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21 January, 2013

Cruise Report

RV Oceania, AREX2012

Institution	Institute of Oceanology Polish Academy of Sciences
Ship Name	RV Oceania
Cruise Name	AREX2012
Time Frame	20.06.2012 – 23.07.2012
Port Calls	Tromsø (Norway), Longyearbyen (Spitsbergen)
Research Area	the Norwegian, Greenland and Barents Seas
Chief Scientist	Waldemar Walczowski, Assoc. Prof.
Principal Project	AREX
Number of Scientist	12

Hydrography of the Norwegian, Barents and Greenland Seas in summer 2012.

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1. Observations and deployments

The main part of the Arctic Experiment of the Institute of Oceanology, Polish Academy of Sciences (IOPAN), the so-called AREX2012, was performed aboard RV Oceania between 20 June and 23 July, 2012. During this cruise part profiles along standard sections were done. As in previous years the sections were perpendicular to the general direction of the Atlantic Water (AW) inflow according to the West Spitsbergen Current (WSC) location, which is situated between the Barents Sea slope in the south-east area, the west Spitsbergen shelf-break/slope region in the north-east and a system of underwater ridges: Mohn Ridge and Knipovich Ridge on the west. Due to convergence of isobaths in the northern part, currents pattern and structure is complicated and forms a wedge, wide in the southern part and narrower on the north. Main effort concentrated in the Atlantic domain - from the Lofoten Basin on the south to the Fram Strait on the north where processes controlling the AW inflow into the Arctic Ocean and the westward recirculation occur.

All in all, 192 CTD profiles were taken along 12 sections (Fig.1, Tab.1). The Seabird CTD (SBE 911+) system with duplicate temperature and conductivity and some additional sensors (temperature sensors SBE3, conductivity sensors SBE4 and SBE 50 digital oceanographic pressure sensor, SBE 43 dissolved oxygen sensor, Alec Electronics Co., Ltd. Optical DO sensor Rinko III and Seapoint Sensors, Inc. Fluoroscein fluorometer) was used. The SBE sensors were calibrated by the Sea-Bird Electronics service before the cruise.

Currents measurements were performed at all the CTD stations with downward looking lowered Acoustic Doppler Current Profiler (LADCP). The self-recording 300 kHz RDI devices was used to profile the entire water column during the standard CTD casts. Three mooring systems were recovered: one in the Hornsund mouth (equipped with 600 kHz RDCP), one south of the South Cape (Workhorse ADCP) and one over the slope (MMP) (Fig. 1).

At 47 stations water samples were collected with the rosette water sampler SBE32 in order to estimate the nutrients content. At 54 stations water samples for oxygen isotopes were collected as a cooperation work with AARI (Petersburg, Russia).

One Argo float was launched under the Argo Poland program (under Euro-Argo). After deployment it collected 56 profiles along the west Spitsbergen slope (Fig. 2).

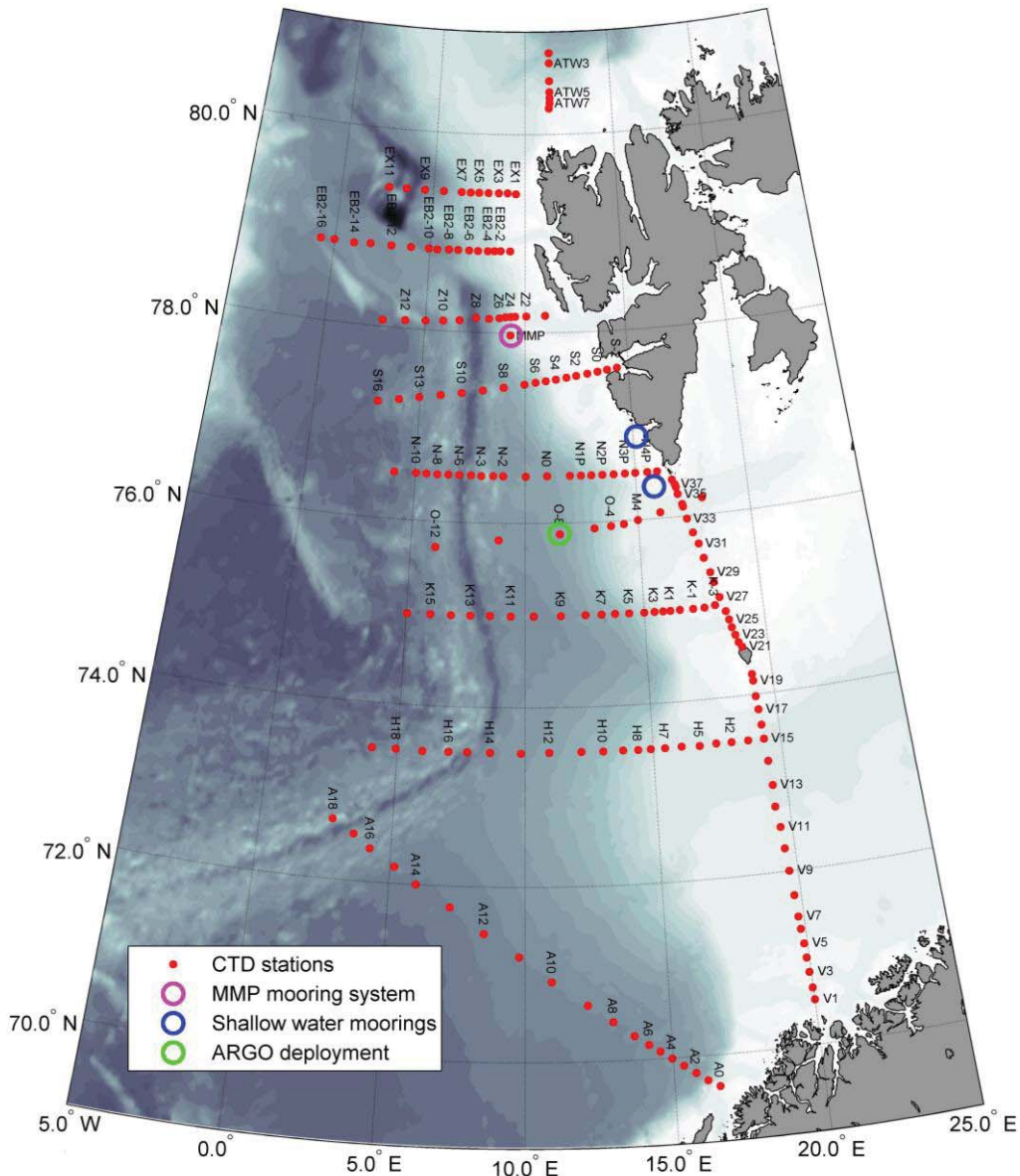


Figure 1: Geographical locations of CTD/LADCP stations and operations performed during IOPAN Arctic Experiment AREX2012 aboard RV Oceania in summer 2012.

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Table 1. CTD stations taken during the AREX 2012 cruise and some of their main parameters.

No	Station	Depth (m)	Latitude	Longitude	Date	Time	File/Cast
1	A0	70	69°38.39'N	016°30.53'E	20/06/2012	17:25	ar12_001
2	A1	980	69°42.96'N	016°07.27'E	20/06/2012	18:47	ar12_002
3	A2	2228	69°48.65'N	015°44.40'E	20/06/2012	20:58	ar12_003
4	A3	2285	69°54.27'N	015°20.91'E	20/06/2012	23:44	ar12_004
5	A4	2415	69°59.67'N	014°57.89'E	21/06/2012	02:19	ar12_005
6	A5	2505	70°05.06'N	014°34.94'E	21/06/2012	06:27	ar12_006
7	A6	2529	70°10.10'N	014°12.67'E	21/06/2012	10:14	ar12_007
8	A7	2620	70°16.72'N	013°44.01'E	21/06/2012	13:16	ar12_008
9	A8	2606	70°26.94'N	013°01.75'E	21/06/2012	16:50	ar12_009
10	A9	2612	70°38.78'N	012°10.46'E	21/06/2012	20:23	ar12_010
11	A10	2610	70°55.42'N	010°55.83'E	22/06/2012	00:57	ar12_011
12	A11	2628	71°12.42'N	009°46.98'E	22/06/2012	05:56	ar12_012
13	A12	2725	71°28.09'N	008°31.26'E	22/06/2012	10:31	ar12_013
14	A13	2812	71°45.54'N	007°16.13'E	22/06/2012	15:03	ar12_014
15	A14	2850	72°00.07'N	006°00.01'E	22/06/2012	20:24	ar12_015
16	A15	2766	72°11.27'N	005°10.08'E	23/06/2012	01:38	ar12_016
17	A16	2424	72°22.54'N	004°12.96'E	23/06/2012	06:40	ar12_017
18	A17	2124	72°31.58'N	003°34.13'E	23/06/2012	10:49	ar12_018
19	A18	1153	72°40.41'N	002°44.36'E	23/06/2012	16:03	ar12_019
20	H19	2872	73°30.00'N	003°59.93'E	23/06/2012	22:22	ar12_020
21	H18	2698	73°30.21'N	004°56.39'E	24/06/2012	02:02	ar12_021
22	H17	1948	73°29.82'N	005°58.89'E	24/06/2012	05:57	ar12_022
23	H16	2270	73°30.01'N	007°00.00'E	24/06/2012	08:59	ar12_023
24	H15	3063	73°30.19'N	007°44.25'E	24/06/2012	11:40	ar12_024
25	H14	2490	73°30.04'N	008°37.49'E	24/06/2012	14:59	ar12_025
26	H13	2283	73°29.67'N	009°50.13'E	24/06/2012	19:33	ar12_026
27	H12	2054	73°30.09'N	010°56.43'E	24/06/2012	23:10	ar12_027
28	H11	1807	73°30.31'N	012°11.71'E	25/06/2012	02:30	ar12_028
29	H10	1574	73°30.15'N	013°02.79'E	25/06/2012	05:12	ar12_029
30	H9	1288	73°30.25'N	013°49.38'E	25/06/2012	07:33	ar12_030
31	H8	1011	73°29.98'N	014°24.94'E	25/06/2012	09:29	ar12_031
32	H4	679	73°30.06'N	014°54.23'E	25/06/2012	11:14	ar12_032
33	H7	479	73°30.11'N	015°28.00'E	25/06/2012	12:44	ar12_033
34	H6	461	73°30.23'N	016°07.07'E	25/06/2012	14:33	ar12_034
35	H5	445	73°29.64'N	016°49.49'E	25/06/2012	16:52	ar12_035
36	H3	424	73°30.30'N	017°28.76'E	25/06/2012	18:38	ar12_036
37	H2	406	73°30.14'N	018°04.62'E	25/06/2012	20:10	ar12_037
38	H1	425	73°30.13'N	018°43.44'E	25/06/2012	21:36	ar12_038
39	V1	133	70°30.85'N	020°00.01'E	26/06/2012	14:19	ar12_039
40	V2	156	70°39.10'N	019°58.54'E	26/06/2012	15:45	ar12_040

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41	V3	183	70°50.00'N	019°56.08'E	26/06/2012	17:14	ar12_041
42	V4	184	70°59.96'N	019°54.01'E	26/06/2012	18:44	ar12_042
43	V5	210	71°09.87'N	019°52.53'E	26/06/2012	20:20	ar12_043
44	V6	206	71°19.95'N	019°49.85'E	26/06/2012	21:55	ar12_044
45	V7	237	71°28.52'N	019°47.92'E	26/06/2012	23:28	ar12_045
46	V8	265	71°43.32'N	019°44.95'E	27/06/2012	01:23	ar12_046
47	V9	311	72°00.12'N	019°40.98'E	27/06/2012	03:37	ar12_047
48	V10	319	72°15.47'N	019°36.96'E	27/06/2012	05:58	ar12_048
49	V11	388	72°30.04'N	019°33.94'E	27/06/2012	08:07	ar12_049
50	V12	396	72°44.16'N	019°27.65'E	27/06/2012	10:45	ar12_050
51	V13	413	72°58.75'N	019°28.17'E	27/06/2012	13:01	ar12_051
52	V14	448	73°15.06'N	019°24.26'E	27/06/2012	15:20	ar12_052
53	V15	478	73°30.01'N	019°20.72'E	27/06/2012	17:29	ar12_053
54	V16	346	73°39.60'N	019°18.94'E	27/06/2012	19:09	ar12_054
55	V17	230	73°49.78'N	019°16.09'E	27/06/2012	20:47	ar12_055
56	V18	133	73°58.59'N	019°13.52'E	27/06/2012	22:26	ar12_056
57	V19	68	74°09.00'N	019°11.68'E	28/06/2012	00:01	ar12_057
58	V20	56	74°13.43'N	019°10.59'E	28/06/2012	00:52	ar12_058
59	V21	25	74°32.14'N	018°54.82'E	28/06/2012	10:09	ar12_059
60	V22	68	74°35.33'N	018°47.67'E	28/06/2012	10:56	ar12_060
61	V23	97	74°40.29'N	018°41.58'E	28/06/2012	11:43	ar12_061
62	V24	227	74°45.48'N	018°35.16'E	28/06/2012	12:36	ar12_062
63	V25	200	74°50.61'N	018°30.49'E	28/06/2012	13:30	ar12_063
64	V26	72	74°56.27'N	018°24.63'E	28/06/2012	14:35	ar12_064
65	V27	68	75°05.91'N	018°12.55'E	28/06/2012	15:53	ar12_065
66	V28	63	75°15.94'N	018°02.48'E	28/06/2012	17:31	ar12_066
67	V29	103	75°22.53'N	017°55.95'E	28/06/2012	18:34	ar12_067
68	V30	131	75°32.20'N	017°43.15'E	28/06/2012	19:50	ar12_068
69	V31	212	75°41.68'N	017°33.57'E	28/06/2012	21:07	ar12_069
70	V32	291	75°49.19'N	017°21.44'E	28/06/2012	22:25	ar12_070
71	V33	318	75°58.26'N	017°08.84'E	28/06/2012	23:48	ar12_071
72	V34	288	76°06.30'N	017°01.06'E	29/06/2012	01:04	ar12_072
73	V35	216	76°14.52'N	016°50.26'E	29/06/2012	02:14	ar12_073
74	V36	105	76°19.04'N	016°46.85'E	29/06/2012	03:50	ar12_074
75	V37	56	76°21.05'N	016°44.17'E	29/06/2012	05:01	ar12_075
76	V38	29	76°24.01'N	016°38.04'E	29/06/2012	06:24	ar12_076
77	K-3	153	75°00.93'N	017°58.98'E	29/06/2012	23:21	ar12_077
78	K-2	114	75°00.00'N	017°32.00'E	30/06/2012	00:39	ar12_078
79	K-1	129	74°59.92'N	017°03.60'E	30/06/2012	01:50	ar12_079
80	K0	230	74°59.96'N	016°29.94'E	30/06/2012	03:00	ar12_080
81	K1	218	74°59.94'N	016°05.50'E	30/06/2012	04:10	ar12_081
82	K2	326	74°59.95'N	015°47.37'E	30/06/2012	05:11	ar12_082
83	K3	805	74°59.99'N	015°25.59'E	30/06/2012	06:20	ar12_083

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84	K4	1106	74°59.99'N	014°59.94'E	30/06/2012	07:53	ar12_084
85	K5	1509	75°00.10'N	014°22.16'E	30/06/2012	09:48	ar12_085
86	K6	1799	75°00.29'N	013°46.74'E	30/06/2012	11:52	ar12_086
87	K7	1983	75°00.18'N	013°12.53'E	30/06/2012	14:10	ar12_087
88	K8	2158	75°00.25'N	012°31.81'E	30/06/2012	16:44	ar12_088
89	K9	2377	74°59.98'N	011°30.09'E	30/06/2012	19:47	ar12_089
90	K10	2501	74°59.85'N	010°21.76'E	30/06/2012	23:08	ar12_090
91	K11	2557	74°59.88'N	009°23.55'E	01/07/2012	02:00	ar12_091
92	K12	2780	75°00.07'N	008°30.75'E	01/07/2012	04:55	ar12_092
93	K13	2205	75°00.01'N	007°41.67'E	01/07/2012	08:19	ar12_093
94	K14	2131	74°59.93'N	006°53.09'E	01/07/2012	11:12	ar12_094
95	K15	2819	74°59.88'N	006°00.97'E	01/07/2012	14:07	ar12_095
96	K16	3064	74°59.70'N	005°02.32'E	01/07/2012	17:22	ar12_096
97	O-12	2585	75°43.46'N	006°05.03'E	01/07/2012	23:41	ar12_097
98	O-10	2345	75°48.97'N	008°49.86'E	02/07/2012	06:33	ar12_098
99	O-8	2065	75°52.82'N	011°31.10'E	02/07/2012	13:05	ar12_099
100	O-6	1357	75°55.92'N	013°03.24'E	02/07/2012	17:19	ar12_100
101	O-4	897	75°57.01'N	013°47.15'E	02/07/2012	19:36	ar12_101
102	O-2	331	75°57.78'N	014°21.27'E	02/07/2012	21:30	ar12_102
103	M4	336	75°59.86'N	014°59.05'E	02/07/2012	23:02	ar12_103
104	O2	384	76°03.87'N	016°00.11'E	03/07/2012	01:25	ar12_104
105	O4	284	76°07.92'N	017°00.14'E	03/07/2012	03:18	ar12_105
106	O6	280	76°10.95'N	017°54.51'E	03/07/2012	05:34	ar12_106
107	MMP	836	77°58.34'N	009°15.73'E	05/07/2012	20:03	ar12_107
108	N5	45	76°30.08'N	015°59.85'E	10/07/2012	19:38	ar12_108
109	N4P	128	76°30.01'N	015°32.67'E	10/07/2012	20:43	ar12_109
110	N4	165	76°29.99'N	015°00.14'E	10/07/2012	22:22	ar12_110
111	N3P	213	76°30.00'N	014°31.85'E	11/07/2012	00:23	ar12_111
112	N3	759	76°29.99'N	014°00.82'E	11/07/2012	03:25	ar12_112
113	N2P	1243	76°30.01'N	013°30.41'E	11/07/2012	06:13	ar12_113
114	N2	1519	76°30.00'N	013°00.39'E	11/07/2012	09:15	ar12_114
115	N1P	1728	76°30.02'N	012°31.85'E	11/07/2012	13:02	ar12_115
116	N1	1889	76°29.98'N	012°02.06'E	11/07/2012	16:39	ar12_116
117	N0	2088	76°30.06'N	010°59.87'E	11/07/2012	23:05	ar12_117
118	N-1	2226	76°29.86'N	010°01.20'E	12/07/2012	04:17	ar12_118
119	N-2	2256	76°30.03'N	009°00.00'E	12/07/2012	09:36	ar12_119
120	N-3	2261	76°30.11'N	008°32.42'E	12/07/2012	13:26	ar12_120
121	N-3	1913	76°29.97'N	008°00.26'E	12/07/2012	17:10	ar12_121
122	N-5	2475	76°30.17'N	007°31.77'E	12/07/2012	20:13	ar12_122
123	N-6	2857	76°30.05'N	007°00.08'E	12/07/2012	22:46	ar12_123
124	N-7	2500	76°30.08'N	006°30.46'E	13/07/2012	01:43	ar12_124
125	N-8	2542	76°29.99'N	006°00.61'E	13/07/2012	04:52	ar12_125
126	N-9	2555	76°30.03'N	005°29.87'E	13/07/2012	07:52	ar12_126

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127	N-10	2365	76°30.09'N	005°01.70'E	13/07/2012	11:52	ar12_127
128	N-11	2583	76°29.85'N	004°02.28'E	13/07/2012	16:24	ar12_128
129	S16	2884	77°13.59'N	003°00.24'E	13/07/2012	23:40	ar12_129
130	S15	2555	77°15.71'N	003°59.75'E	14/07/2012	03:16	ar12_130
131	S13	2357	77°17.88'N	004°57.39'E	14/07/2012	06:27	ar12_131
132	S12	2574	77°19.90'N	005°57.68'E	14/07/2012	09:37	ar12_132
133	S10	2641	77°21.82'N	006°57.63'E	14/07/2012	12:49	ar12_133
134	S9	2288	77°23.77'N	007°58.22'E	14/07/2012	16:12	ar12_134
135	S8	2053	77°25.82'N	008°58.20'E	14/07/2012	19:30	ar12_135
136	S7	1605	77°27.82'N	009°57.48'E	14/07/2012	22:30	ar12_136
137	S6	1259	77°28.97'N	010°30.03'E	15/07/2012	00:34	ar12_137
138	S5	699	77°29.84'N	010°59.38'E	15/07/2012	02:23	ar12_138
139	S4	276	77°30.72'N	011°28.29'E	15/07/2012	04:52	ar12_139
140	S3	174	77°31.85'N	011°58.93'E	15/07/2012	06:05	ar12_140
141	S2	98	77°32.83'N	012°27.91'E	15/07/2012	07:22	ar12_141
142	S1	135	77°34.02'N	013°00.02'E	15/07/2012	08:24	ar12_142
143	S0	143	77°34.88'N	013°30.30'E	15/07/2012	09:29	ar12_143
144	S-1	138	77°35.85'N	013°57.71'E	15/07/2012	10:30	ar12_144
145	S-2	133	77°36.82'N	014°26.99'E	15/07/2012	11:32	ar12_145
146	Z1	255	78°10.49'N	011°00.07'E	15/07/2012	16:50	ar12_146
147	Z2	267	78°10.03'N	010°03.31'E	15/07/2012	18:25	ar12_147
148	Z3	266	78°09.89'N	009°29.99'E	15/07/2012	19:26	ar12_148
149	Z4	703	78°09.76'N	009°16.12'E	15/07/2012	20:13	ar12_149
150	Z5	1128	78°09.48'N	009°00.01'E	15/07/2012	21:21	ar12_150
151	Z6	1580	78°08.90'N	008°42.03'E	15/07/2012	22:54	ar12_151
152	Z7	2160	78°08.41'N	008°11.23'E	16/07/2012	00:57	ar12_152
153	Z8	3425	78°08.90'N	007°32.16'E	18/07/2012	07:34	ar12_153
154	Z9	2293	78°07.05'N	006°42.73'E	18/07/2012	11:48	ar12_154
155	Z10	2484	78°06.28'N	005°53.64'E	18/07/2012	14:38	ar12_155
156	Z11	2506	78°05.59'N	005°00.82'E	18/07/2012	18:07	ar12_156
157	Z12	2891	78°05.00'N	004°00.05'E	18/07/2012	21:35	ar12_157
158	Z13	3011	78°04.08'N	002°52.71'E	19/07/2012	01:10	ar12_158
159	EB2-16	2608	78°49.88'N	000°44.54'W	19/07/2012	08:48	ar12_159
160	EB2-15	2586	78°49.91'N	000°02.13'W	19/07/2012	12:53	ar12_160
161	EB2-14	2421	78°49.45'N	001°00.74'E	19/07/2012	17:43	ar12_161
162	EB2-13	2500	78°49.99'N	001°52.58'E	19/07/2012	20:31	ar12_162
163	EB2-12	2409	78°49.96'N	002°58.57'E	19/07/2012	23:22	ar12_163
164	EB2-11	2291	78°50.01'N	004°00.00'E	20/07/2012	02:15	ar12_164
165	EB2-10	2648	78°49.94'N	004°56.61'E	20/07/2012	05:03	ar12_165
166	EB2-9	2550	78°49.65'N	005°23.81'E	20/07/2012	08:37	ar12_166
167	EB2-8	2413	78°49.93'N	005°59.44'E	20/07/2012	12:43	ar12_167
168	EB2-7	1952	78°50.04'N	006°28.86'E	20/07/2012	16:11	ar12_168
169	EB2-6	1371	78°49.98'N	007°04.12'E	20/07/2012	19:36	ar12_169

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170	EB2-5	1119	78°49.86'N	007°31.73'E	20/07/2012	22:24	ar12_170
171	EB2-4	971	78°49.85'N	008°02.27'E	21/07/2012	02:20	ar12_171
172	EB2-3	695	78°50.01'N	008°23.37'E	21/07/2012	05:31	ar12_172
173	EB2-2	215	78°49.95'N	008°42.63'E	21/07/2012	08:36	ar12_173
174	EB2-1	201	78°49.90'N	009°12.56'E	21/07/2012	09:58	ar12_174
175	EX1	126	79°24.41'N	009°29.34'E	21/07/2012	13:51	ar12_175
176	EX2	130	79°25.02'N	009°02.63'E	21/07/2012	14:46	ar12_176
177	EX3	191	79°24.99'N	008°33.65'E	21/07/2012	15:35	ar12_177
178	EX4	417	79°25.00'N	007°59.94'E	21/07/2012	16:32	ar12_178
179	EX5	907	79°24.99'N	007°29.85'E	21/07/2012	17:39	ar12_179
180	EX6	1197	79°24.98'N	007°01.89'E	21/07/2012	19:04	ar12_180
181	EX7	1452	79°25.04'N	006°31.71'E	21/07/2012	20:36	ar12_181
182	EX8	2191	79°25.03'N	005°33.81'E	21/07/2012	22:52	ar12_182
183	EX9	2504	79°25.03'N	004°31.83'E	22/07/2012	01:58	ar12_183
184	EX10	2897	79°25.16'N	003°31.57'E	22/07/2012	05:12	ar12_184
185	EX11	2856	79°24.98'N	002°34.45'E	22/07/2012	08:13	ar12_185
186	ATW8	183	80°15.35'N	011°21.95'E	22/07/2012	21:24	ar12_186
187	ATW7	201	80°18.50'N	011°25.00'E	22/07/2012	22:06	ar12_187
188	ATW6	316	80°21.36'N	011°25.11'E	22/07/2012	22:57	ar12_188
189	ATW5	506	80°24.95'N	011°24.85'E	22/07/2012	23:50	ar12_189
190	ATW4	873	80°31.40'N	011°25.18'E	23/07/2012	01:20	ar12_190
191	ATW3	1285	80°41.83'N	011°25.05'E	23/07/2012	03:11	ar12_191
192	ATW2'	1573	80°47.71'N	011°24.63'E	23/07/2012	04:56	ar12_192

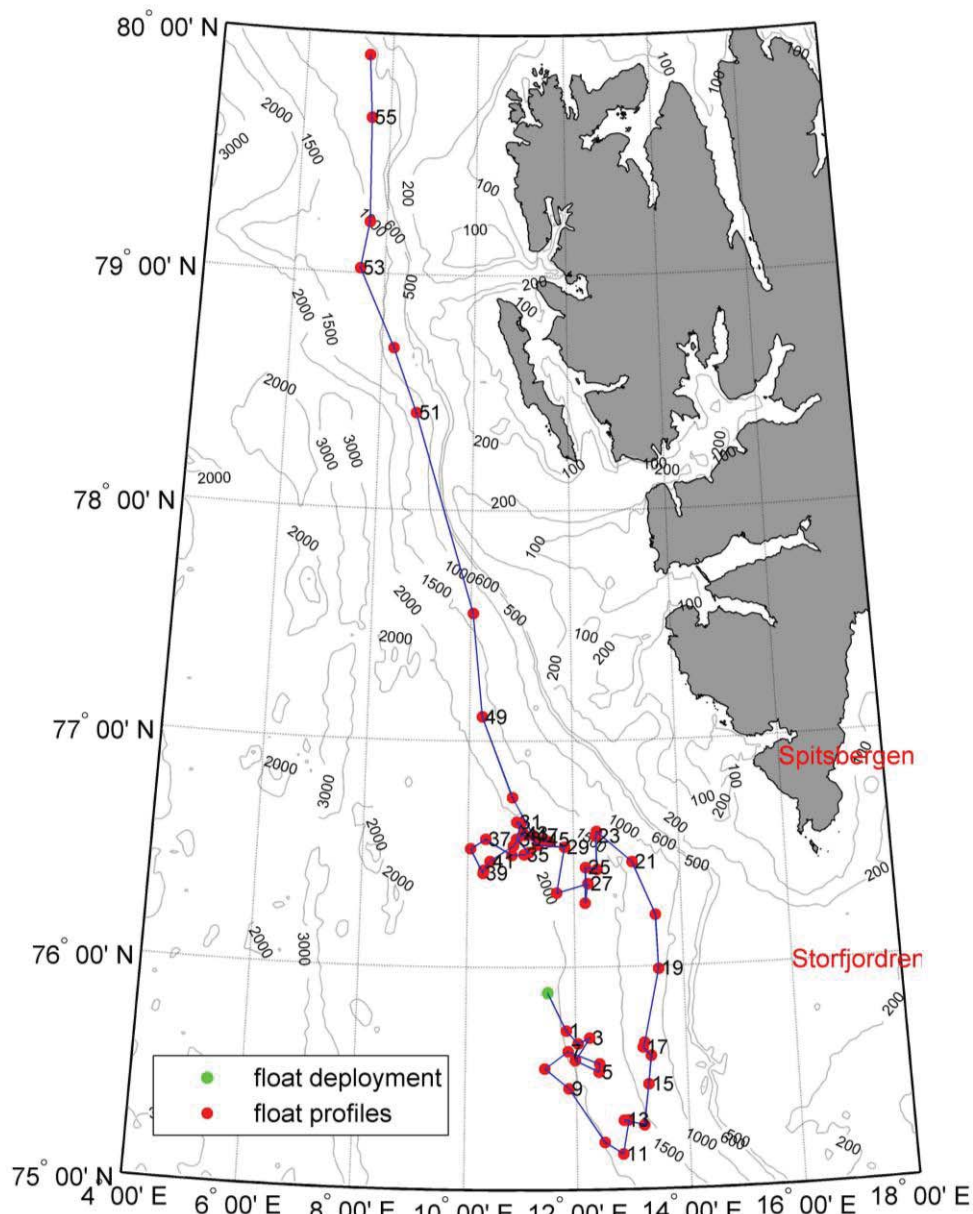


Figure 2. Track of the Argo float deployed by IOPAN in the Greenland Sea in July 2012.

2. Preliminary results

During last three summers the AW temperature was close to average with low variability. Simultaneously, high values of salinity were found as opposite to the high positive correlation between temperature and salinity usually observed in this region (Fig. 15). It may suggest prevailing of the local processes (cooling) over the remote processes (advection) in the AW temperature variation in the last period.

The raw datasets obtained from moored instruments were downloaded, processed and visualized after the recovery. Preliminary results from two instruments deployed in the Sørkapp and near the Hornsund mouth show the warm water inflowing during the winter months on the west Spitsbergen shelf. Water of temperature above 4°C was observed near the bottom (111 m) south of the Sørkapp, similarly, water mass with temperature above 3°C was present in February 2012 on the shelf near Hornsund (101 m). This information is consistent with observations done by researchers from UNIS in the Isfjord and with information collected by the overwintering Polish scientists in Hornsund (bad ice cover conditions in the last winter).

The Argo float (WMO 6901902) deployed by IOPAN from the board of Oceania on 2 July 2012 took 56 profiles from 6 July to 17 December 2012. After that no more information was received. Perhaps, the float was stuck under the sea-ice. The last three profiles were done only to the 300 dbar (Fig. 16). However, the float probably followed the slope and flowed northward under the compact sea ice and seems to be lost.

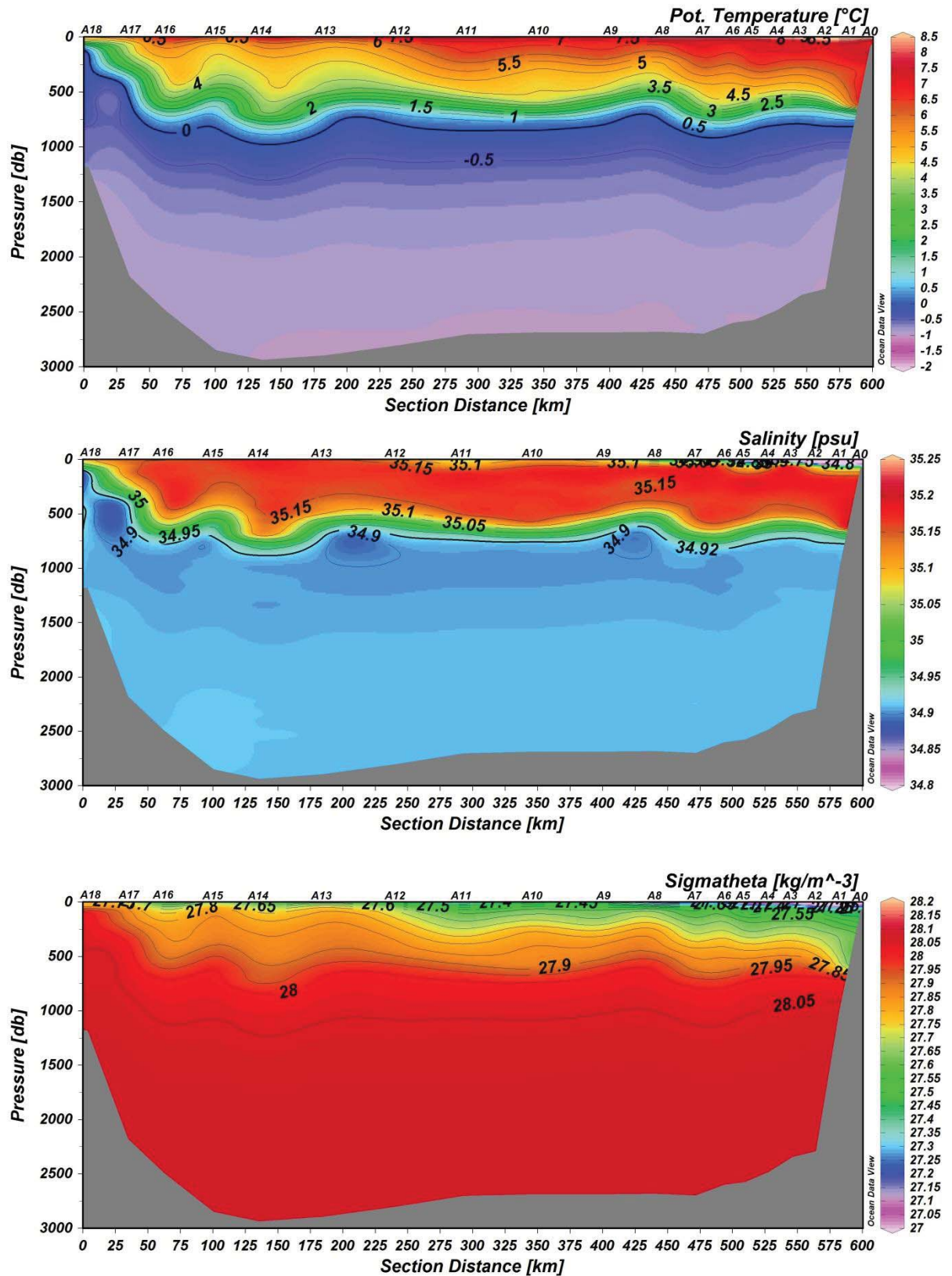


Figure 3. Temperature (θ), salinity and density (σ_{θ}) distribution along section A

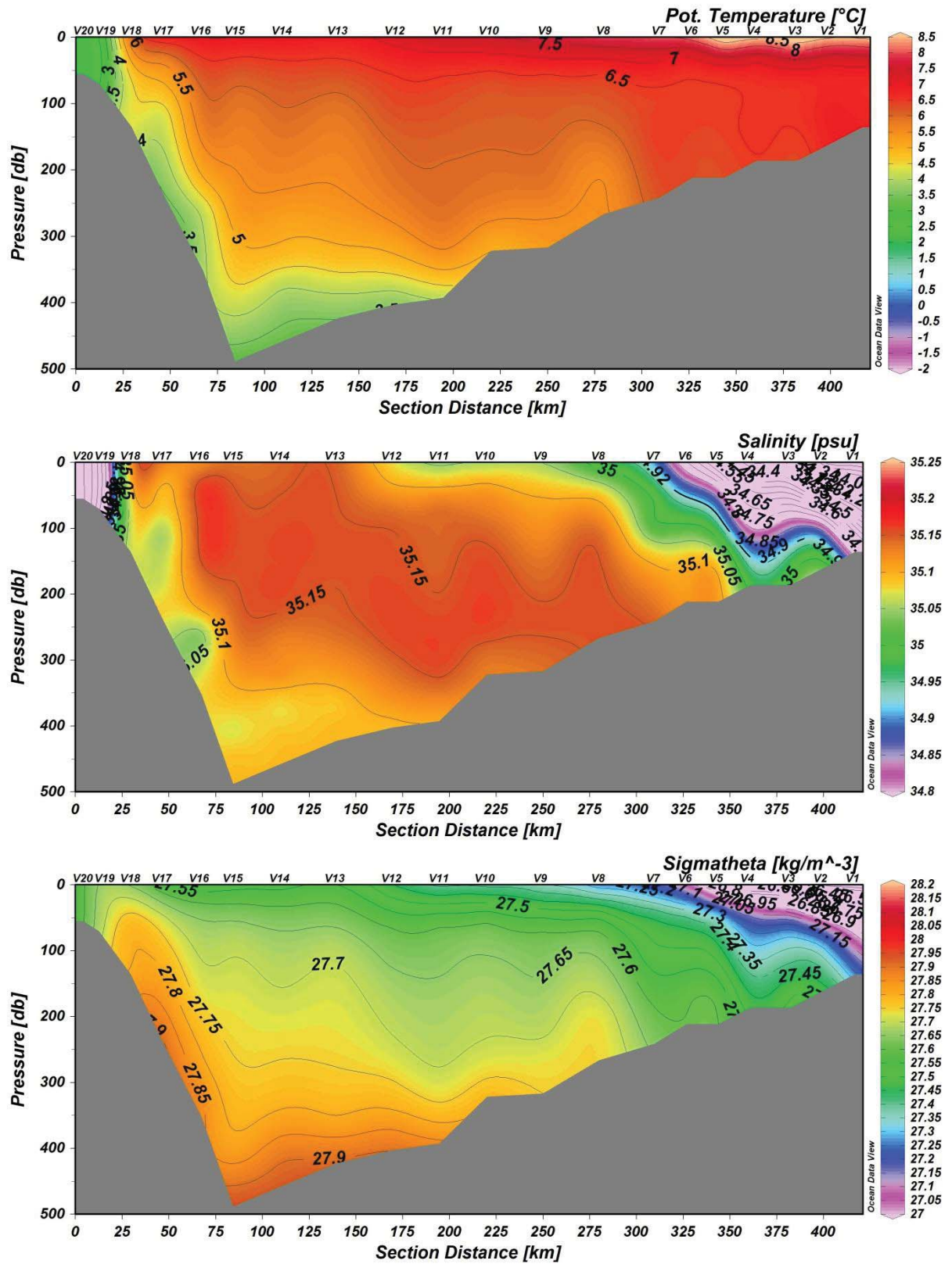


Figure 4. Temperature (θ), salinity and density (σ_θ) distribution along section V1

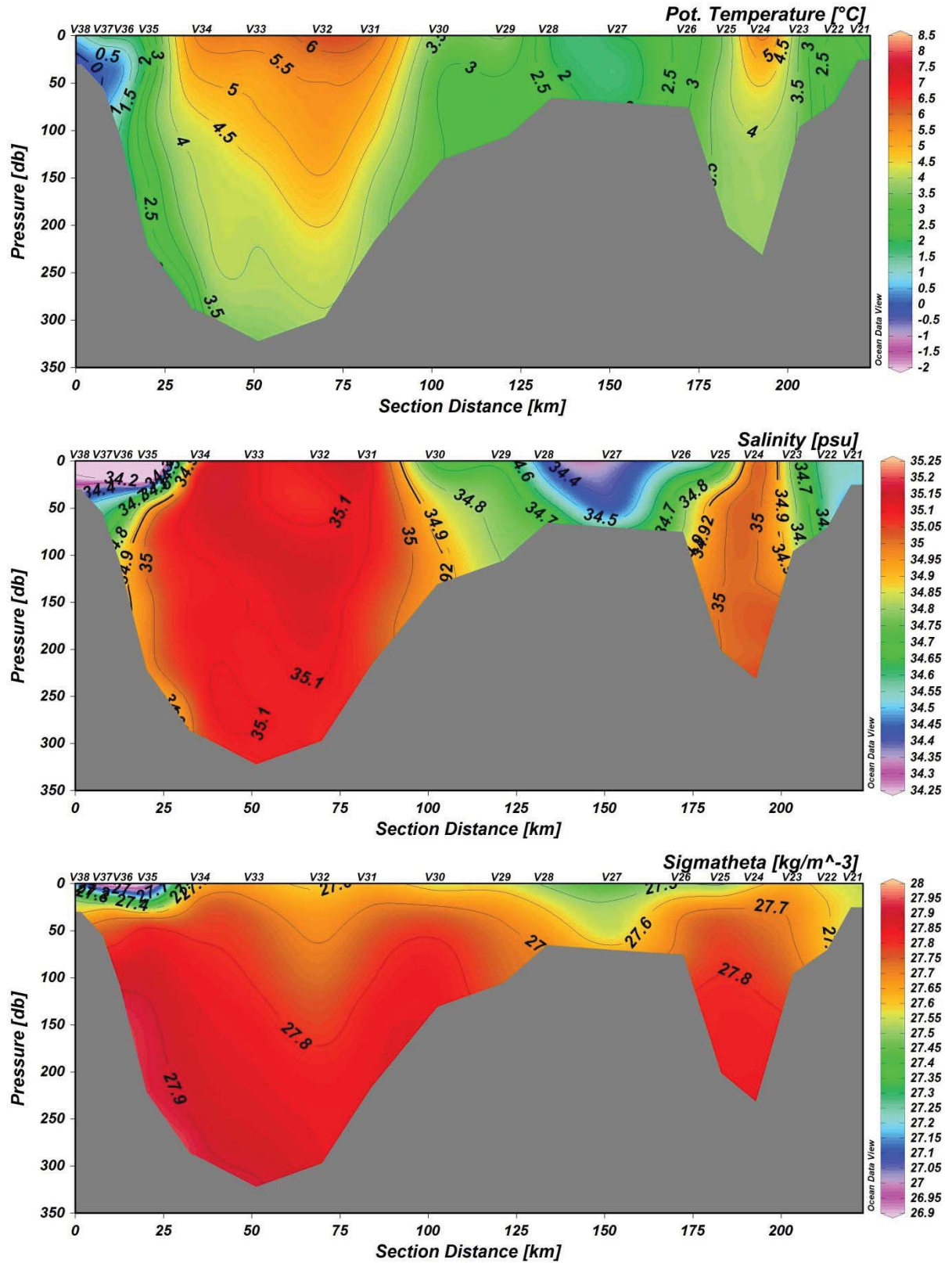


Figure 5. Temperature (θ), salinity and density (σ_θ) distribution along section V2

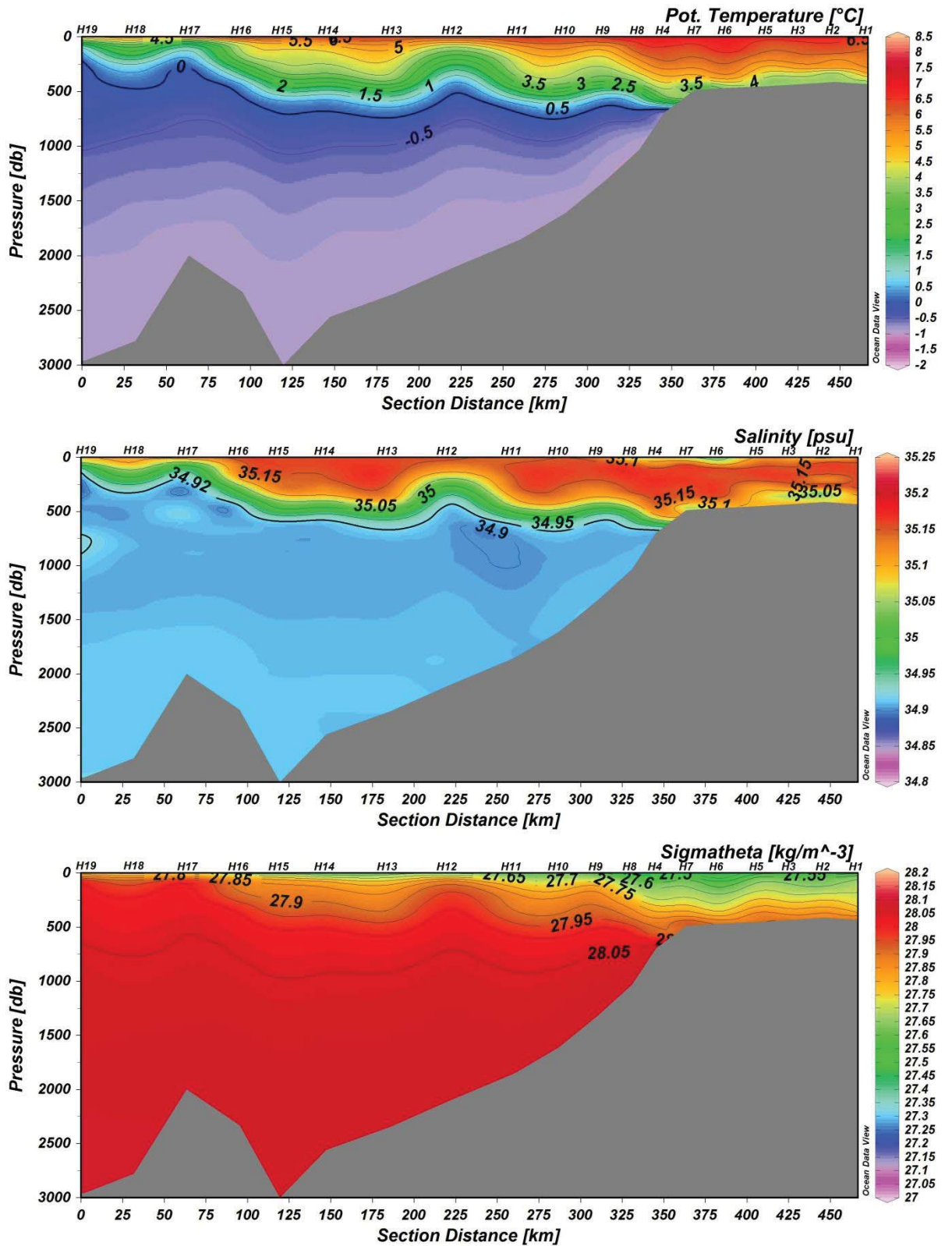


Figure 6. Temperature (θ), salinity and density (σ_{θ}) distribution along section H

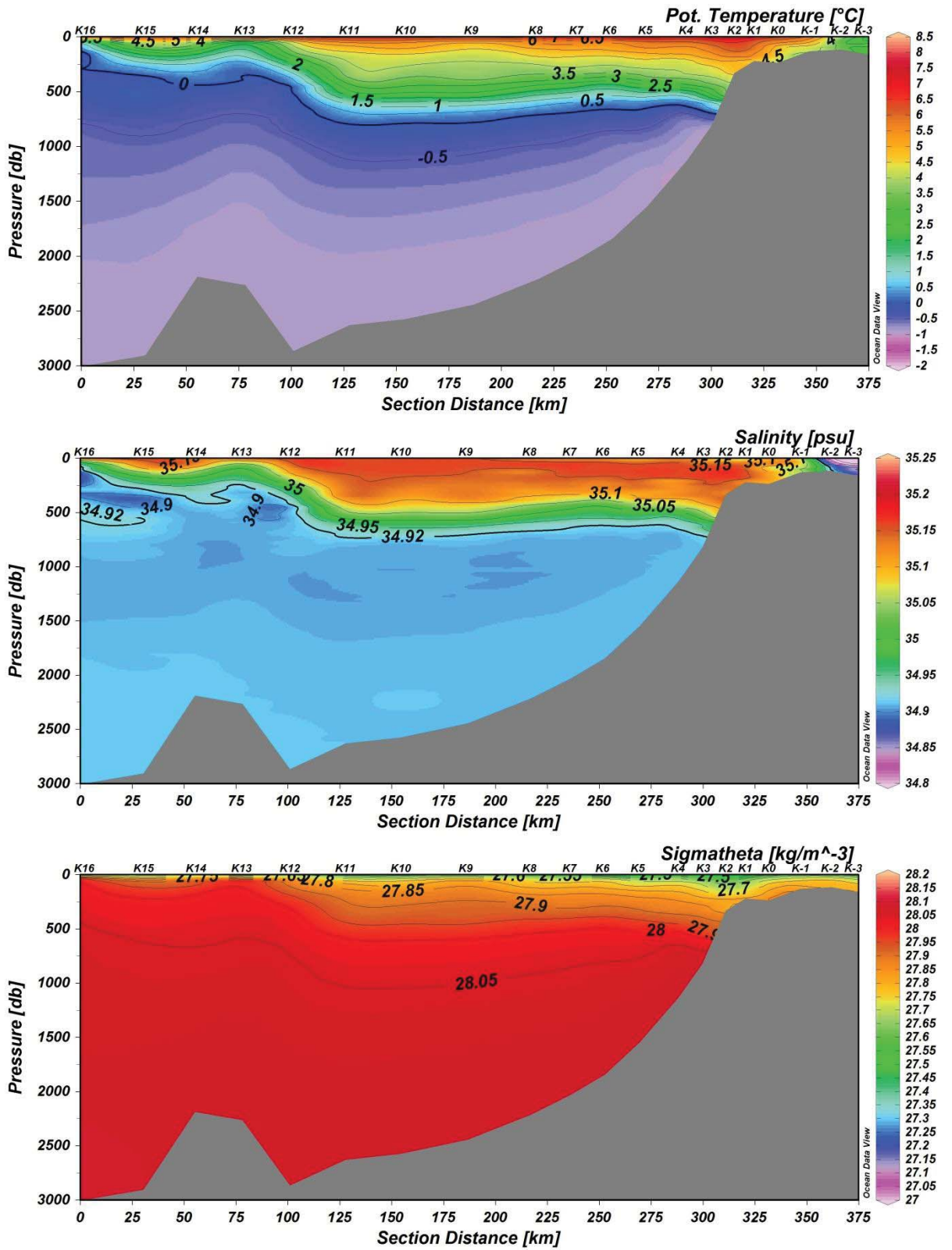


Figure 7. Temperature (θ), salinity and density (σ_θ) distribution along section K

3.

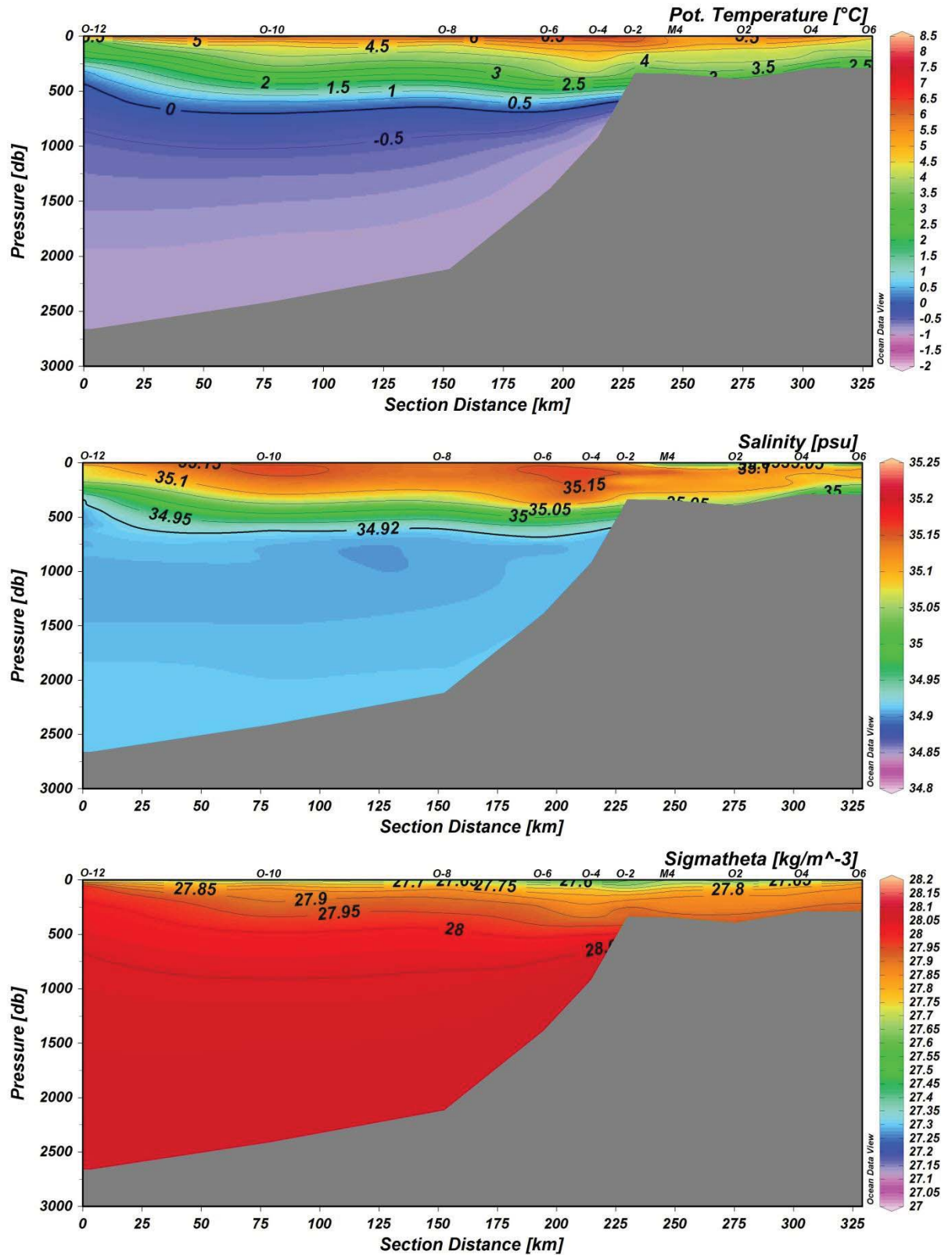


Figure 8. Temperature (θ), salinity and density (σ_{θ}) distribution along section O

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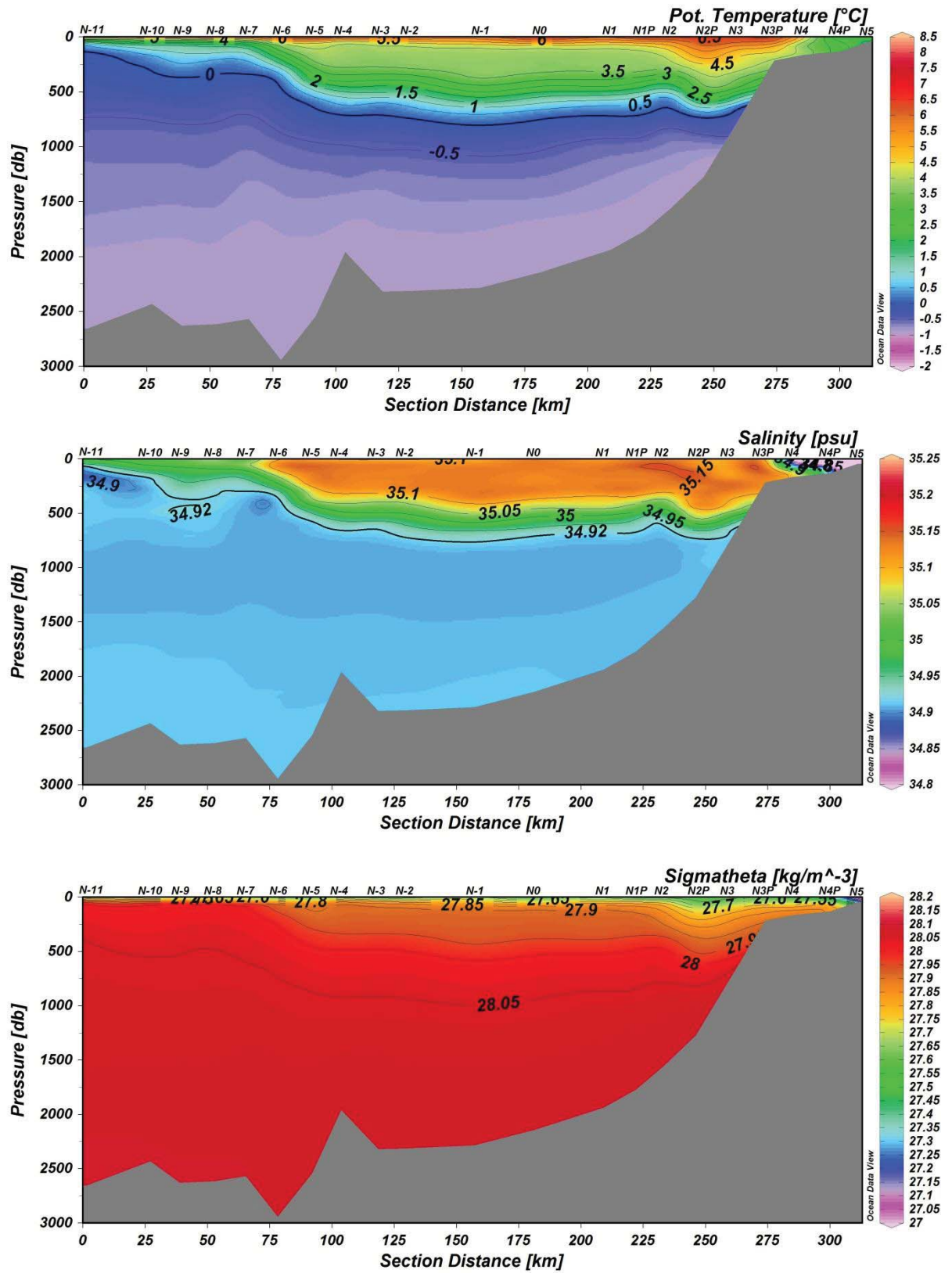


Figure 9. Temperature (θ), salinity and density (σ_θ) distribution along section N

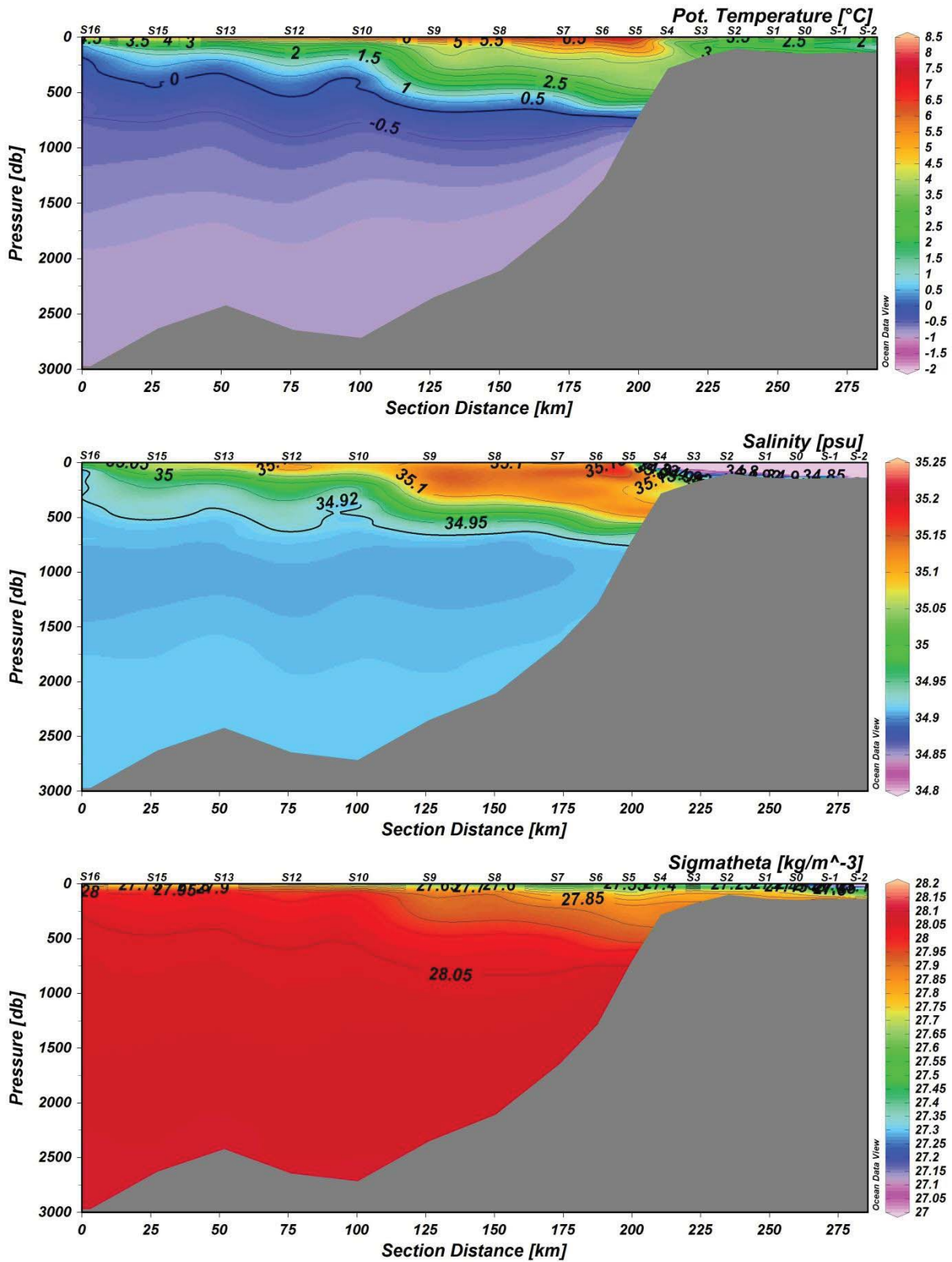


Figure 10. Temperature (θ), salinity and density (σ_θ) distribution along section S

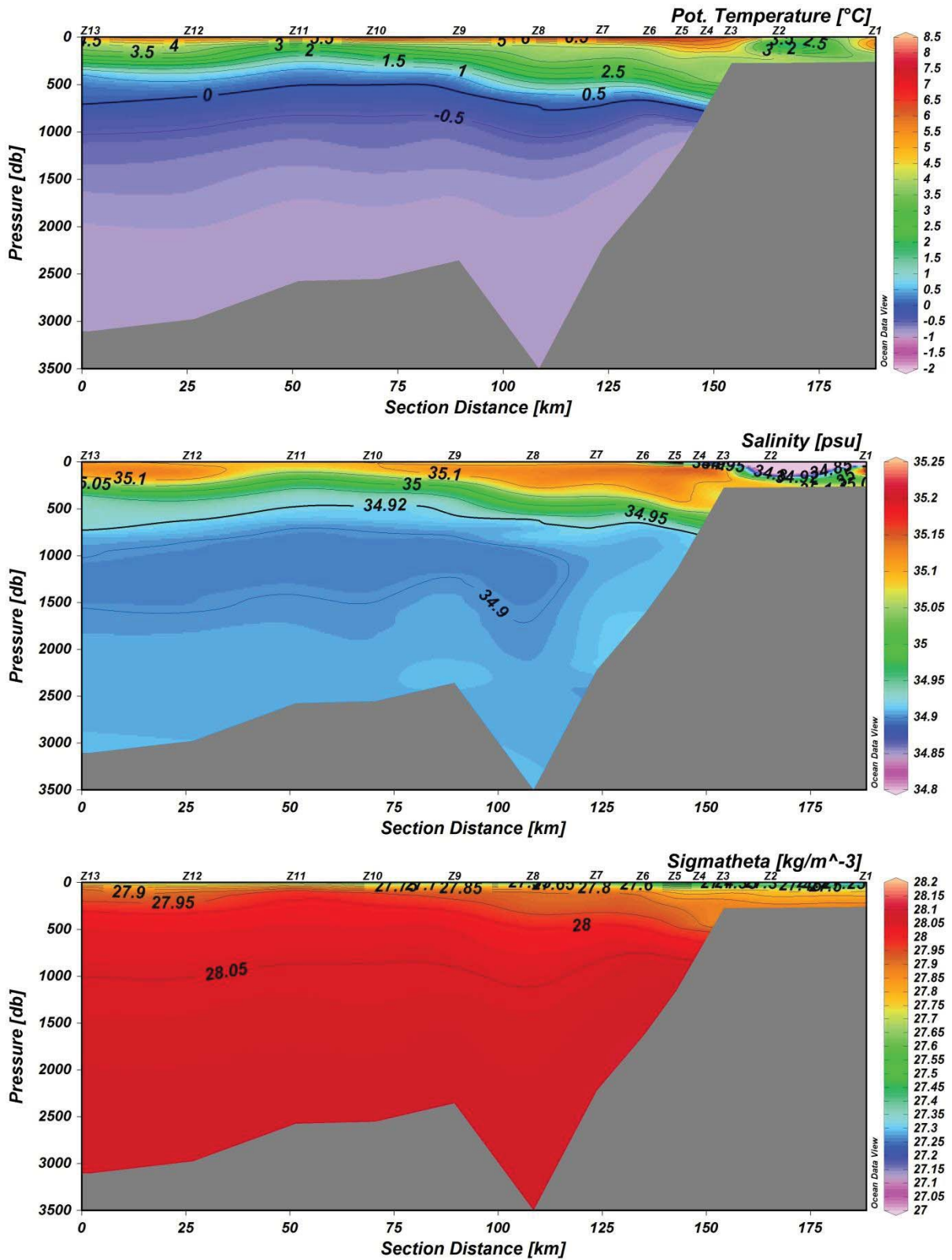


Figure 11. Temperature (θ), salinity and density (σ_θ) distribution along section Z

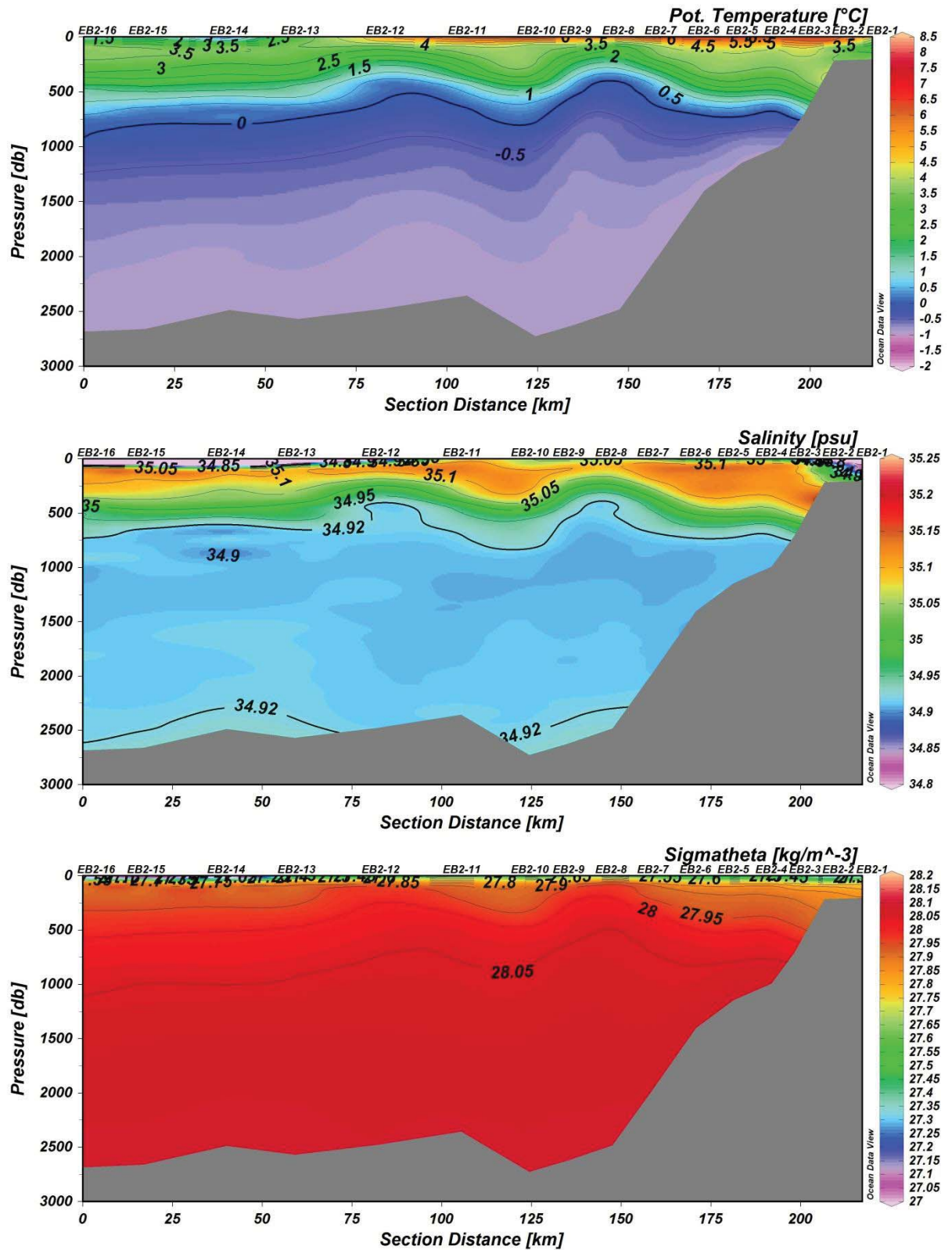


Figure 12. Temperature (θ), salinity and density (σ_θ) distribution along section EB2

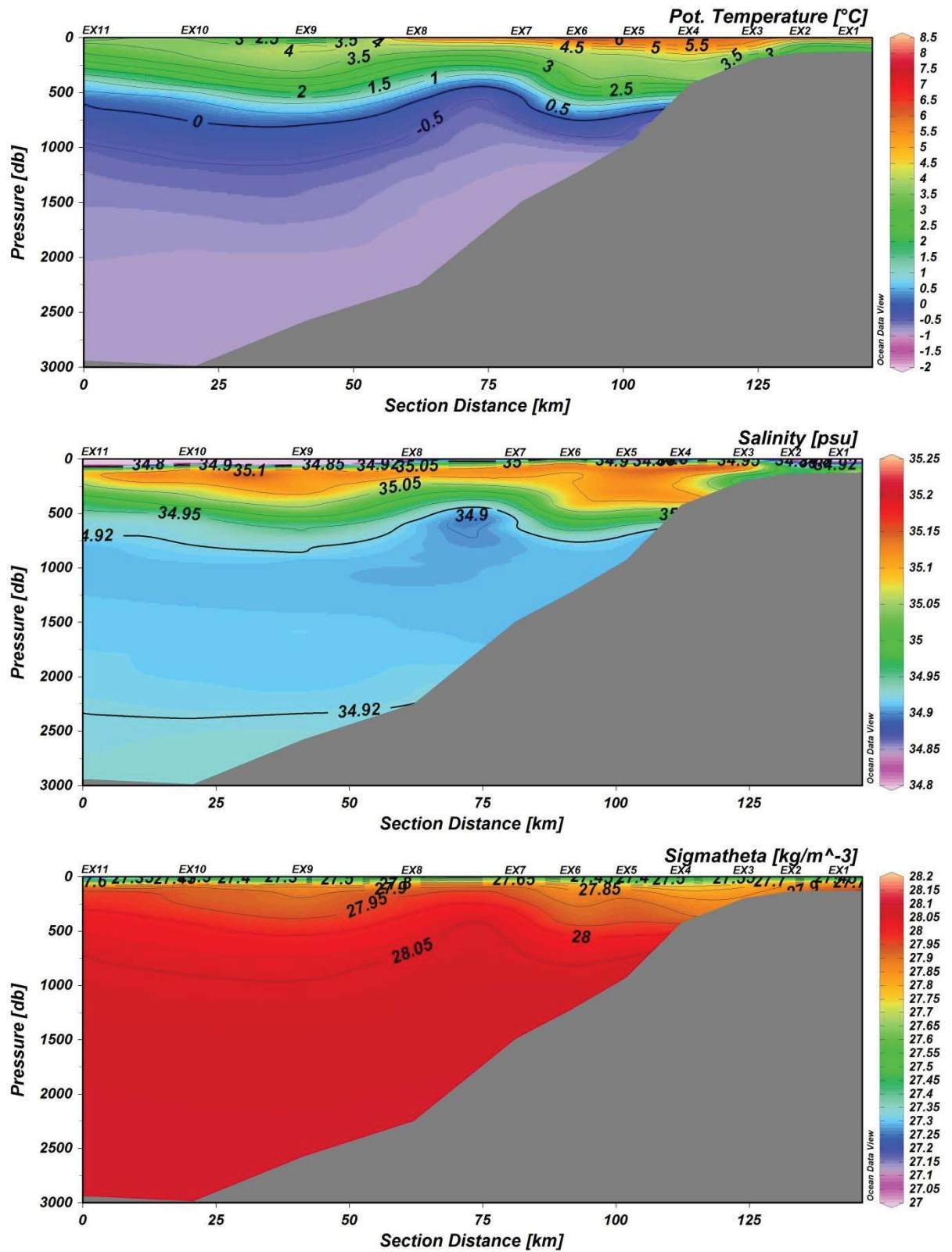


Figure 13. Temperature (θ), salinity and density (σ_{θ}) distribution along section EX

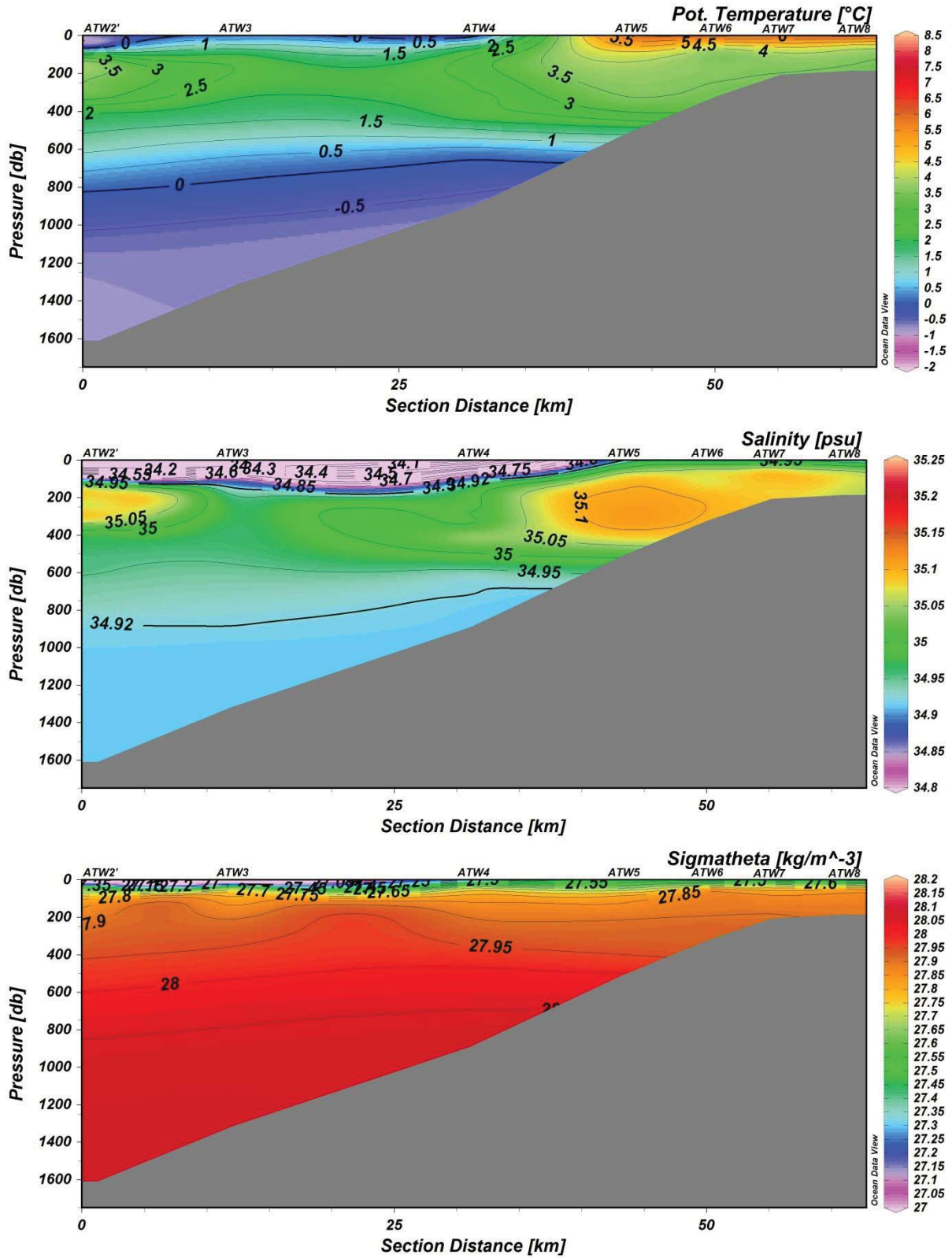


Figure 14. Temperature (θ), salinity and density (σ_θ) distribution along section ATW

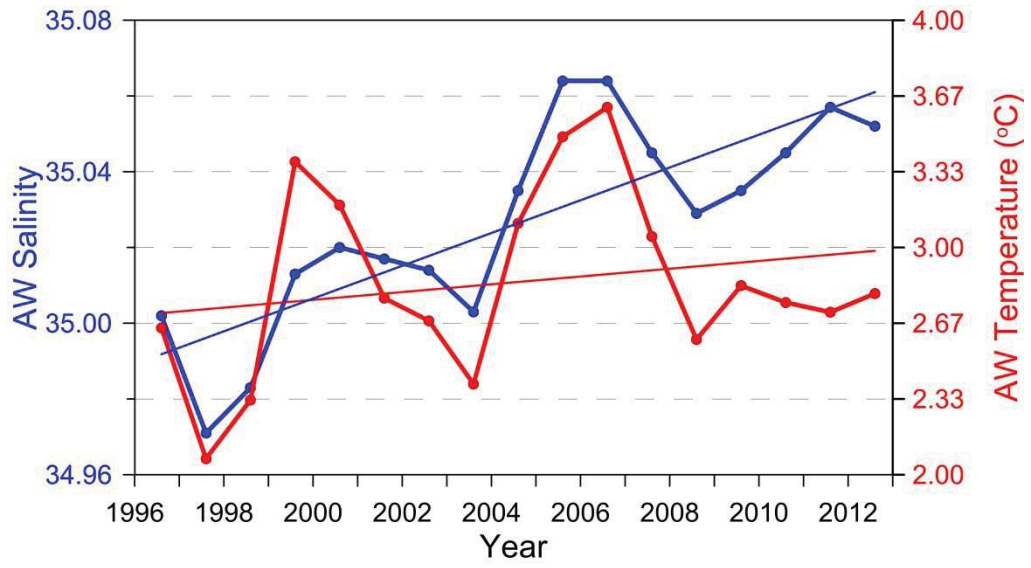


Figure 15. Changes of the mean Atlantic Water temperature and salinity calculated from the data collected at the IOPAN section N along the 76°30'N parallel in years 1996-2012.

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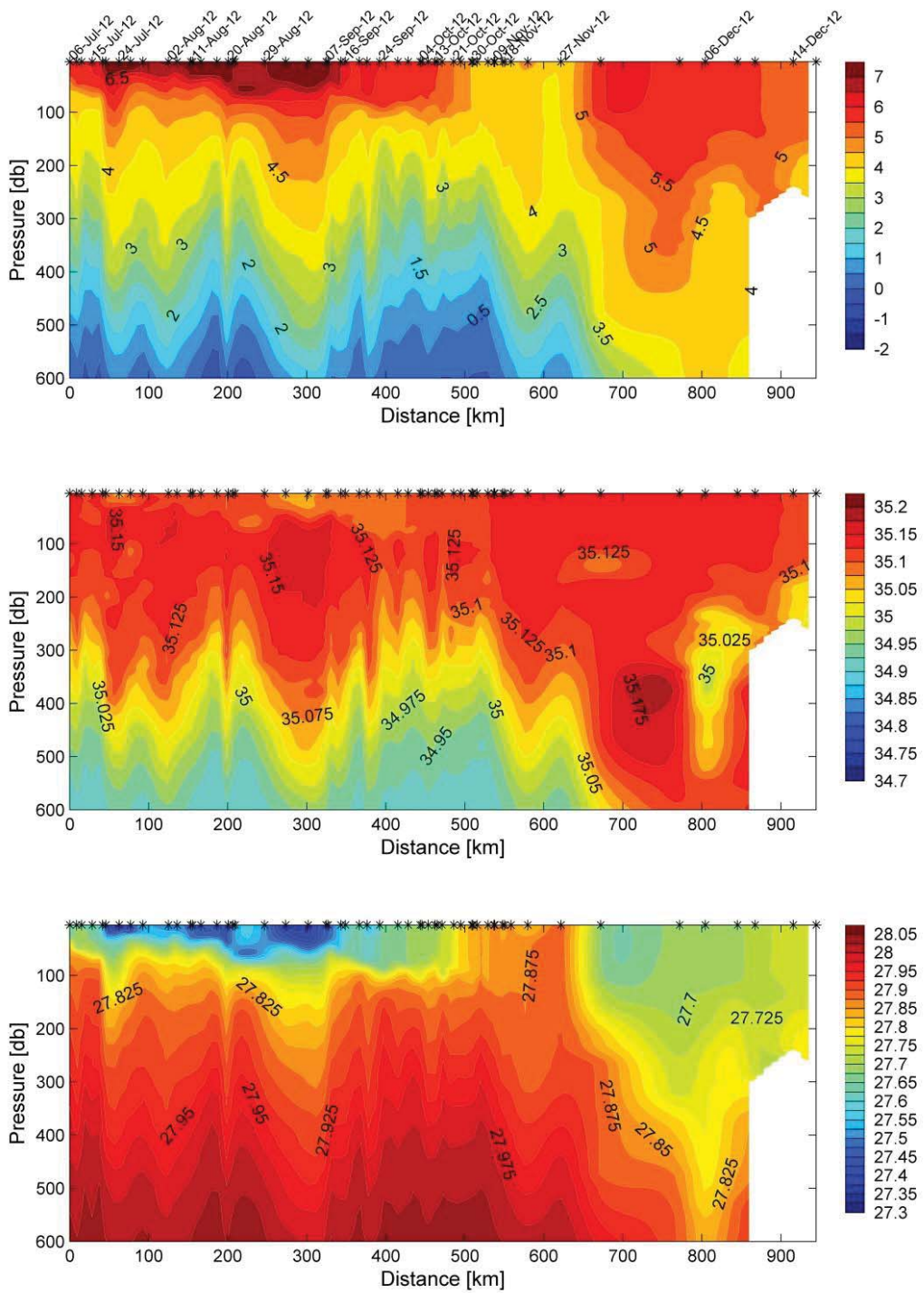


Figure 16. Temperature (θ), salinity and density (σ_θ) distribution in the upper layer of the Greenland Sea along the ARGO float track deployed in July 2012.