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Water temperature in the Newfoundland and Labrador areas in 1977-1978

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The temperature of the Labrador Current on standard oceanological sections in the Newfoundland and Labrador areas in winter 1977-1978, in spring, summer and autumn 1978 was compared with the long-term mean. Positive anomalies from 0.1 to 1.9 were observed everywhere except the North-eastern slope of the Grand Newfoundland Bank. Maximal positive anomalies were in the core of the current in the 50-100 and 50-200m layers, minimal - in the 200-500m layers.

By the end of 1978 the water temperature decreased and in November the anomalies accounted for 0.04-0.31°.

Introduction

The heat content of water masses in the Newfoundland and Labrador areas was traced from November 1977 till November 1978 as before (Elizarov, 1962; Burmakin, 1972) according to the average water temperature of different layers and branches of the Labrador Current on standard oceanological sections (Fig 1).

Observations made during the 16th (November 1977-January 1978) and 17th (May-July 1978) cruises of RV "Protsion" and 21st (November-December 1978) cruise of FRV "Perseus" are used in the paper. In all 686 hydrological stations including observations on standard depths up to 2000m were analysed.

Methods

The weighted mean water temperature was calculated for the layers 0-50, 50-200, 0-200, 200-500 and 0-500m by separate parts of the sections (Fig 1).

Temperature anomalies on the date of observations are taken for the layers 0-200 and 200-500m from the diagrams of the normal (average) annual variation plotted earlier (Burmakin, 1972, 1976). The average temperature of layers was presented for some sections by definite dates (Burmakin, 1969) and anomalies were calculated on the basis of the average norm.

Results of observations

In 1978 an extremel rise of water masses temperature ^{occurred,} in the Newfoundland and Labrador areas which coincided with found previously quasi-four-year cyclic recurrence in the variation of temperature in the 0-200m layer (Burmakin, 1972).

In November and December 1977 and in January and May to July 1978 the temperature of the 0-200m layer increased by 0.10-1.90° in the north as compared with the long-term mean (sections 8-A, NW and SE - sides of the triangle) and by 1.26-1.60° in the south of the Grand Newfoundland Bank (Table 1). In the area of the North-eastern slope of the Grand Newfoundland Bank (sections SW of the triangle, 7-A and 6-A) the negative anomalies (up to -0.90°) were also observed together with the positive ones. We think that moderation and flow of the main branch of the Labrador Current eastward caused by the accumulation of the Gulf Stream waters from the south took place there.

As the analysis of facsimile maps of the ground-level pressure and temperature of ^{the} sea surface showed the cyclonic type of weather prevailed in May-July. Cyclones moved from the west to the east and the north-east causing strong winds of southern directions (Fig.2). These winds favoured the accumulation of warm Atlantic waters and meanders of the Gulf Stream on the Grand Bank and, as a consequence, caused the weakening of the intensity of the cold Labrador Current, flowing from the north to the south and spreading of its waters eastward on the North-Eastern slope of the Grand Bank.

In contrast to the temperature anomalies in the 0-200m layer the anomalies in the 200-500m layer were more frequently with an opposite sign in November and December 1977 and in January and May to July 1978 though sometimes they coincided (Table 2). Negative anomalies

es in the 200-500m layer prevailed along the eastern slope of the Grand Bank (from the section SE of the triangle to the section 4-A), positive - further to the north (NW of the triangle) and further to the south (sections 3-A and 2-A).

Temperature variations in 1978 compared with 1977 (May-June and November) are shown in Tables 3 and 4.

In May-June 1978 the temperature in all layers of the Labrador Current along the eastern slope of the Grand Bank increased considerably compared with the last year (at most in the 50-200m layer - by 1-2°). A very low temperature on the western slope of the Flemish Cap Bank (layer 0-50m, region H₂ of the section 6-A) is explained by the existing there circulations and wedging out of cold Labrador waters towards the surface. Perhaps this is a short-term phenomenon and it does not demonstrate the warming up throughout the whole Labrador and Newfoundland areas in summer 1978.

In November 1978 the temperature in the 0-200 and 200-500m layers accounted for 0.04 and 0.31° whereas in July it amounted to 1.90 and 1.34° (Tables 1 and 2). Thus there occurred the decrease in the 0-200m layer and by in the 200-500m layer which corresponded to the cyclic recurrence of temperature variations traced since 1936 (Burmakin, 1972). In 1979 the water temperature of the Labrador Current should be close to the long-term mean.

The greatest fall of temperature in November 1978 compared with 1977 was observed in the core of a cold component (AB) of the Labrador Current (layer 50-200m) and its warm eastern component (C) (Table 4).

Thus both the rise of temperature at the beginning of the year in spring and summer and its fall at the end of the year took place for the most part in the core of the Labrador Current (layer 50-200m).

Conclusions

Before winter, in winter, spring and in summer 1978 the extremely high positive anomalies of the Labrador Current water temperature, almost the same as in very warm 1966, were observed in the

Newfoundland and Labrador areas. The area of the North-eastern slope of the Grand Newfoundland Bank where there occurred the moderation and flow of the Labrador Current surface layer eastward resulting in negative anomalies there was an exception.

Maximal positive anomalies were recorded in the core of the Labrador Current in the 50-100 and 50-200m layers. By the end of the year positive anomalies decreased and in November the water temperature was at the level of the moderately warm years.

REFERENCES

- BURMAKIN V.V. 1969. Hydrographic conditions in the Labrador and Newfoundland areas, 1968. Int. Comm. Northw. Atlant. Fish. Redbook, 1969, Part III : 66-70.
- BURMAKIN V.V. 1972. Seasonal and year-to-year variations in water temperatures in the Labrador and Newfoundland areas. Spec. Publ. Int. Comm. Northw. Atlant. Fish., 8 : 63-70.
- BURMAKIN V.V. 1976. Water temperatures in the Labrador and Newfoundland areas in 1975. Annu. Meet. Int. Comm. Northw. Atlant. Fish. Res. Doc. 76/VI/72, Serial No. 3876 (mimeographed).
- ELIZAROV A.A. 1962. On the inter-annual fluctuations of intensity in the Labrador and West Greenland currents and on possibility of temperature prognosis in the commercial areas of the Northwestern section of the Atlantic Ocean. Okeanologiya, vol.2, No.5: 796-809.

TABLE 1. Temperature anomalies of 0-200m layer in the end of 1977 and in 1978.

Sections and dates	1977		1978				
	November	December	January	May	June	July	November
8-A (B) November 1 1977 July 8, November 7	1.63	-	-	-	-	1.90	0.04
Triangle (NW) November 26 1977, June 7, July 4	0.65	-	-	-	0.10	0.90	-
Triangle (SW) November 28 1977, June 9, July 3	-0.11	-	-	-	0.10	0.30	-
Triangle (SE) November 29 1977, June 9, July 3	0.39	-	-	-	0.40	0.70	-
7-A December 2 1977, June 3 and 30	-	0.08	-	-	-0.10 -0.80	-	-
6-A (G) December 5 1977, January 12, May 22 June 25, July 25	-	0.18	-0.90	-0.60	-0.80	-0.20	-
4-A December 12 1977, May 12 June 23	-	-0.80	-	0.70	0.20	-	-
3-A December 29 1977, May 10, June 17	-	0.00	-	0.10	1.00	-	-
2-A December 31 1977, July 30	-	1.60	-	-	-	1.26	-

TABLE 2. Temperature anomalies of the layer 200-500m in the end of 1977 and in 1978.

Sections and dates	1977		1978				
	November	December	January	May	June	July	November
8-A (B) November 1 1977, July 8, November 7	1.25	-	-	-	-	4.34	0.31
Triangle (NW) November 25 1977, June 7, July 4	0.65	-	-	-	0.32	0.40	-
Triangle (SE) November 29 1977, June 9, July 3	-0.08	-	-	-	0.53	-0.20	-
7-A December 2 1977, June 3 and 30	-	0.30	-	-	0.00 0.08	-	-
6-A (G) December 5 1977 January 12, May 22 June 25 July 25	-	0.00	-0.30	-0.40	0.02	0.42	-
4-A December 12 1977, January 19, May 12, June 23	-	0.04	-0.45	0.20	-0.6	-	-
3-A December 29 1977, May 10, June 17	-	1.80	-	-0.09	1.45	-	-
2-A December 31 1977 July 30	-	0.40	-	-	-	0.55	-

TABLE 3. Differences of water temperature in 1978 compared with 1977 on standard sections in the Labrador and Newfoundland area in May - June 1978.

Standard sections	Date	$\Delta t(1978 - 1977)$ for the layers, m			
		0-50	50-200	0-200	200-500
7-A	June 3	1.37	0.51	0.69	-0.01
6-A (H ₂)	June 26	-3.02	0.34	-0.51	0.27
6-A (G)	June 25	1.80	0.91	0.99	-0.20
6-A (H ₁)	May 21	-0.12	0.70	-0.03	-
6-A (H ₁)	June 25	0.95	0.18	0.57	-
4-A	May 12	0.67	2.00	1.44	0.91
3-A	May 10	0.52	1.00	0.64	0.37

TABLE 4. Average water temperature (its anomaly) and the difference of water temperature in 1978 compared with 1977 on the section 8-A according to the data presented by November 1.

Regions of the section 8-A	: t ^w °C and its anomalies of the 0-200 m layer	$\Delta t(1978-1977)$ for the layers, m			
		0-50	50-200	0-200	200-500
A	0.50 (-0.02)	-0.72	-1.52	-1.30	-
B	1.35 (+0.13)	-1.02	-1.62	-1.50	-0.70
C	3.30 (-0.40)	-1.37	-0.77	-0.91	-0.76
ABC	1.49 (+0.09)	-1.05	-1.48	-1.38	-

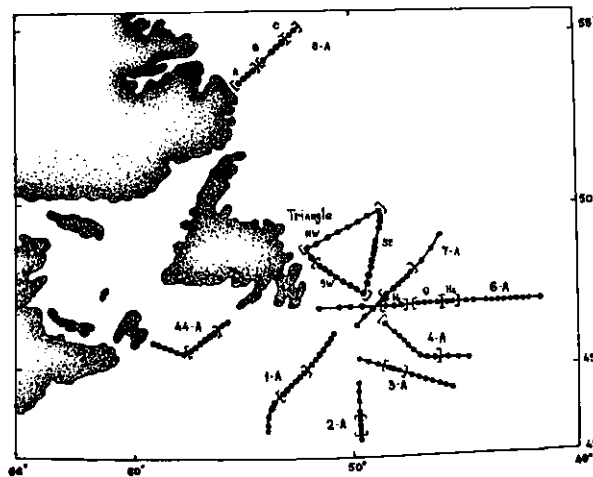


Fig. 1. Position of standard oceanological sections.

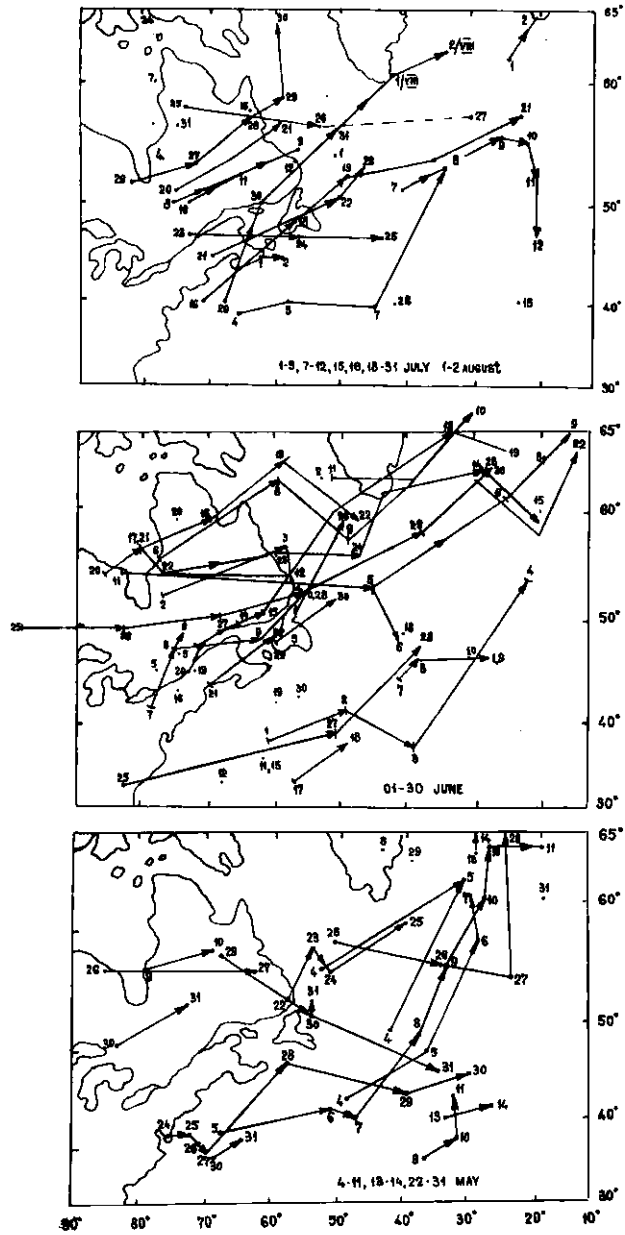


Fig. 2. Movement of cyclon centers, May-August 1978.

