of the 70m contour) was well-mixed compared to the northern areas, where ice had been present in the past week or 10 days, and compared to the deeper areas. There, the greater depth inhibits mixing while the greater bottom slope promotes advection of water from farther south.

Shallower casts often had the highest fluorescence near the bottom. An interesting progression is seen at transects MN and less strikingly at SL and PN. There, the stations in the deepest water had a lobe of high chlorophyll in the upper water column, with the highest bulls-eye just over the station where the bottom slope increased. These upper-layer maxima were associated with high oxygen values. However, just inshore of this station, the highest fluorescence, associated with low oxygen values, occurred near the bottom.

Acknowledgements: We would like to thank the officers and crewmembers of R/V *Thomas G. Thompson* for their hard work and can-do attitude. Even though they didn't arrange the weather as well as they did for Leg 1, they did everything they could to make the cruise a success.

Table: Station Positions. CTDs were done at all stations, and bongos were done as indicated.

PN1	May	16	2005	02:04:14	57.323	169.922	59	Bongo
PN2	May	16	2005	04:01:00	57.439	169.786	67	
PN3	May	16	2005	05:23:42	57.554	169.650	73	Bongo
PN4	May	16	2005	07:06:03	57.670	169.514	72	
PN5	May	16	2005	08:23:00	57.785	169.379	68	Bongo
PN6	May	16	2005	10:05:21	57.901	169.243	68	
PN7	May	16	2005	11:27:50	58.016	169.106	71	Bongo
PN8	May	16	2005	13:15:05	58.132	168.971	72	
PN9	May	16	2005	14:39:26	58.248	168.836	70	Bongo
PN10	May	16	2005	16:39:37	58.363	168.700	67	
PN11	May	16	2005	18:06:27	58.479	168.564	64	Bongo
PN12	May	16	2005	19:46:15	58.594	168.429	57	
PN13	May	16	2005	21:01:14	58.710	168.293	51	Bongo
PN14	May	16	2005	22:52:52	58.825	168.157	48	
PN15	May	17	2005	00:06:54	58.941	168.021	44	Bongo
PN16	May	17	2005	01:38:00	59.056	167.886	43	
PN17	May	17	2005	02:55:03	59.172	167.750	42	Bongo
MN28	May	17	2005	07:39:14	59.900	168.000	31	
MN27	May	17	2005	09:14:23	59.900	168.383	39	
MN26	May	17	2005	10:51:25	59.900	168.767	42	
MN25	May	17	2005	12:50:14	59.900	169.150	47	Bongo
MN24	May	17	2005	15:06:27	59.900	169.533	51	
MN23	May	17	2005	16:42:33	59.900	169.917	56	Bongo
MN22	May	17	2005	18:36:30	59.900	170.301	63	
MN21	May	17	2005	20:17:22	59.856	170.694	69	Bongo
MN20	May	17	2005	22:18:30	59.900	171.068	72	
MN19	May	17	2005	23:43:02	59.900	171.450	73	Bongo
MN18	May	18	2005	02:11:36	59.900	171.832	73	
MN17	May	18	2005	12:39:02	59.900	172.217	76	Bongo
MN16	May	18	2005	15:18:13	59.900	172.600	77	
MN15	May	18	2005	16:49:38	59.900	172.983	78	Bongo
MN14	May	18	2005	18:38:34	59.900	173.367	86	
MN13	May	18	2005	20:05:32	59.900	173.751	105	Bongo
MN12	May	18	2005	22:01:43	59.900	174.133	106	
MN11	May	18	2005	23:34:12	59.900	174.517	112	Bongo
MN10	May	19	2005	01:33:57	59.900	174.900	118	
MN09	May	19	2005	03:12:26	59.900	175.283	123	Bongo
MN08	May	19	2005	04:45:22	59.900	175.667	129	
MN07	May	19	2005	06:17:04	59.900	176.050	138	Bongo
MN06	May	19	2005	08:17:37	59.900	176.434	143	
MN05	May	19	2005	09:54:59	59.900	176.817	140	Bongo
MN04	May	19	2005	12:05:07	59.900	177.200	138	
MN03	May	19	2005	13:49:54	59.900	177.583	140	Bongo
MN02	May	19	2005	16:05:58	59.900	177.967	145	
MN01	May	19	2005	17:49:18	59.900	178.350	144	Bongo
SL01	May	20	2005	07:23:34	62.200	175.974	102	Bongo
SL02	May	20	2005	09:22:55	62.200	175.567	89	
SL03	May	20	2005	10:59:52	62.200	175.158	83	Bongo
SL04	May	20	2005	13:07:52	62.200	174.750	78	
SL05	May	20	2005	14:44:58	62.200	174.342	71	Bongo
SL06	May	20	2005	16:49:19	62.200	173.932	66	
SL07	May	20	2005	18:17:58	62.200	173.524	63	Bongo
SL08	May	20	2005	20:16:03	62.200	173.117	61	
SL09	May	20	2005	21:42:26	62.200	172.708	58	Bongo

SL10	May	20	2005	23:32:36	62.200	172.300	56	
SL11	May	21	2005	01:01:02	62.200	171.891	50	Bongo
SL12	May	21	2005	02:43:15	62.200	171.483	49	
SL13	May	21	2005	04:07:45	62.200	171.074	47	Bongo
SLEND	May	21	2005	05:05:02	62.194	170.998	48	
70M01	May	21	2005	14:05:52	62.200	174.750	77	
70M02	May	21	2005	15:29:26	62.036	174.666	77	Bongo
70M03	May	21	2005	17:14:58	61.943	174.377	77	
70M04	May	21	2005	18:36:24	61.878	174.043	75	
70M05	May	21	2005	19:59:55	61.737	173.858	74	Bongo
70M06	May	21	2005	21:40:31	61.585	173.700	74	
70M07	May	21	2005	23:01:59	61.414	173.700	77	
70M07A	May	21	2005	23:58:10	61.329	173.706	77	
70M08	May	22	2005	00:49:59	61.244	173.713	76	Bongo
70M08A	May	22	2005	02:17:01	61.160	173.741	78	
70M09	May	22	2005	03:09:08	61.076	173.769	80	
70M10	May	22	2005	04:32:35	60.908	173.818	86	
70M11	May	22	2005	07:16:58	60.758	173.663	76	Bongo
70M12	May	22	2005	08:49:53	60.628	173.648	72	
70M13	May	22	2005	17:35:32	60.256	173.522	71	
70m14	<i>Could not get to site: too much ice</i>							
70M15	May	22	2005	19:55:23	60.117	173.328	73	
70M16	May	22	2005	21:13:20	60.051	173.029	69	
70M17	May	22	2005	22:32:21	59.985	172.723	69	Bongo
70M18	May	23	2005	00:16:20	59.905	172.422	76	
70M18A	May	23	2005	01:08:16	59.875	172.264	77	
70M19	May	23	2005	02:18:40	59.846	172.104	77	
70M19A	May	23	2005	03:16:51	59.838	171.937	76	
70M20	May	23	2005	04:06:19	59.830	171.769	75	Bongo
70M21	May	23	2005	15:57:34	59.781	171.450	75	
70M22	May	23	2005	17:29:24	59.719	171.139	74	
70M23	May	23	2005	18:59:06	59.598	170.917	73	Bongo
70M24	May	23	2005	20:53:47	59.432	170.889	73	
70M25	May	23	2005	22:13:51	59.329	170.666	70	
70M26	May	23	2005	23:41:34	59.259	170.377	72	Bongo
70M27	May	24	2005	01:28:30	59.110	170.240	69	
70M28	May	24	2005	02:56:58	58.951	170.326	72	
70M29	May	24	2005	04:35:30	58.783	170.292	73	Bongo
70M30	May	24	2005	06:21:18	58.611	170.270	74	
70M31	May	24	2005	07:42:20	58.447	170.179	75	
70M32	May	24	2005	09:11:49	58.283	170.088	74	Bongo
70M33	May	24	2005	11:09:13	58.145	169.914	73	
70M34	May	24	2005	12:51:36	58.047	169.649	72	
70M35	May	24	2005	14:34:47	57.974	169.358	70	Bongo
70M36	May	24	2005	16:38:36	57.909	169.060	70	
70M37	May	24	2005	18:14:35	57.797	168.863	72	
70M38	May	24	2005	19:55:44	57.628	168.822	71	Bongo
70M39	May	24	2005	21:44:11	57.524	168.613	72	
70M40	May	24	2005	23:26:00	57.500	168.303	73	
70M41	May	25	2005	02:43:53	57.500	167.983	73	Bongo
	<i>30-hour storm + winch problems: no bongos until final cast</i>							
70M42	May	27	2005	00:59:56	57.501	167.667	72	
70M43	May	27	2005	03:26:33	57.500	167.349	73	
70M44	May	27	2005	05:21:27	57.523	167.039	71	
70M45	May	27	2005	06:52:27	57.424	166.807	71	
70M46	May	27	2005	08:19:51	57.443	166.523	71	
70M47	May	27	2005	09:54:05	57.320	166.326	72	

70M48	May	27	2005	11:32:17	57.320	166.011	71	
70M49	May	27	2005	13:01:24	57.262	165.747	71	
70M50	May	27	2005	14:23:43	57.108	165.613	72	
70M51	May	27	2005	15:55:04	57.000	165.379	73	
70M52	May	27	2005	17:21:06	56.894	165.137	75	
70M53	May	27	2005	18:37:56	56.909	164.838	74	
70M54	May	27	2005	20:00:10	56.851	164.570	75	
70M55	May	27	2005	21:00:04	56.832	164.310	74	
70M56	May	27	2005	22:02:33	56.879	164.057	73	Bongo