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VERTICAL DISTRIBUTIONS OF TEMPERATURE, SALINITY AND GEOSTROPHIC FLOW ALONG 60°W IN THE SOUTHERN OCEAN IN JANUARY 1988 (EXTENDED ABSTRACT)

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The purpose of this study is to indicate the vertical distributions of temperature, salinity, density and geostrophic flow along the 60°W section in the Scotia Sea. We have been analyzing oceanic structures along the meridional sections in the Southern Ocean (12.5°E/37°E/75°E/114°E/155°E/175°E/170°W/120°W/90°W/45°W/30°W/60°W). This study is one of the above meridian series.

The fifth Antarctic Ocean survey cruise by the R/V KAIYO MARU of the Japanese Fisheries Agency was conducted in the waters between Drake Passage and the Scotia Sea in the Southern Ocean during the 1987/88 austral summer. A series

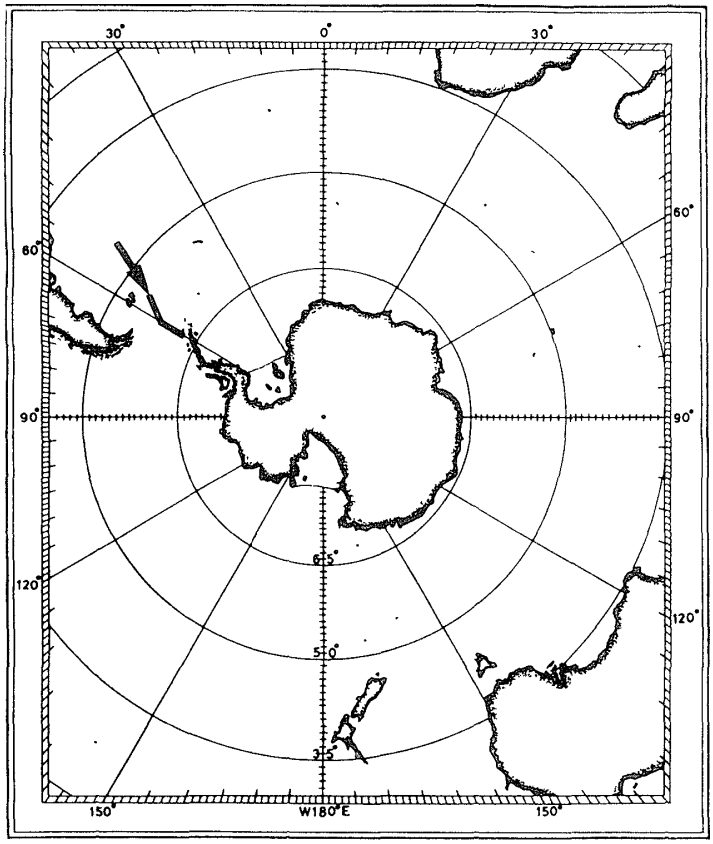

Fig. 1. Oceanographic section along 60°W between 55°S and 62°S in the Scotia Sea of the Southern Ocean surveyed by the R/V KAIYO MARU.

of oceanographic observations was carried out along approximately 60°W from January 13 to 16, 1988 (Fig. 1). From these observations, vertical distributions of temperature, salinity, density and geostrophic flow along the 60°W section from the surface to near the sea bottom, and from 55°S to 62°S near the South Shetland Islands, were obtained.

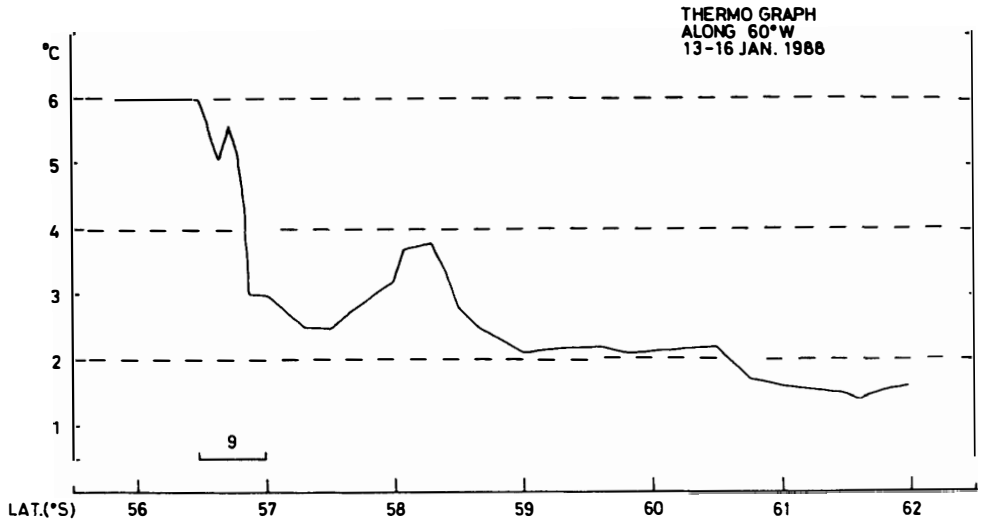

Fig. 2. Continuous record of the surface water temperature (°C) by thermograph along 60°W.

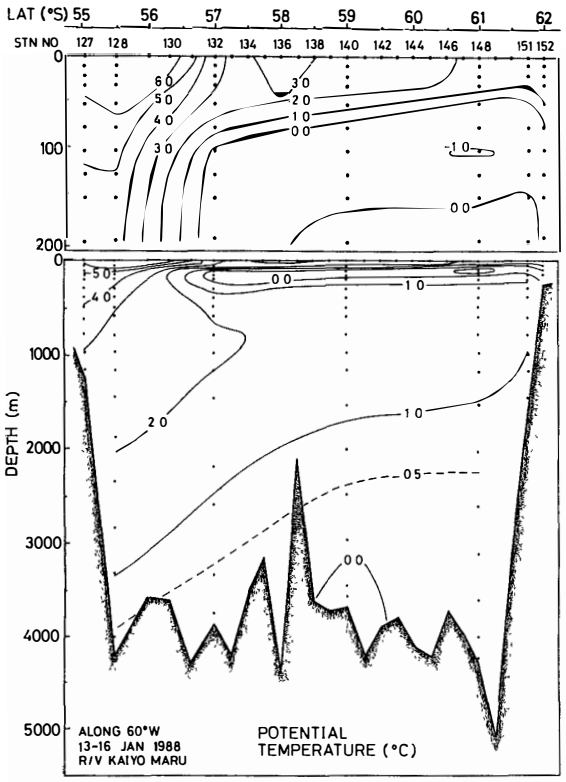

Fig. 3. Vertical distribution of potential temperature (°C) along 60°W.

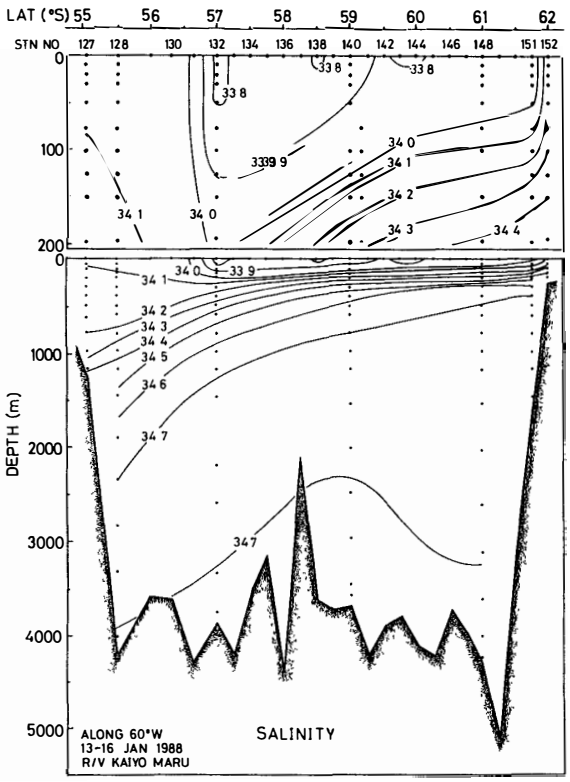

Fig. 4. Vertical distribution of salinity (psu) along 60°W.

The Polar Front recognized by a significant difference in temperature was located around 56°40′S (Figs. 2 and 3). The Antarctic Surface Water, defined as water of temperature 0°C or less, was distributed from 57°S to the southernmost station, 61°45′S (Fig. 3). The minimum temperature layer was distributed between −1.20°C (corresponding to $\Delta(S,t)$: 67 in Fig. 5) at 75 m on 61°45′S and −0.81°C (corresponding to $\Delta(S,t)$: 74 in Fig. 5) at 200 m on 56°59′S. The maximum temperature layer of the upper Warm Deep Water ranged between 2.10°C (corresponding to $\Delta(S,t)$: 41 in Fig. 5) at 1000 m 56°59′S and 1.67°C (corresponding to

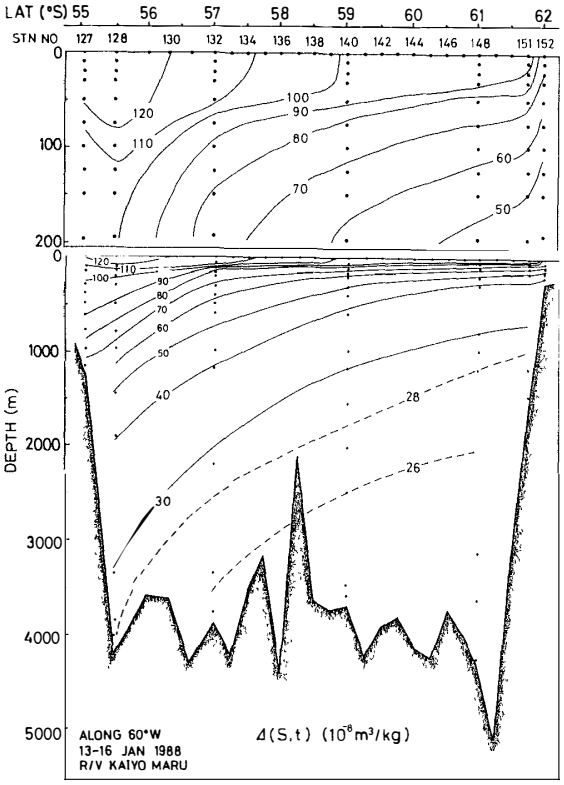

Fig. 5. Vertical distribution of thermosteric anomaly ($\Delta(S,t)$) along 60°W.

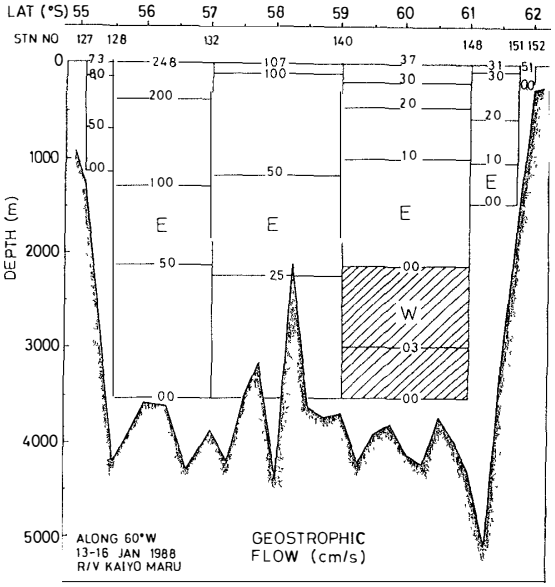

Fig. 6. Vertical distribution of geostrophic flow (cm/s) along 60°W. Open and shaded areas show eastward and westward flow, respectively.

Table 1. Geostrophic volume transport through 60°W (10^6 m^3/s).

Depth	Station							
	127	128	132	140	148	151	152	Total
0-200 m	0.90	9.66	4.61	2.14	0.48	0.11		17.90
0-1 km	3.54	38.22	18 11	4 65	1.73	0.11		66.36
1-2	0.06	17.71	9 57	1.11	0.21			28.66
2-3		7.25	4 58	−0.37				11.46
3-4		0.97	0.63	−0.21				1.39
Total	3.60	64.15	32.89	5.18	1.94	0.11		107.87

Δ(S, t): 33 in Fig. 5) at 400 m on 61°45′S. The maximum salinity layer of the lower Warm Deep Water ranged between 34.717 psu (corresponding to Δ(S, t): 31 in Fig. 5) at 3000 m on 55°32′S and 34.716 psu (corresponding to Δ(S, t): 31 in Fig. 5) at 600 m on 61°45′S (Figs. 4 and 5).

The geostrophic flow across the 60°W section was eastward through the whole section except the weak westward flow through the section between 2000 m and 3500 m, 59°S and 61°S (Fig. 6). The maximum speed of the geostrophic flow was 24.8 cm/s at the region between 55°30′S and 57°S corresponding to the Polar Front zone. The total geostrophic volume transport through the 60°W section between 55°S and 62°S was 107.87×10^6 m^3/s at the eastward flow (Table 1).

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