

5.3.4 Water temperature and hydrometeorological characteristics along the coasts of the New Siberian Islands

Sergey O. Razumov and Mikhail N. Grigoriev

During the expedition "Lena-New Siberian Islands 2002" measurements of water temperature on vertical profiles at 11 stations were conducted. At two sites serial measurements during 1 and 3 days were carried out.

The measurements in the eastern Laptev Sea (west of the Sannikov Strait) have revealed a rather warm water layer (0-0.3 °C) in a water depth of 18-22 m (Fig. 5.3.4-1, Table 5.3.4-1). Apparently this layer was formed as a result of advection of a warmed up (0.1-0.4 °C) salt water mass (30-31 ‰) from the Yana Bay.

East of the Sannikov Strait (near Novoya Sibir Island) the temperature in the water column (0-15 m depth) changed from 2.7-3 °C at the surface to 1.6 °C at the bottom.

The hydrothermal profile along the Sannikov Strait (Fig. 5.3.4-2) shows that according to water temperature distribution cold water (down to -1.1 °C) can be supplied to the Sannikov strait from the Laptev Sea, and warmer water from the East Siberian Sea. During our observations the water temperature varied from -1.1 to 1.8 °C near the bottom and from 1.3 to 3.7 °C near the surface.

The direction of the water currents in the strait mainly depends on the wind regime. During western winds and calm conditions the current is directed from the Laptev to the East Siberian Sea. In this case the near-bottom water temperature decreases down to -0.6 to -1.1 °C (Table 5.3.4-1 and 5.3.4-2; Fig. 5.3.4-3). Under the influence of strong eastern winds a reverse and relatively warm current comes through the strait from the East Siberian Sea. In that case the temperature of the near-bottom water raises up to 1.5 to 1.8 °C.

The temperature measurements along vertical seawater profiles show that sea bottom temperatures below zero are a quite common phenomenon even within the coastal zone. This fact is very important for understanding the development of the off-shore sub-sea permafrost along the shallow shelf. The vast distribution of near bottom low summer temperatures (below zero) indicates that sub-sea permafrost can be preserved in the shallow shelf for a long time.

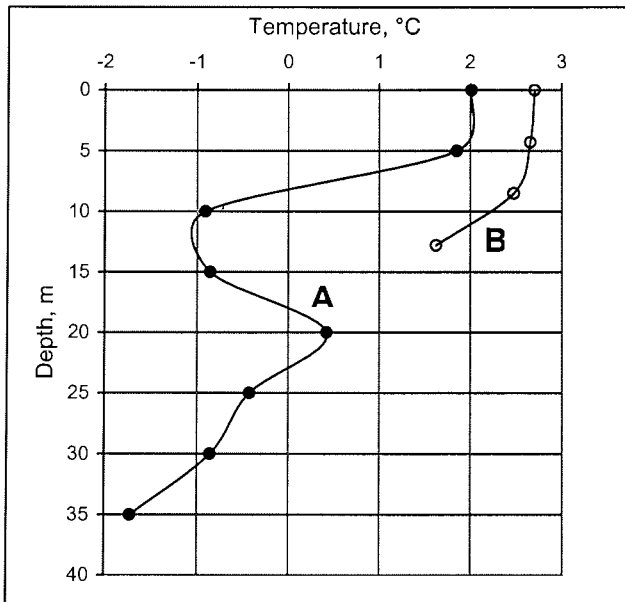


Figure 5.3.4-1. Water temperature profiles (A - station 2, north of Stolbovoy Island and B - station 7, south-west of Novoya Sibir Island).

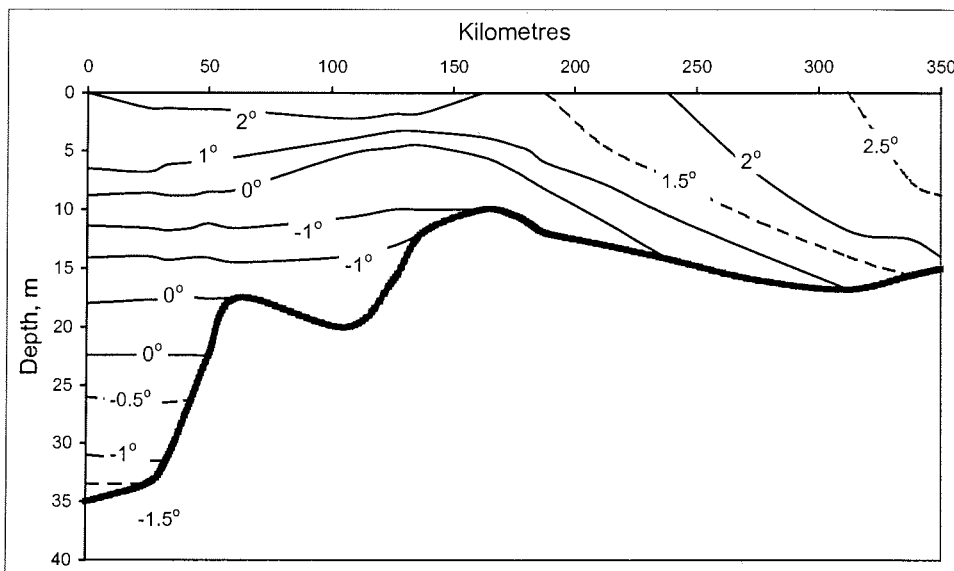


Figure 5.3.4-2. Hydrothermal profile along Sannikov Strait (from Stolbovoy Island to Novoya Sibir Island (August, 2002).

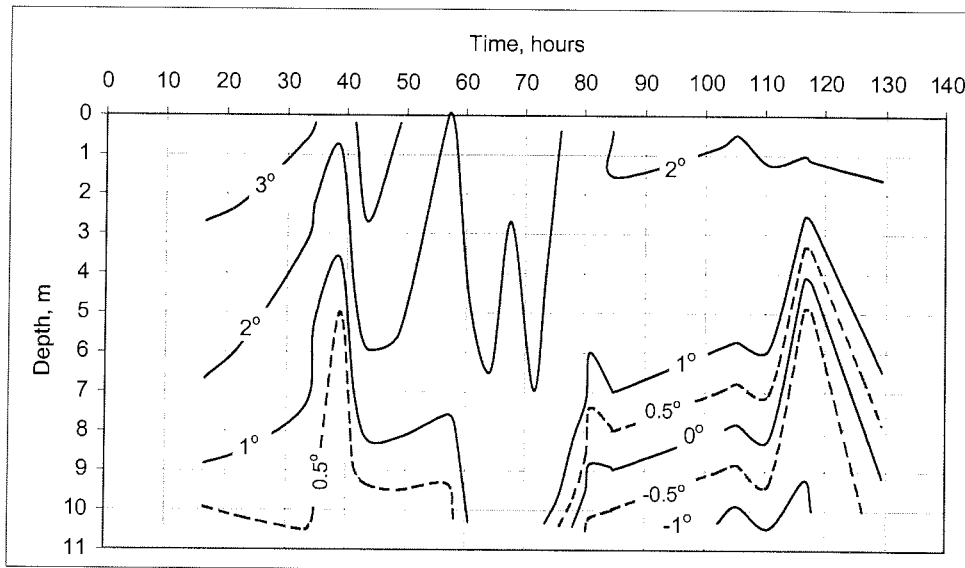


Figure 5.3.4-3. Variation of water temperature in the Sannikov strait (stations 8 and 9) from 22.08 to 27.08.02.

Table 5.3.4-1. Water temperature profiles along New Siberian Island coasts

№ St.	Date Time	Max. Depth, m	Horizon, m							
			0	5	9	15	20	25	30	35
1bk	15.08 00 ³⁰	9	11.00	10.50	8.80					
2s	16.08 01 ⁰⁰	35	0 2.01	5 1.85	10 -0.91	15 -0.86	20 0.42	25 -0.43	30 -0.86	35 -1.72
3b	17.08 09 ⁰⁰	-	0 -1.20							
4k	18.08 9 ³⁰	11	1 0.04	6 -0.15	11 -1.05					
5zb	19.08 09 ³⁰	10	0 6.35	5 5.12	10 5.36					
6ns	20.08 09 ⁰⁰	7	0 3.10	2 2.90	7 2.68					
7ns	21.08 09 ¹⁰	12.8	0 2.70	4.3 2.65	8.5 2.47	12.8 1.62				
8zb	22.08 16 ³⁰	10.2	0.2 3.27	5.2 2.68	10.2 0.38					
	23.08 09 ²⁰	10.2	0.2 3.15	5.2 1.22	10.2 0.70					
	23.08 14 ⁵⁰	10.3	0.3 2.18	5.3 0.40	10.3 0.05					
	23.08 19 ³⁰	10.2	0.2 3.71	5.2 2.32	10.2 0.14					
	24.08 09 ⁰⁰	10.2	0.2 1.95	5.2 1.68	10.2 0.25					
	24.08 16 ²⁰	10.5	0.5 2.49	5.5 2.06	10.5 1.75					
	24.08 19 ³⁰	10.3	0.3 2.11	5.3 1.88	10.3 1.52					
	24.08 23 ³⁰	10.3	0.3 2.60	5.3 2.27	10.3 1.45					
	25.08 09 ⁰⁰	10.5	0.5 1.33	5.5 1.18	10.5 -0.59					
	25.08 13 ⁰⁰	10.4	0.4 2.06	5.4 1.80	10.5 -0.72					
9k	26.08 09 ²⁰	10	0 2.07	5 1.35	10 -1.05					
	26.08 14 ⁴⁰	10	0 2.20	5 1.40	10 -0.80					
	26.08 20 ³⁰	10	0 2.65	5 -0.55	10 -1.08					
	27.08 09 ²⁰	10	0 2.22	5 1.54	10 -0.31					
10 ml	28.08 09 ⁰⁰	9.5	0 2.67							
11d I	29.08 23 ³⁰	12.5	0 4.50	2.5 4.57	7.5 4.30	12.5 4.29				

Indexes: **bk** – Buor-Khaya Peninsula, **s** – Stolbovoy Island, **b** – Belkovsky Island, **k** – Kotelnoy Island, **zb** – Zemiya Bunge, **ns** – Novaya Sibir Island, **ml** – Maly Lyakhovskiy Island, **dl** – Dmitry Laptev Strait.

Table 5.3.4-2. Hydrological-meteorological characteristics along New Siberian Island coasts (bottom water temperature – Tb, air temperature – Ta).

№ St.	Date Time	Lat N	Long E	Wind direction	Wind velocity, m/s	Wave height, m	Wave length, m	Ta, °C	Depth, m	Tb, °C
1bk	15.08 00 ³⁰	71 58.080	133 06.154	WSW	3-6	0.5	10	6.40	9	8.80
2s	16.08 01 ⁰⁰	74 13.468	135 21.778	SE	3-5	0.4	9	3.82	35	-1.72
3b	17.08 09 ⁰⁰	75 21.660	135 49.845	SEE	1-2	0.2	1	2.70	-	-
4k	18.08 09 ³⁰	74 41.993	138 21.780		0	Swell	swell	4.18	11	-1.05
5zb	19.08 09 ³⁰	74 51.903	142 00.243	NE	4-6	0.3	6	6.55	10	5.36
6ns	20.08 09 ⁰⁰	74 59.823	146 56.852	E	2-3	swell 0.4	swell 10	3.85	7	2.68
7ns	21.08 09 ¹⁰	75 05.862	146 25.455	SW	5-7	0.4	5	1.05	12.8	1.62
8zb	22.08 16 ³⁰	74 49.690	140 30.405	WSW	1-3	0.2	2	4.60	10.2	0.38
	23.08 09 ²⁰	- " -	- " -	WSW	5-7	0.8	9	6.55	10.2	0.70
	23.08 14 ⁵⁰	- " -	- " -	WSW	3-5	1.0	15	6.65	10.3	0.05
	23.08 19 ³⁰	- " -	- " -	WSW	0-1	swell 0.3	swell 15	6.12	10.2	0.14
	24.08 09 ⁰⁰	- " -	- " -	E	8-10	0.8	10	4.52	10.2	0.25
	24.08 16 ²⁰	- " -	- " -	E	7-10	0.7	7	4.33	10.5	1.75
	24.08 19 ³⁰	- " -	- " -	E	7-10	0.7	8	3.30	10.3	1.52
	24.08 23 ³⁰	- " -	- " -	E	7-9	0.7	7	3.60	10.3	1.45
	25.08 09 ⁰⁰	- " -	- " -	SE	5-7	0.6	6	3.70	10.5	-0.59
	25.08 13 ⁰⁰	- " -	- " -	SSE	4-6	0.4	5	6.49	10.4	-0.72
9k	26.08 09 ²⁰	74 38.363	139 20.806	SW	5-7	0.8	10	8.25	10	-1.05
	26.08 14 ⁴⁰	- " -	- " -	SSW	5-8	1.0	12	7.40	10	-0.80
	26.08 20 ³⁰	- " -	- " -	SW	3-5	swell 1.3	swell 18-20	6.07	10	-1.08
	27.08 09 ²⁰	- " -	- " -	SE	2-5	0.4	5	9.79	10	-0.31
10 ml	28.08 09 ⁰⁰	74 15.500	140 08.833	SE	8-12	1.3	15	5.48	9.5	-
11d I	29.08 23 ³⁰	72 48.653	142 23.202	SW	4-5	0.5	6	5.27	12.5	4.29