Preliminary Report

of

The Hakuhō Maru Cruise KH-77-2

July 5 —Aug. 17, 1977

The Seas around Kuroshio Area

Ocean Research Institute
University of Tokyo
1987

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by

The Scientific Members of the Expedition

Edited by

Toshiyuki HIRANO

Preface

This volume contains the oceanographic data obtained during the KH-77-2 cruise of the R/V Hakuho Maru from 5 July to 17 August 1977. Brief summaries of the research conducted by the scientists aboard are also included.

The Kuroshio Current is considered to have a function to transport and to distribute fish eggs and larvae from a spawning ground to their nursery ground, and the fluctuation of the currents seems to cause remarkable influence on abundance of recruitment and larval mortality. This cruise therefore aimed to make clear the processes of recruitment of fish larvae and juveniles in connection with oceanographic structure of the Kuroshio region.

On behalf of the scientists aboard, I wish to express my sincere gratitude to Captain Ichiro Tadama, the other officers and the crew members of the Hakuho Maru for their cooperation and skillful assistance throughout the cruise.

Toshiyuki Hirano
Chief Scientist

Contents

Outline of the cruise

Under the overall title of " Studies on the production of living resources and their environment in the Kuroshio region", the following research items were investigated: (1) Studies on sistematics, comunity structure and production of plankton, micronecton and bacteria, (2) Studies on the physical and chemical properties of the Kuroshio, (3) Studies of the biochemical activities and metabolism, (4) Studies on the movement of surface water masses marked by radar-transponder buoys, (5) Measurements of deep water currents in the sea around the Izu Ridge, (6) Studies on the transport of substances between atmosphere and sea water, (7) Observation of gravity anomaly, (8) Observation of thunder storms at sea.

The cruise consisted of two legs as shown in Table 1. On the first leg from Tokyo to Pusan, several detailed cross-sections of the Kuroshio have been made to measure physical and biological properties distributions. The second leg from Pusan to Tokyo was devoted to observations of time changes of physical and biological properties in a drifting water mass marked by radar-transponder buoys. The location of observation lines and stations are given in Fig. 1.

The names of the scientists who participated in the cruise are listed in Table 2, and the observations at each station are summarized in Table 3.

Table 1. Cruise itinerary

	Arrival	Departure
Tokyo	--	July 5, 1977
Pusan	July 25, 1977	Aug. 1, 1977
Tokyo	Aug. 17, 1977	--

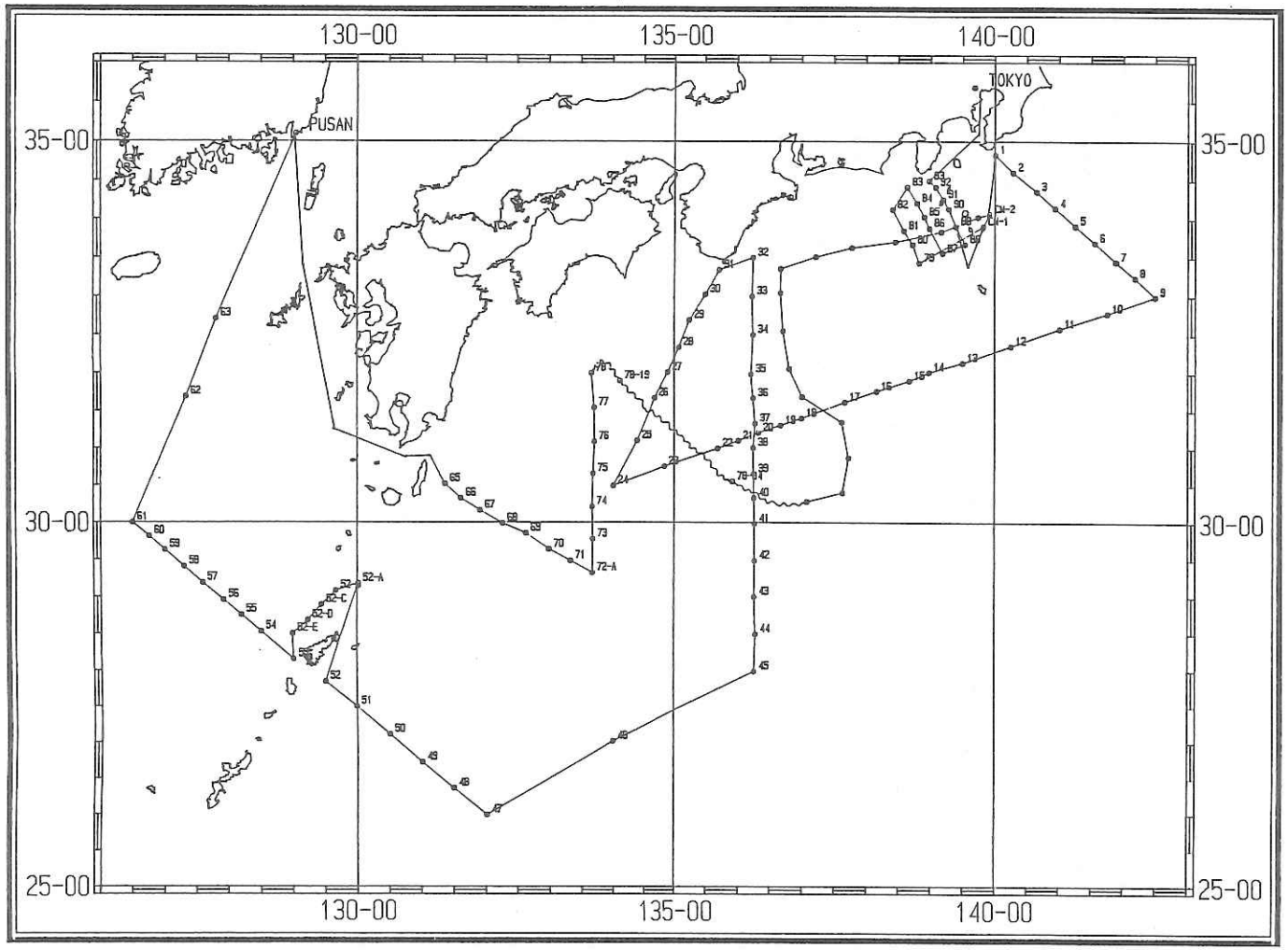

Fig. 1 Track chart of the KH-77-2 cruise of the Hakuho Maru.

Table 2. Scientists aboard

Toshiyuki HIRANO Chief Scientist	Ocean Res. Inst., Univ. of Tokyo
Yoshihiko FUJITA	Ocean Res. Inst., Univ. of Tokyo
Toshisuke NAKAI	Ocean Res. Inst., Univ. of Tokyo
Keiichi HASUNUMA	Ocean Res. Inst., Univ. of Tokyo
Kouichi KAWAGUCHI	Ocean Res. Inst., Univ. of Tokyo
Hideaki NAKATA	Ocean Res. Inst., Univ. of Tokyo
Hiroshi HASUMOTO	Ocean Res. Inst., Univ. of Tokyo
Akinori UCHIYAMA	Ocean Res. Inst., Univ. of Tokyo
Tadashi INAGAKI	Ocean Res. Inst., Univ. of Tokyo
Hideo NAGAE	Ocean Res. Inst., Univ. of Tokyo
Kimiko YAMAURA	Ocean Res. Inst., Univ. of Tokyo
Toshiro SAINO	Ocean Res. Inst., Univ. of Tokyo
Kazuhiro KOGURE	Ocean Res. Inst., Univ. of Tokyo
Yutaka MATSUO	Ocean Res. Inst., Univ. of Tokyo
Kyu-dae CHO	Ocean Res. Inst., Univ. of Tokyo
Wataru SAKAMOTO	Fac. of Agriculture, Kyoto Univ.
Kei TAKIZAWA	Fac. of Agriculture, Kyoto Univ.
Sooji SHIMURA	Inst, of Biol. Sci., Univ. of Tsukuba
Katsumi MATSUSHITA	Fac. of Agriculture, Univ. of Tokyo
Shinya MINATO	Fac. of Science, Univ. of Tokyo
Hideo MIURA	Fac. of Science, Univ. of Tokyo
Haroud SOLOMON	Fac. of Science, Univ. of Tokyo
Kazuyuki OTSUKA	Tokyo Univ. of Fisheries
Masanami IZUMI	Tokyo Univ. of Fisheries
Shigemi SUZUKI	Tokyo Univ. of Fisheries
Denzou INAGAKE	Tokyo Univ. of Fisheries
Yukuya YAMAGUCHI	Tokyo Univ. of Fisheries
Jung-shin CHOE	Tokyo Univ. of Fisheries
Minoru FUJIMOTO	Tokai Reg. Fish. Res. Lab.
Toshio TAKEUCHI	Res. Inst. of Atmospherics, Nagoya Univ.
Tsunemi KUBODERA	Fac. of Fisheries, Univ. of Hokkaido
Noriyuki TANAKA	Fac. of Fisheries, Univ. of Hokkaido
Seiichi SAITO	Fac. of Fisheries, Univ. of Hokkaido
Sun-duck CHANG	Fisheries Univ. of Busan
Jong-man KIM	Korean Ocean Res. Develop. Inst.

Table 3 Items of observation at each station

CTD Stn.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
RMS																						
Van Dorn	o	o	o	o	o		o		o							o						
Nansen -1	o		o						o													
Nansen -2		o							o							o				o		
Norpac twin	o	o	o	o	o				o							o					o	
MTD	o		o	o	o		o		o													
IKMT s						o							o									
IKMT d	o								o									o				
ORI surf	o		o			o			o				o					o				
Neuston					o				o							o					o	
Pl-Rec.			o				o		o													

CTD Stn.	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
RMS													o									
Van Dorn												o			o		o	o	o	o		o
Nansen -1												o		o				o				o
Nansen -2		o						o					o									
Norpac twin			o		o							o			o		o	o	o	o		o
MTD																						
IKMT s	o										o											
IKMT d	o																					o
ORI surf	o								o		o											o
Neuston			o		o					o												
Pl-Rec.																						

CTD Stn.	45	46	47	48	49	50	51	52	52A-E	53	54	55	56	57	58	59	60	61	62	63	64
RMS																					
Van Dorn		o	o									o		o				o			
Nansen -1												o		o				o			
Nansen -2	o					o															
Norpac twin		o	o									o		o				o			
MTD						o				o		o	o	o	o	o	o				
IKMT s		o					o						o			o			o	o	
IKMT d			o						o			o									
ORI surf			o				o		o				o			o			o	o	
Neuston	o					o						o		o							
Pl-Rec.			o																		

CTD Stn.	65	66	67	68	69	70	71	72	73	74	75	76	77	78	78-1-33	95
RMS								o								
Van Dorn								o							o	
Nansen -1																
Nansen -2								o						o		
Norpac twin																
MTD								o							o	
IKMT s																
IKMT d																
ORI surf																
Neuston															o	
Pl-Rec.															o	

Abbreviations: RMS, Rosette Multi-Sampler; ORI, Ocean Research Institute plankton net; MTD, Motoda multilayer plankton net; IKMT, Isaacs-Kidd mid-water trawl; Pl-Rec., Plankton Recorder

1. Hydrographic characteristics

K. Hasunuma, T. Nakai and M. Fujimoto

Temperature and salinity data were obtained through routine hydrocast survey along several cross-sections of the Kuroshio using a CTD with Rossete Multi-Sampler on leg 1. Intensive efforts were made to collect plankton, fish eggs and larvae in the Section I (off the Nojima-zaki) and Section II (around Amami-oshima Is.). On the other hand, the observations in a water mass marked by drifting buoys were mainly conducted on leg 2. Data from CTD observations are attached as appendices at the end of this volume. Based on these data, hydrographic characteristics are summarized as follows:

1) During the cruise, the Kuroshio has taken the large-meander path and the large cold eddy was present off the Kii Peninsula. But, according to the results of CTD observations on leg 1, this cold eddy was cut-off from the main path of the Kuroshio and an isolated cold core ring was formed (Fig. 2).

2) On leg 2, it was revealed that the isolated ring had been joined again with the Kuroshio. This fact was also confirmed by the tracking of the Kuroshio surface water using drifting buoys (see Fig. 28). The horizontal distribution of temperature at 200 m was shown in Fig. 3, based on the data obtained on leg 2 of the cruise and routine observations of fisheries experimental stations around the Kuroshio region.

3) In the Section I, 9 CTD casts were carried out (Stns. 1-9). Figs. 4-6 show the vertical sections of temperature, salinity and thermosteric anomaly, respectively. The Kuroshio was observed to flow near the coast and its main axis was located around Stn. 2 about 20 miles off the Nojima-zaki.

4) In the Section II, 14 CTD casts were carried out (Stns. 47-60). Figs. 7-9 show the vertical sections of temperature, salinity

and thermosteric anomaly, respectively. The main axis of the Kuroshio was found along the shelf edge (Stn. 56) of the East China Sea. It was noticiable that coastal water with salinities lower than 34 % extended over the Kuroshio in the surface layer.

2. Distribution of macroplankton collected with MTD net

H. Nakata and K. Yamaura

In order to clarify the roles of the Kuroshio Current on the transport of planktonic organisms including fish eggs and larvae, MTD net was towed in 10 different strata between 200 m and the surface in two cross-sections of the Kuroshio Current (Fig. 10). Results obtained in the Section I off the Nojima-zaki were summarized as follows:

1) The ranges of the values of settling volume and total biomass in wet weight were 0.02 - 0.74 ml/m^3 and 5 - 126 mg/m^3, respectively (Figs. 11,12). The values of total biomass (mg/m^3 in wet weight) integrated from surface to the depth of 200 m were 26-40 in the coastal waters, 23-26 in the Kuroshio Current, 50-62 in the outer edge of the Kurosio Current and 26-38 in the offshore waters of the Kuroshio.

2) In all the samples, Copepods were the most dominant group on the basis of biomass, followed by Chaetognaths. However abundant distribution of Euphausiids was seen in the lower layer below the thermocline in the coastal waters of the Kuroshio.

3) Total number of fish eggs was most abundant in the surface water of the inner edge of the Kuroshio Current. On the other hand, total number of larvae was abundant in 20-50 m layers and its maximum value was obtained in the outer edge of the Kuroshio Current, where the total biomass showed relatively high value.

3. Distribution of Fish eggs and larvae in the Kuroshio

K. Matsushita

In order to investigate the pattern of distribution of fish eggs and larvae, three types of samplings were conducted.

Firstly, collection with MTD net in 10 different strata was carried out to know the vertical distribution of fish eggs and larvae. The samples were divided into halves, and then examined the number of fish eggs and larvae. The results are shown in Tables 4-5.

Secondly, filtering of the surface water pumped up from ship bottom was adopted to know the horizontal distribution of plankton biomass including fish eggs and larvae. The distributions of settling volume per about 1 m^3 at several cross-sections of the Kuroshio are shown in Fig. 13.

An apparatus was newly devised to collect fish eggs and larvae continuously, and tested during this cruise . This apparatus is quite simple in structure and requires neither use of pump nor any supply of power, then it is expected to be an inexpensive and handy tool. The samples were interposed between two net clothes which shift with propeller revolved by water motion when the tool is towed. Average towing length and filtered volume per rotation were about 27 m and 1.3 m^3 , respectively. An example of the results is shown in Fig. 14.

4. Family composition of fish larvae collected on the line transecting the Kuroshio

K. Kawaguchi

The fish larvae of MTD-net samples, collected at 7 stations on the Kuroshio transecting line, were sorted at family level. At each station ten different layers from surface to 200 m depth were fished at the same time by the MTD-nets. It is remarkable that the larvae of mesopelagic species belonging to the families Myctophidae, Gonostomatidae, Melanostomiatidae, and Sternoptychidae accounted for 79.8 - 97.7 percent of total number of larvae caught as shown in Table 6. Of these two families, Myctophidae and Gonostomatidae, predominated over others and comprised 79.6 - 99.7 percent of the total catch.

Myctophid larvae were distributed uniformly along the transact, although the species composition has not been analysed yet. Conversely the distribution of gonostomatid larvae were quantitatively restricted to the offshore stations beyond the Kuroshio axis, indicating the most of the gonostomatid are oceanic.

Vertical distribution of larvae are mostly restricted to the layer shallower than the 18°C isotherm, i. e. 5 - 50 m depth.

The more detailed analysis at species level is not completed mainly due to the difficulties in the identification of mesopelagic fish larvae. The more accumulation of the knowledge on the early life history of mesopelagic fishes is badly needed for the comprehension of these data.

5. Studies of systematic, vertical distributions, diurnal migrations of larval squids and bathypelagic cephalopods in the Kuroshio

T. Kubodera and S. Mishima

Studies of larval squids in the western North Pacific have been conducted by Watanabe (1965), Okutani (1968, 1972), Shojima (1970) and Yamamoto & Okutani (1975). In these studies, main species composition of larval squids and their vertical distributions were reported and the spawning grounds of some species were estimated.

There is no doubt that the Kuroshio Current is important for the transport and dispersion of larval squids which hatch out in the east China Sea and southern waters off kyushu. However, there are not much informations about detailed vertical distribution and diurnal migration of larval squids in the cross-sections of the Kuroshio. Further, we have few knowledges about bathypelagic cephalopods in the waters of considerable depth.

During the cruise, collection with MTD net which can be towed simultaneously at surface, 10, 20, 30, 50, 75, 100, 125, 150 and 200 m depths were conducted at 9 stations off Nojima-zaki (Section I) and 6 stations in the north-western water off Amamioshima (Section II). IKMT 10-feet net was occasionaly towed obliquely from about 200m and 1000m depths at 11 times and 7 times respectively for the purpose of collecting juvenile and bathypelagic squids.

Examinations are now on the progress and the results obtained up to now are as follows. 1) In the cross-sections of the Kuroshio, the density of total larval squids from surface to 200m depth was the highest on the main flow of the Current and decreasing towards the margins of the Current (Fig. 15). 2) Vertically, the density of larval squids was higher in the surface layer shal-

lower 50m depth, and decreased with depth. 3) Abundance of total larval squids collected with MTD nets was larger at the stations off Nojima-zaki than those off Amamioshima. 4) The lower limit in the vertical distributions of larval squids fairly coincided with 18-20 ℃ isothermal depth in the transverse section off Nojima-zaki. 5) In the MTD nets samples, Enoploteuthidae and Ommastrephidae were dominant. 6) Diurnal migration was seen in Ommastrephidae larval squids but it was not clear in Enoploteuthidae (Fig. 16). 7) Seven families including 13 species were classified from the samples collected with IKMT 10-feet net, though only 6 species were confirmed their identity (Table 7).

6. Sampling of neuston

Y. Matsuo

1) Cross-sectional sampling

In order to compare the composition and biomass of neuston in the Kuroshio Current and outside of the Kuroshio Current, cross-sectional sampling in waters around the Kuroshio was done in the daytime at the stations of 2, 5, 9, 16, 21, 23, 25, 27, 31, 32, 45, 50, 55, 57, 61.

For the sampling of neuston, ORI neuston net was used. ORI neuston net has two strata in mouth parts, each of which is 20 cm high and 60 cm wide. Mesh size of the filtering cloth is 0.33 mm, and the buoyancy of the floats is adjusted in order to tow at the depth from 0 to 10 cm (upper mouth) and from 10 to 30 cm (lower mouth). This net was towed for 40 minutes out of the bow wave at the right side of the R/V Hakuho Maru. Length of towing lope was 30 m and ship speed was about 2 kts. The volume of seawater filtered of the lower net was estimated with a RGS flow meter, and

the volume of seawater filtered of the upper net was estimated as the half volume of the lower net. At same stations, Norpac twin net (mesh size, 0.3 and 0.1 mm) was towed vertically from 150 m to the surface in order to compare the composition and biomass of pelagic plankton to neuston.

The collected samples were preserved in 10% solution of neutralized formalin seawater. Later they will be sorted, and wet weight of each group will be weighed and number will be counted.

2) Sampling during drift

In order to examine the effect of diurnal vertical migration of pelagic plankton on neuston, simultaneous sampling with ORI neuston net and MTD horizontal closing nets was repeated 7 times at a 4 hours' interval. These nets were towed in 40 minutes at the stations of 78-1, 78-4, 78-5, 78-6, 78-7 (daytime sampling), and 30 minutes at the stations of 78-2, 78-3, 78-4 (nighttime sampling).

MTD horizontal closing nets, 56 cm in diameter and 0.33 mm in mesh, were towed simultaneously at the estimated depth of 0, 10, 25, 50, 75, 100, 125, 150 m and their real depths these nets towed were measured by depth recorder (Yanagi Instrument Co., Ltd.). The volume of seawater filtered was estimated with a RGS flow meter attached to each net. The samples were preserved in 10% solution of neutralized formalin seawater, too.

Sorting of the samples collected by ORI neuston net was finished, and Table 8 shows the wet weight and number of each group. Sorting of the samples collected by MTD nets is now in progress.

7. Distribution of tintinnids in two sections of the Kuroshio Current

S. Suzuki

In order to investigate the distribution of tintinnids in two sections of the Kuroshio Current, 20 liters of sea water were obtained with Van Dorn Sampler at 7 layers (0, 10, 30, 50, 75, 100 and 150 m) from the surface to 150 m. One section was located off BōsoPeninsula (Stns. 1, 2, 3, 4, 5, 7 and 9), and the 2nd one off Kii Peninsula (Stns. 34, 37, 39, 40, 41, 42 and 44).

The water samples were preserved by adding 200 ml of neutralized formalin. A part of samples were settled and concentrated to 5 liters on the ship. Finally, all were concentrated to 25 ml at the land based laboratory.

The cell number of tintinnids were found to be less than 20 per liter and the number of species at one station were from 5 to 10 in surface water. Helicostomella subulata and Tintinnopsis kofoidi usually distributed in relatively cold coastal areas (the large number of them appeared in Tokyo Bay in spring) were found in surface water at Stn. 9. Moreover, the lorica of Favella taraikaensis which is a coastal species as above mentioned was found at Sta. 9 at a depth of 10 m. Therefore, it is very interesting to note their occurrences in such a station of Kuroshio Current.

8. Distribution of bacteria in the Kuroshio Current

K. Kogure and N. Taga

The distribution of bacteria in or near the Kuroshio Current was investigated by two enumeration methods.

Seawater samples were collected with ORIT samplers at 8 stations during the 1st leg of the cruise. For the determination of viable counts, appropriate amount of seawater was filtered through Nuclepore filter (pore size 0.2 μm), which was then incubated on PPES-II agar plate (Taga, 1968) at 20 ℃ for 3 weeks before counting colonies. The direct counts were obtained by the epifluorescent technique (Hobbie et al., 1977). Sample seawater in Nansen bottle was filxed with formalin (final conc. 2%) and filtered through Nuclepore filter (pore size 0.2 μm). The filter was stained with acridine orange and observed with Nikon fluorescent microscope. Particulate matter was collected on Whatman GF/C glass fiber filter by filtration of seawater collected with Van Dorn samplers. The Yanagimoto CHN corder MT-2 was used for the analysis.

The vertical profiles of bacterial populations is shown in Fig. 17. Generally, the direact counts were 10^5 cells per ml, which exceeded the viable counts by about 4 orders of magnitude. The result suggest that the difference between the values obtained by the two methods becomes extremely great in low-nutrient offshore seawaters. Relatively large numbers of bacterial populations were found at the surface and small peaks often emerged between 50 and 100 m.

At Stn. 44, 30 - 40 bacterial strains were isolated from each 0, 10, 100, and 400 m sample seawater and their generic compositions were determined according to the scheme of Simidu (Simidu, 1974) (Fig. 18). Pseudomonas dominated at the surface layer, whereas the population was dominated by Acinetobacter and Vibrio

at 100 and 400 m, respectively. This fact indicates the change in the dominant bacterial populations with the depth and their different ecological situations.

Most of the bacterial cells observed with the fluorescent microscope seemed to be free-living samll coccoid forms (0.3 - 0.4 μ m).

The distribution of POC and PON are shown in Fig. 19. At almost all the stations, the minimum value was recorded at 200 m depth. At Stns. 57 and 34, clear peaks occured at 50 and 100 m, respectively. No clear correlation was detected between the distribution of POC and bacterial populations. Further detailed inverstigations will be necessary in future.

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9. Biogeochimical transport of material in the surface water of the Kuroshio region studied with natural radionuclides

S. Tsunogai and N. Tanaka

The naturally occurring radioisotopes, Th-234 (halflife, 24 days) and Be-7(halflife, 53 days) are isotopes of insoluble elements in seawater. It appears that these nuclides are rapidly

removed from seawater by their incorporation in particulate matter following the production of Th-234 from its dissolved precursor, U-238, or the introduction of Be-7 from the atmosphere. Accordingly, the nuclides can be used as tracers of particulate matter of which major part is biogenic.

Surface seawater samples were collected during the KH-77-2 cruise and analyzed for Th-234 by the method of Tanaka et al. (1983) and for Be-7 by the method of Tanaka and Tsunogai (1983).

The results obtained are shown in Figs. 20 and 21. The concentration of Be-7 in the surface water of the higher latitudes seems to be larger than that in the lower latitudes.

The residence time of thorium (T_{Th}) can be calculated by introducing the observed values into the following equation.

$$T_{Th} = \tau_{Th} (R/1-R)$$

where τ_{Th} is the radioactive mean life of Th-234 and R is the activity ratio of Th-234/U-238 in the water column.

If we can assume that the residence time of beryllium in the surface water is equal to that of thorium because of their similar chemical nature and their common conveyor, biogenic particles, in the ocean. The input rate of Be-7(I_{Be}) is calculated from the following equation.

$$I_{Be} = N_{Be}/T_{Th}$$

where the N_{Be} is the number of Be-7 atoms in the water column. The calculated results together with the residence time of thorium are given in Table 9. The input rate of Be-7 agrees fairly well with that estimated by Silker et al. (1973).

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10. Inorganic nitrogen metabolism in the Kuroshio region

T. Saino and A. Hattori

1) Inorgenic nitrogen metabolism of the marine blue-green algal *Trichodesmium* and an estimate of nitrogen input to the sea surface by nitrogen fixation

Nitrogen fixation and ammonium assimilation by *Trichodesmium* were studied using the acetylene reduction and the ^{15}N tracer techniques. Emphasis was placed on diel variation of nitrogen fixing and ammonium assimilation capacities. Experiment was also conducted for the effect of light on nitrogen fixation.

A 200-fold difference was observed between day and night nitrogen fixing capacities when measured at a light intensity of 12,000 lux. The pattern and extent of variation were different from diel variation ever reported concerning photosynthesis, nutrient uptake and nitrogen fixation of natural population of marine phytoplankton. No diel variation was observed on ammonium assimilation capacity of *Trichodesmium* (Deep-Sea Res.; in press).

On the basis of algal biomass, nitrogen fixation rate per unit algal biomass and its diel variation, nitrogen input to the surface was estimated to be 20 ng atom N l^{-1} day^{-1} at Stn. 78 on 7 Aug. 1977.

2) Vertical distribution of ^{15}N natural abundance in particulate organic matter

To obtain some insight into the extent of formation and degradation of particulate organic matter (POM) in water column, natural abundance of ^{15}N in POM was determined. Water samples were collected with 25-l Van Dorn samplers from 0 to 2,500 m at Stn. 72.

3) Nitrate uptake in the subsurface chlorophyll maximum layer

Vertical profile of chlorophyll a in the Kuroshio area exibits a peak in a subsurface layer of about 100 m. The characteristics and extent of nitrate utilization by phytoplankton population in this layer were investigated using an ^{15}N tracer technique under simulated in situ conditions at Stn. 72.

11. Structure of phytoplankton community and primary production

Y. Yamaguchi and Y. Fujita

Investigation of the structure of phytoplankton community in relation to the primary production in the Kuroshio and its adjacent area off Shikoku in summer was done at stns. 72 and 78. Supplementary observations were also made at the surface stations set along the cruise track during leg 2. Horizontal as well as vertical distribution of phytoplankton was surveyed with use of chlorophyll a index the community structure was estimated by the analyses of pigment composition.

In the surface waters in the western coastal regions of

Kyushu, around Tanegashima Is., and in the Kuroshio and its adjacent area off Shikoku, the standing stock of phytoplankton chlorophyll was very high. Pigment analyses revealed that a large part of the phytoplankton community was composed by the pelagic blue-green algae, Trichodesmium. Clear differences about the vertical distributions of phytoplankton were observed between stn. 72 and stn. 78. At stn. 78 located in the northern adjacent area of the Kuroshio, the amount of chlorophyll a in the water column was very high and the blue-green algae occupied 100% of the chlorophyll a stock in the surface layer. Their distribution, however, were restricted within the upper 30 m of the water column. While at stn. 72 situated in the warmer water mass, the standing stock of chlorophyll a was considerablly low. The distribution of blue-green algae reached to 70 m depth though their contribution to the chlorophyll a stock was relatively low (Table 10).

A subsurface maximum of chlorophyll distribution was observed at stns. 72 and 78; the size of the maxima was 2 to 4 times larger than those at the surface and the maximum layers appeared at 75 to 85 m depth. Higher ratios of chl. c/ chl. a observed in the subsurface chlorophyll maxima strongly suggested the distributions of photo-adapted deep living communities in these layers. Moreover, phycoerythrin, a major phycobilin compornent, was detected in the subsurface chlorophyll maximum at 85 to 100 depth as well as in the surface layer at stn. 72 (Table 11). The spectrophotometric nature of the phycoerythrin obtained in the deep layer was very similar to that of the phycoerythrin contained in Cryptophyceae. Thus, it can be concluded that the deep living phytoplankton which formed subsurface chlorophyll maximum might be attributed partly to the cryptophycean algae in this station. Analyses of the data for photosynthetic activities are now in progress.

12. Application of aircraft remote sensing to fisheries oceanography - A case study off Shiono-misaki

S. Saitoh

The objective of this study was to learn how we could best use the data provided from aircraft remote sensing techniques and sea-truth observations for fisheries oceanography with special reference to the boundary zone areas lying inbetween coastal waters and offshore waters. The development of techniques to infer the subsurface fields from surface or remotely sensed information has already been recommended in the workshop on oceanic fronts in coastal processes held at Stony Brook, U.S.A., 1977. For an experimental study, the sea area off Shiono-misaki was chosen due to the reasons as follows: 1) The coastal zone off Kumano-nada and Enshu-nada including the water off Shiono-misaki is one of the extremely important nursery grounds for several migratory fish species whose eggs and larvae are transported and diffused by the Kuroshio current. 2) a number of studies on fisheries oceanography have been made so far in these areas. However, the spatial and temporal coverage of these field studies has been limited to small geographic locations and for a short time of observation because of shortage in practical observations by using a vessel.

As a first step, joint aircraft and ship observations were made in order to study the applicability of remote sensing data for fisheries oceanography for delineating sea surface and subsurface ecosystem off Shiono-misaki on July 14, 1977. Sea-truth observations were carried out on 9 stations of about 2 miles interval from 8:57 to 16:43. The parameters of sea-truth employed for this study are shown in Table 12. Other observations were made at 8 sites on the sea located inbetween these nine stations. They included surface water temperature, salinity and chlorophyll a.

The area off Shiono-misaki was observed by four courses of flight of which coverage is shown in Fig. 22. Multi-spectral Scanner (MSS) JSCAN-AT-XM recently developed by Japan Foundation for Shipbuilding Advancement was used for this remote sensing survey. The flight conditions of the present remote sensing observations are summarized in Table 13. Selected channel numbers and wavelengths of MSS are shown in Table 14.

As a result, it was considered to be effective to apply aircraft MSS data to investigation of the micro structure of oceanic fronts lying inbetween the coastal waters and the offshore Kuroshio water. However, due to scarcity of sea-truth observations in these oceanic front areas, further detailed studies are required before we practically employ this technique.

13. Characteristics of the thermall structure in the vicinity of the Zenisu Ridge

K. Otsuka, D. Inagake and M. Izumi

The Izu Ridge is considered to be a barrier against the Kuroshio and to cause roundabout of the current, topographical upwelling, downwelling and mixing around this region. These physical mechanizms are very important environmental conditons for fish eggs and larvae mackerel, etc.

The detailed observations of distrubance on the thermal structure in the vicinity of the Zenisu Ridge were carried out in the foremost and last periods of this cruise. First, 16 stations were observed with XBT off Iro-zaki, from Izu Peninsula to Kurose Bank, and second, 16 stations of CTD casts and 18 stations of XBT observations were conducted in three sections across the Zenisu Ridge.

As shown in Fig. 23, complicated thermal structure was observed more often in the northeastern side of the Ridge than in the southwestern side. Divergence of the Kuroshio adjacent to the Izu Ridge was clearly observed on the horizontal distribution of water temperature at 200 m (Fig. 24). In the deeper layer, such as 400 or 500 m depth, the Kuroshio was branched off by the Zenisu Ridge, and it was suggested that the main current took a roundabout southward of the Ridge (Fig. 25).

14. Tracking of the Kuroshio surface water with drifting buoys

K. Hasunuma, H. Nakata and T. Hirano

Surface water marked with Radar Buoys were traced in the coastal water adjacent to the Kuroshio with the intentions of measuring the horizontal movement and the downstream changes of water characteristics.

In the upper 100 m, vertical temperature and velocity distributions were continuously recorded at the same time with use of a temperature-sensor array and a current-meter array. Both the arrays were suspended from surface buoys drifting with current-shade sheets (CM type and T type in Fig. 26).

During the tracking of these drifters, efforts to collect fish eggs, larvae and juveniles were made in and around the marked surface water by MTD net towing and the two sets of trap net attached to the Radar Buoys (Fs and Fl types in Fig. 27).

The result of the tracking is illustrated in Fig. 28. From this figure, it is revealed that the buoys disperse largely to the direction of the current, which suggests the horizontal shear dispersion taking place in the shear zone between the Kuroshio and the coastal water plays major roles in the transport of materials

in the Kuroshio region. Divergence and convergence of the surface waters associated with the motion of inertia period (about 21 hrs) were also found in the loci of the drifters.

15. Continuous counting of particulated matters in the surface layer

W. Sakamoto and K. Takizawa

The transportation mechanisms of water are studied with either physical and biological interests. Recently numerical descriptions of discountinuity of the flow pattern have been performed by means of carfol tracking. On the other hand, measurements of the plankton patchiness became possible since some equipments has been developed to collect samples at intervals of a few meters. But there are many difficulties to joint the physical and the biological processes relating to the formation of parchiness. For the purpose to examine in site both of these processes, the authors are developing a continuous particle counting apparatus (Fig. 29).

1) Method

The 1mm width parallel light beam was sent from a side of cylindrical pipe which was 59 mm in diameter and 100 mm in length. At the opposite side of the pipe, Cd-s photoresistor was attached, which had 15 mili second time constant, to receive the variations of light intensity that occured when the particulated matters were crossed the beam. The electric stabilizer was put between light beam and source to avoid the effect of electric power fluctuation. Two plankton nets tied to the paired ring (60 cm in diameter, distance between the centers of the nets was 70 cm). Counter was connected to one side net end instead of backet, since the counting number in unit time seemed to be very small without any

concentrator. The another net was used to collect the samples to compare the counting results.

2) Experiment

The experiments were carried out from Aug. 10 to Aug. 12, 1977, in the area of 31°53'07"N, 134°06'00"E and 30°16'09"N, 134° 03'01"E (Table 15).

An example of the data is presented in Fig. 30. As seen from this figure, particles did not cross the beam in constant intervals. Large amplitude and high frequency pulse rows were found in the record, which suggest the existence of patchiness.

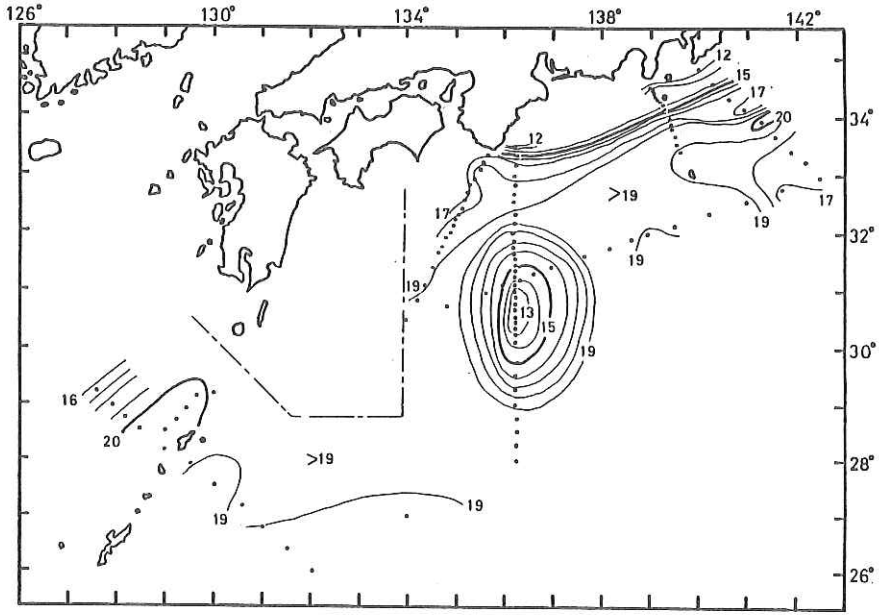

Fig. 2 Horizontal distribution of the temperature at 200 m over studied areas on leg 1 of the cruise.

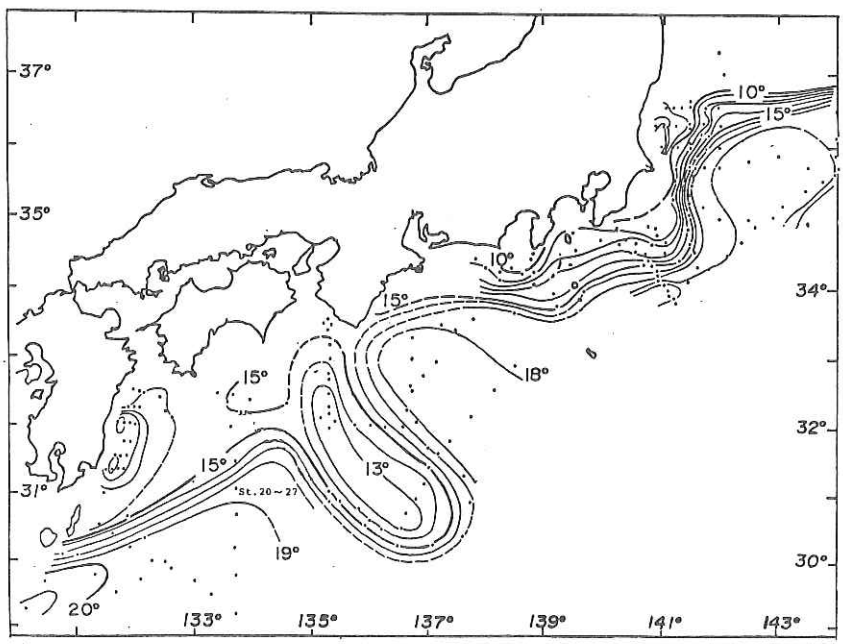

Fig. 3 Horizontal distribution of the temperature at 200 m over studied areas on leg 2 of the cruise.

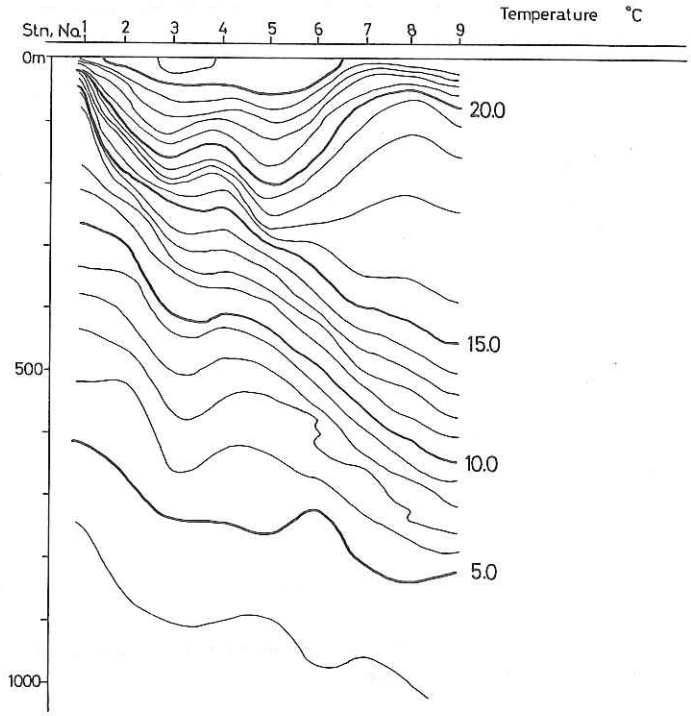

Fig. 4 Water temperature along Section I.

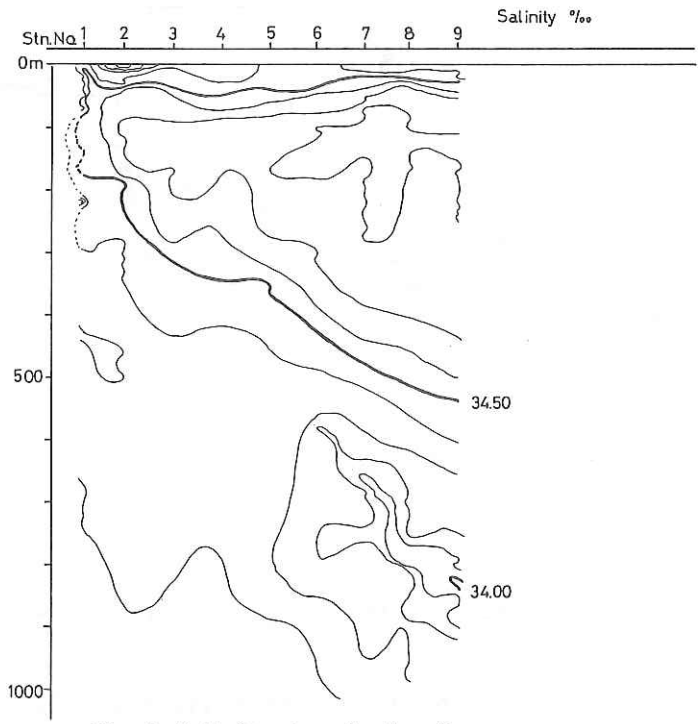

Fig. 5 Salinity along Section I.

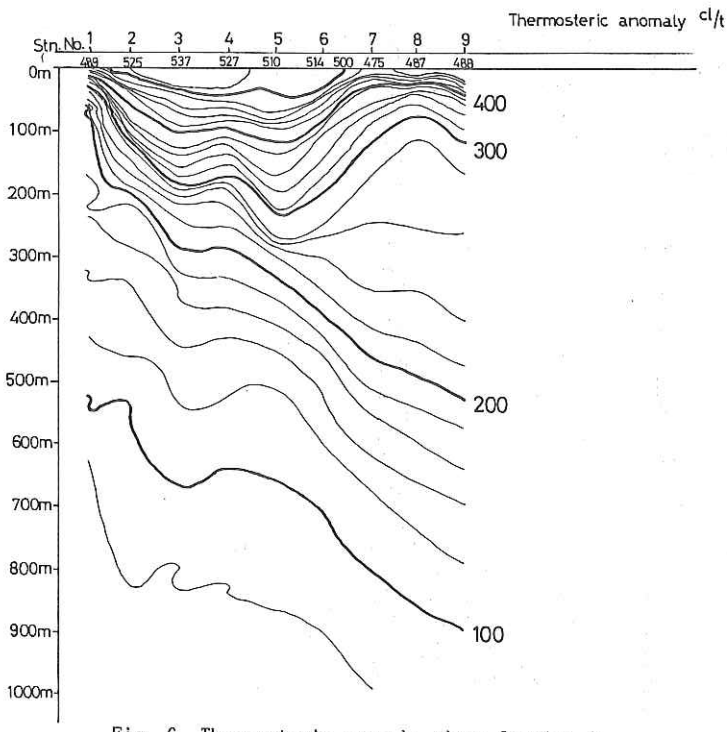

Fig. 6 Thermosteric anomaly along Section I.

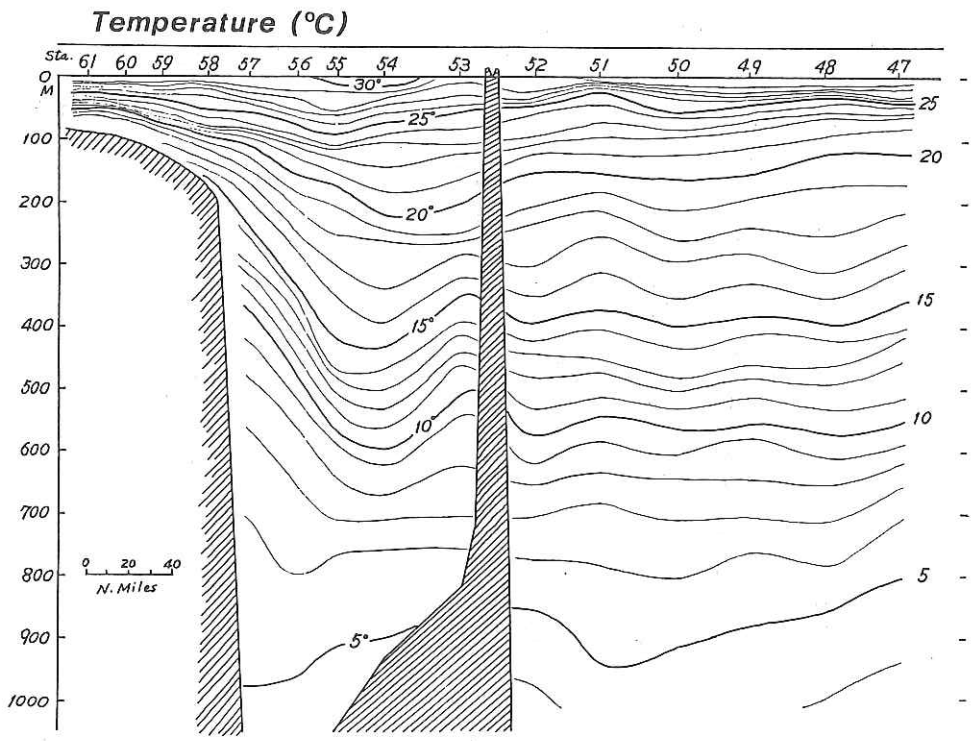

Fig. 7 Water temperature along Section II.

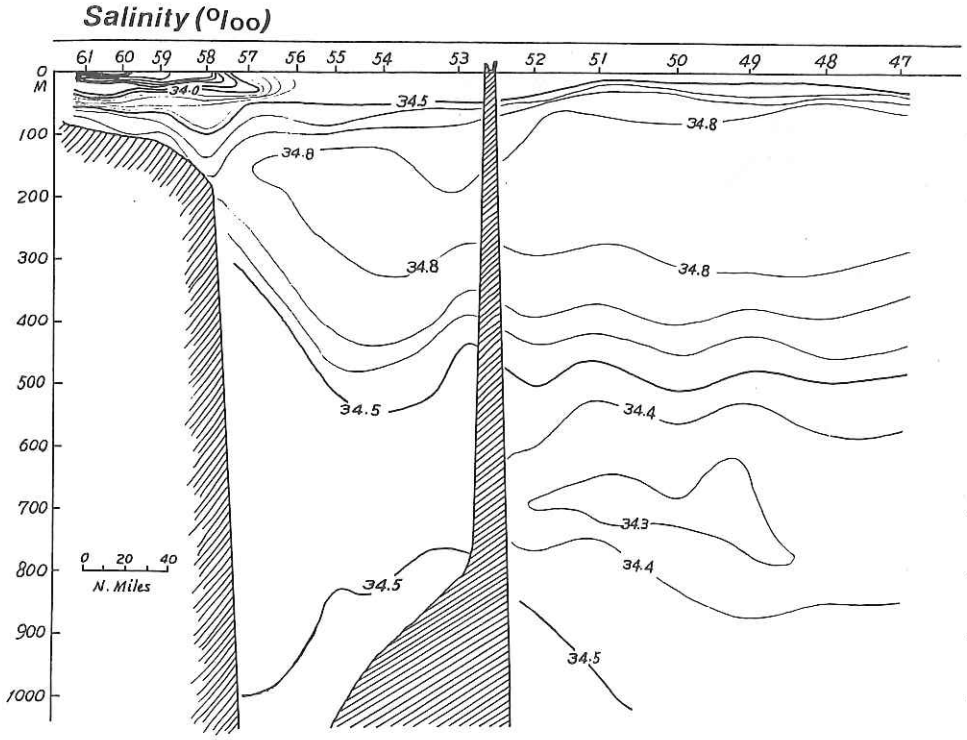

Fig. 8 Salinity along Section II.

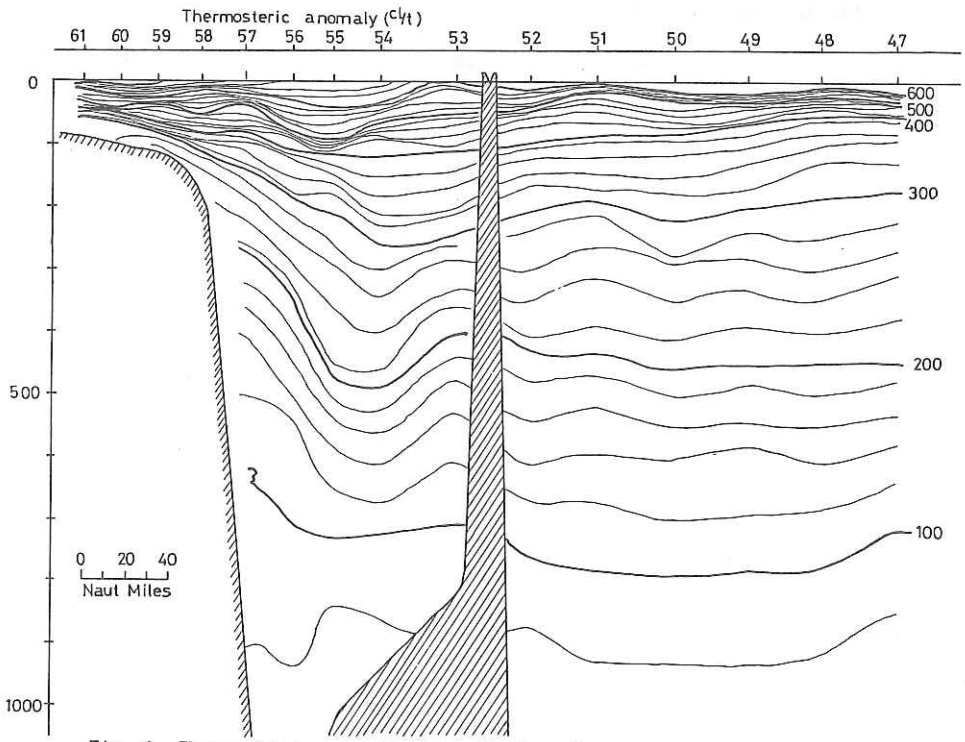

Fig. 9 Thermosteric anomaly along Section II.

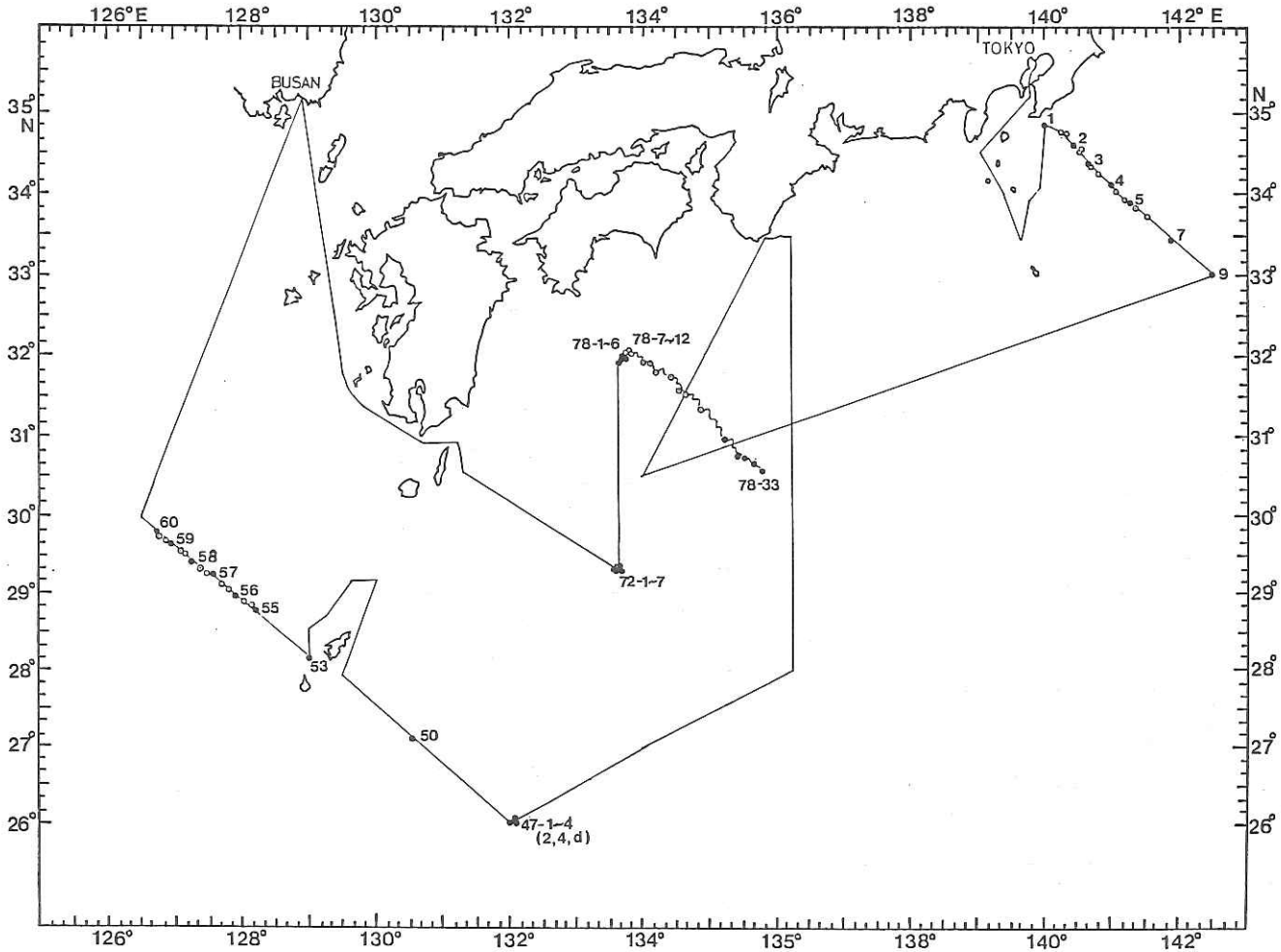

Fig. 10 Sampling stations of MTD net

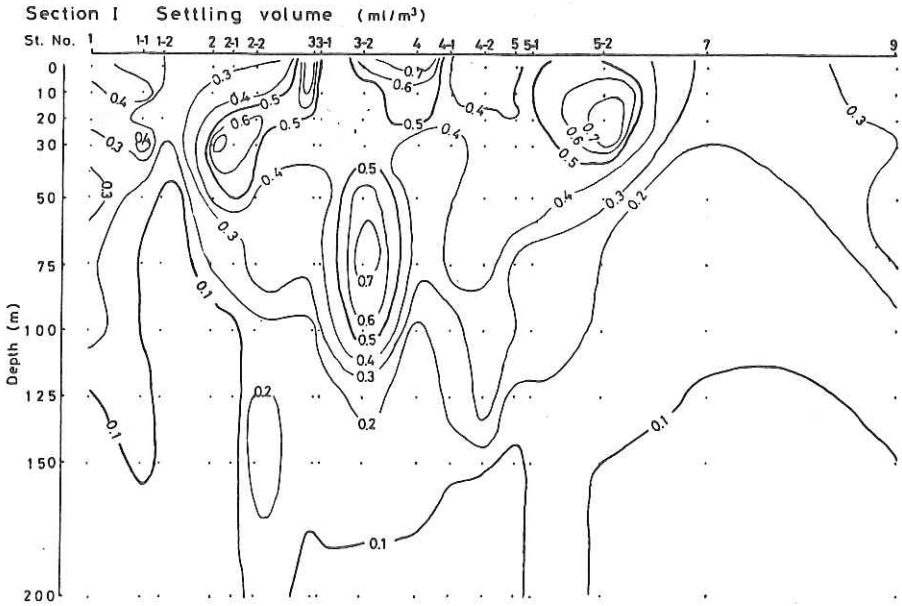

Fig. 11 Settling volume of macroplankton along Section I.

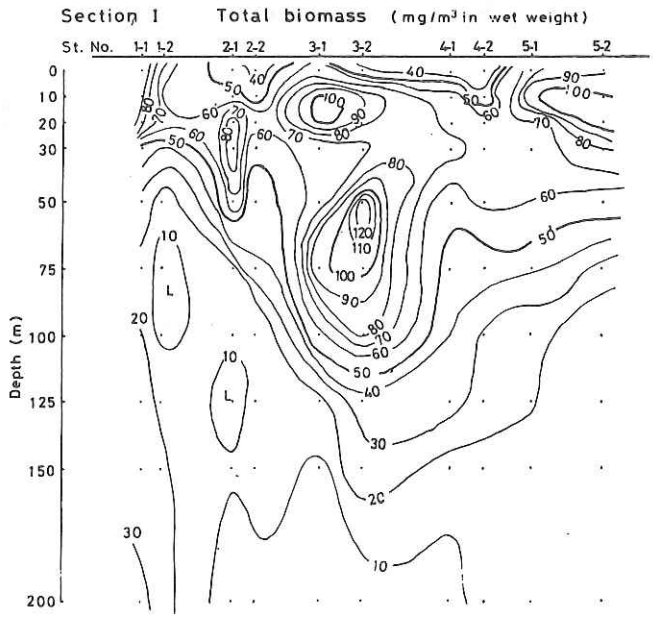

Fig. 12 Wet weight of macroplankton along Section I.

Table 4 Total number of fish eggs collected with MTD net.

STATION / DEPTH	1	2	3	4	5	7	9
0 m	3203	80	11	53	7	19	9
10 m	966	41	24	56	10	10	9
20 m	224	126	0	32	2	15	12
30 m	228	136	14	23	3	20	24
50 m	66	31	7	9	3	8	2
75 m	24	11	10	3	2	2	0
100 m	15	8	7	4	0	1	1
125 m	11	2	7	1	1	0	0
150 m	76	16	14	5	2	1	0
200 m	17	9	5	1	7	6	1
TOTAL	4830	460	99	187	37	82	58

	60	59	58	57	56	55
0 m	59	27	2	7	3	7
10 m	(5m) 51	24	3	1	13	9
20 m	(10m) 172	6	8	1	4	2
30 m	(20m) 4	4	6	4	2	20
50 m	(30m) 12	(40m) 31	(40m) 5	1	0	18
75 m	(40m) 9	(50m) 13	(50m) 4	1	3	3
100 m	(50m) 16	(65m) 0	(60m) 3	3	5	3
125 m	(60m) 5		(75m) 3	1	1	2
150 m				0	1	9
200 m				0	1	3
TOTAL	328	105	34	19	33	76

Table 5 Total number of fish larvae collected with MTD net.

STATION / DEPTH	1	2	3	4	5	7	9
0 m	76	8	34	18	20	0	106
10 m	114	39	41	112	39	15	155
20 m	144	420	88	118	57	159	382
30 m	24	145	127	110	763	55	156
50 m	14	67	110	38	124	39	92
75 m	4	59	61	79	71	143	100
100 m	4	21	82	11	53	91	188
125 m	3	5	28	4	29	7	133
150 m	1	0	12	3	4	4	69
200 m	0	2	5	0	2	2	13
TOTAL	384	766	588	1081	1162	522	1394

	60	59	58	57	56	55
0 m	3	2	2	19	45	2
10 m	(5m) 11	1	8	10	136	12
20 m	(10m) 16	67	27	12	53	23
30 m	(20m) 11	18	87	40	112	19
50 m	(30m) 18	(40m) 12	(40m) 37	43	91	25
75 m	(40m) 14	(50m) 12	(50m) 23	9	79	27
100 m	(50m) 20		(60m) 46	9	51	31
125 m	(60m) 13		(75m) 28	9	16	24
200 m				0	8	2
TOTAL	106	112	258	157	600	182

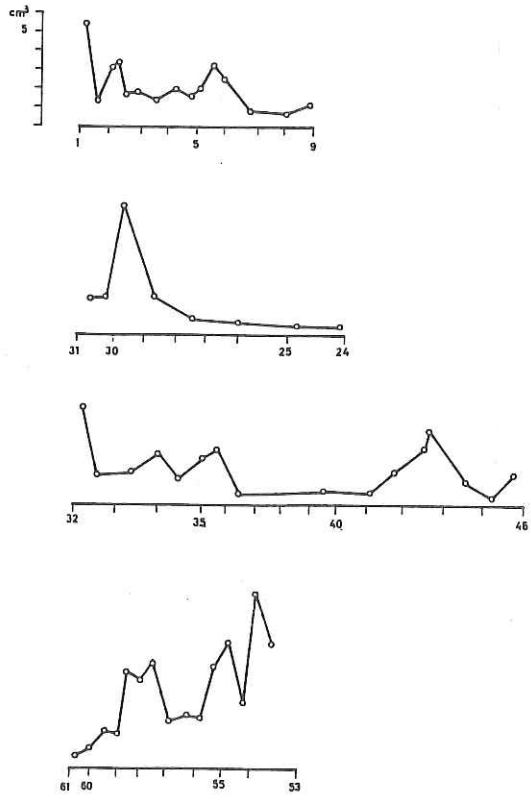

Fig. 13 Settling volume per about 1 m^3 along cross-sections. Numerals indicate station number in Fig. 1.

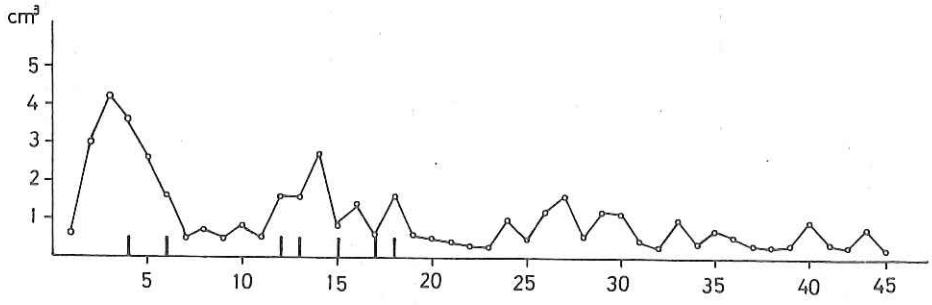

Fig. 14 Settling volume (cm^3/m^3) of the samples collected with continuous sampler -- an example of the results of test towing.

Table 6 Relative abundance of larvae of the major families of fishes collected at Stns 1-9.

Sta.	Myctophidae	Gonostomatidae	Melanostomiatidae	Sternoptychidae	Other families	Number of inds. per 1000 m^3
1	70.8 %	19.5 %	0.1 %	0 %	9.6 %	3543
2	82.8	3.7	0.3	0	13.2	12389
3	84.4	6.5	0.5	0	8.6	17374
4	72.6	7.0	0.1	0.1	20.1	6008
5	71.5	10.1	0.9	0	17.4	13644
7	29.5	60.6	0	0	9.9	13268
9	70.7	27.0	0	+	2.2	27400

Table 7 Cephalopods collected with IKMT-10 feet net.

Order Vampyromorpha,	Family Vampyroteuthae,	Genus	*Vampyroteuthis infernalis*	3
Order Teuthoidea				
Suborder Oegopsida,	Family Enoploteuthidae,			
	Subfamily Enoploteuthinae			
		Genus	*Enoploteuthis sp.*	1
		Genus	*Abralia andamanica*	4
			Abralia sp.	1
	Subfamily Pyroteuthinae			
		Genus	*Pterygioteuthis giardi*	2
	Family Histioteuthidae			
		Genus	*Histioteuthis meleagroteuthis*	2
			Histioteuthis sp	1
	Family Ommastrephidae			
	Family Chiroteuthidae		*Rhyncohoteuthion type A*	1
			Chiroteuthis sp. *(Doratopsis larva)*	1
	Family Mastigoteuthidae			
		Genus	*Mastigoteuthis sp.*	1
	Family Cranchiidae			
	Subfamily Cranchiinae			
		Genus	*Liocranchia reinhardti*	1
	Subfamily Taoniinae			
		Genus	*Teuthowenia elongata*	1
		Genus	*Megalocranchia sp.*	1

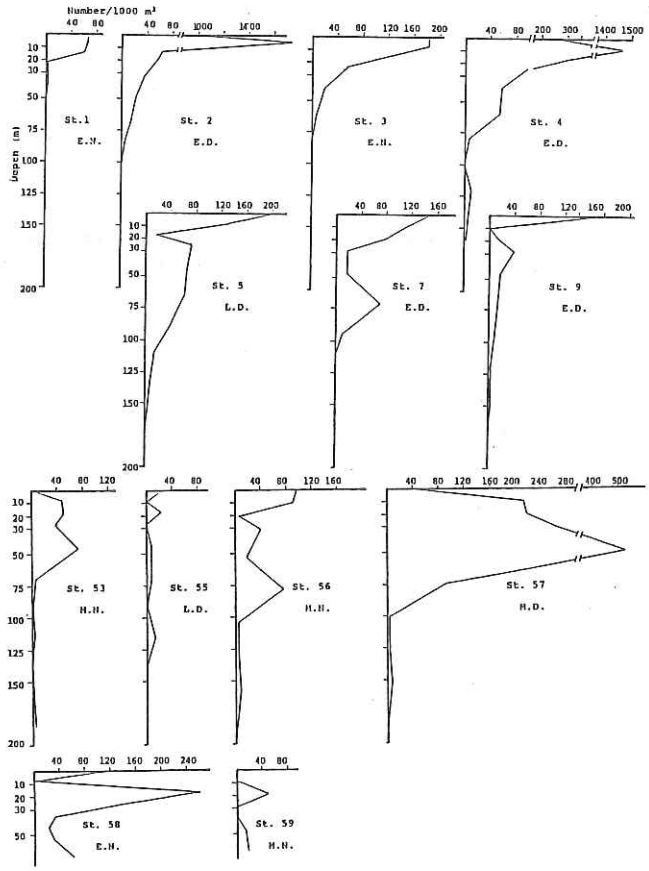

Fig. 15 Vertical distribution of total cephalopods.

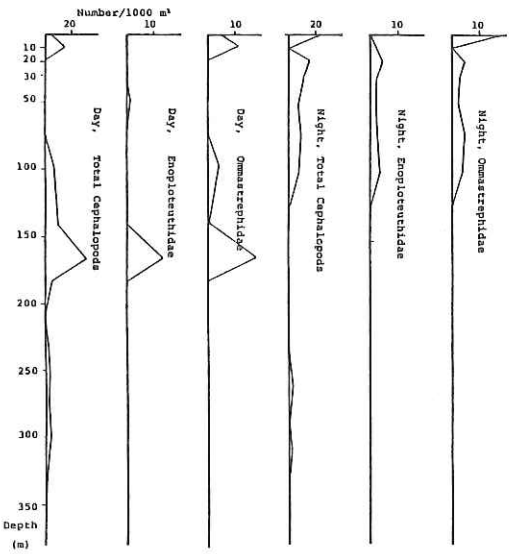

Fig. 16 Change of vertical distribution of cephalopods larvae by daytime and night at Stn. 47.

Table 8-1 Wet weight (g/100m^3) of neuston collected in the upper net (0-10 cm).

station	78-1	78-2	78-3	78-4	78-5	78-6	78-7
sampling time	18:44 - 19:25	22:20 - 22:50	02:39 - 03:11	06:39 - 07:20	10:25 - 11:05	14:30 - 15:10	18:27 - 19:08
Turbellaria	0.000	0.006	0.006	-	0.006	0.010	0.044
Polychaeta	0.113	0.036	0.011	0.000	0.022	0.040	0.126
Gastropoda	0.735	0.598	0.912	0.064	0.051	0.176	4.112
Bivalvia	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cephalopoda	-	-	0.000	0.000	-	-	0.006
Cladocera	0.000	0.000	0.000	0.000	0.000	-	0.000
Ostracoda	0.057	0.000	0.011	0.000	-	-	0.000
Copepoda	2.968	2.209	2.473	4.984	3.816	2.694	4.636
Mysidacea	1.018	1.134	0.902	0.000	-	-	0.082
Isopoda	-	-	-	-	0.000	-	-
Amphipoda	1.541	0.287	0.144	1.189	0.139	0.242	0.941
Euphausiacea	0.014	0.060	0.000	0.000	0.006	0.000	0.063
Decapoda	0.707	0.268	0.282	0.371	0.067	0.096	1.593
Stomatopoda	0.028	-	-	0.013	-	-	0.052
Insecta	0.014	0.251	0.205	0.038	0.017	0.025	0.050
Chaetognatha	0.438	0.448	0.985	1.610	0.072	0.116	1.537
Appendiculata	0.028	0.042	0.111	0.026	0.006	0.000	0.063
Others	0.028	0.066	0.028	0.000	0.045	0.085	0.045
total	7.689	5.403	6.075	8.294	4.245	3.485	13.351
Pisces	4.507	5.804	1.731	1.163	5.131	2.227	1.940
Fish egg	0.424	0.036	0.006	-	0.011	0.050	0.000

Table 8-2 Wet weight (g/100m^3) of neuston collected in the lower net (10-30 cm).

station	78-1	78-2	78-3	78-4	78-5	78-6	78-7
Turbellaria	-	-	-	-	-	-	0.000
Polychaeta	0.035	0.030	0.017	0.045	0.008	0.050	0.050
Gastropoda	0.085	0.149	0.261	0.019	0.003	0.046	1.020
Bivalvia	0.000	0.000	0.000	0.000	-	0.008	0.000
Cephalopoda	-	-	-	0.013	-	-	0.006
Cladocera	0.000	-	0.000	0.000	-	0.000	0.000
Ostracoda	0.000	0.000	0.006	0.000	-	-	0.000
Copepoda	3.332	2.346	2.464	1.163	0.549	0.454	2.192
Mysidacea	0.000	0.149	0.116	-	-	-	0.000
Isopoda	-	-	-	-	-	-	-
Amphipoda	0.545	0.173	0.116	0.562	0.084	0.045	0.428
Euphausiacea	0.000	0.036	0.011	0.006	0.000	0.000	0.037
Decapoda	0.247	0.310	0.162	0.147	0.003	0.011	0.328
Stomatopoda	-	-	-	-	-	-	-
Insecta	-	-	-	-	-	-	-
Chaetognatha	4.202	0.507	1.312	1.220	0.111	0.114	1.631
Appendiculata	0.064	0.078	0.066	0.051	0.008	0.005	0.038
Others	0.028	0.042	0.017	0.026	0.006	0.033	0.032
total	8.538	3.821	4.545	3.252	0.772	0.765	5.764
Pisces	-	0.272	0.000	0.006	0.028	0.033	0.000
Fish egg	0.141	0.012	0.033	0.000	0.006	0.010	0.006

Table 8-3 Number of neuston collected in the upper net (specimens/100m^3)

station	78-1	78-2	78-3	78-4	78-5	78-6	78-7
Hydrozoa							
Hydroida	0	12	33	141	6	0	25
Trachylina	212	90	194	192	6	0	101
Siphonophora	466	1690	782	3478	1162	439	312
Scyphozoa	0	0	0	16	0	0	0
Ctenophora	0	12	0	13	0	0	0
Turbellaria	28	18	11	0	17	15	38
Polychaeta	353	66	39	66	45	106	252
Gastropoda							
Atlantacea	608	746	642	371	585	1786	1707
Thecosomata	622	597	249	716	247	172	580
Gymnosomata	85	48	50	0	0	0	38
Nudibranchia	0	6	11	13	89	20	69
Others	792	400	531	740	499	1675	2450
Bivalvia	14	131	66	13	6	202	82
Cephalopoda	0	0	6	13	0	0	25
Crustacea							
Cladocera	28	24	6	2	11	0	6
Ostracoda	452	18	194	38	0	0	50
Copepoda	13993	12788	15209	24959	12273	9781	26306
Mysidacea	1696	2460	1975	51	0	0	334
Isopoda	0	0	0	0	1	0	0
Amphipoda	2601	645	338	4246	507	671	2784
Euphausiacea	169	125	66	102	11	5	151
Decapoda							
Brachyura	495	472	205	141	0	20	2961
Others	1286	442	194	524	39	35	750
Stomatopoda	14	0	0	13	0	0	2
Insecta	28	125	39	38	33	10	35
Chaetognatha	2148	985	2185	3312	384	156	3036
Appendiculata	1230	1194	14136	3655	786	252	3421
Cyclomyaria	1625	1749	1693	2288	546	61	2828
Desmomyaria	226	162	741	1623	407	96	252
Cyphonautes larva	113	42	17	0	468	35	0
Cirripedia larva	71	54	17	26	39	45	32
Others	919	1923	553	665	100	1650	1575
Pisces	364	22	24	205	669	280	233
Fish egg	481	72	22	0	33	76	13

Table 8-4 Number of neuston collected in the lower net (specimens/100m^3)

station	78-1	78-2	78-3	78-4	78-5	78-6	78-7
Hydrozoa							
Hydroida	7	6	39	51	6	3	25
Trachylina	99	125	172	166	8	0	95
Siphonophora	262	591	814	2268	608	73	95
Scyphozoa	0	0	0	0	0	0	0
Ctenophora	0	0	0	0	0	0	0
Turbellaria	0	0	0	0	0	0	6
Polychaeta	127	96	44	90	20	76	170
Gastropoda							
Atlantacea	325	334	349	268	282	843	598
Thecosomata	163	579	509	332	39	98	145
Gymnosomata	35	42	11	0	0	0	25
Nudibranchia	0	0	6	13	3	0	0
Others	276	239	305	390	192	517	756
Bivalvia	28	30	33	45	0	30	63
Cephalopoda	0	0	0	19	0	0	25
Crustacea							
Cladocera	7	0	11	19	0	8	6
Ostracoda	14	30	66	19	0	0	19
Copepoda	12838	12884	15131	12313	4256	3541	15628
Mysidacea	7	414	415	0	0	0	6
Isopoda	0	0	0	0	0	0	0
Amphipoda	1691	454	520	1943	326	119	1506
Euphausiacea	57	167	66	211	3	3	126
Decapoda							
Brachyura	71	472	183	45	0	8	491
Others	559	448	331	230	14	10	284
Stomatopoda	0	0	0	0	0	0	0
Insecta	0	0	0	0	0	0	0
Chaetognatha	1719	1254	2663	2907	488	361	2117
Appendiculata	757	1964	3543	2748	898	242	1846
Cyclomyaria	1372	1505	1683	1291	382	48	1543
Desmomyaria	163	72	653	1227	321	20	88
Cyphonautes larva	35	18	6	6	17	8	13
Cirripedia larva	14	12	11	32	8	13	25
Others	566	830	576	728	145	621	787
Pisces	0	20	22	13	8	4	6
Fish egg	156	24	44	13	14	20	13

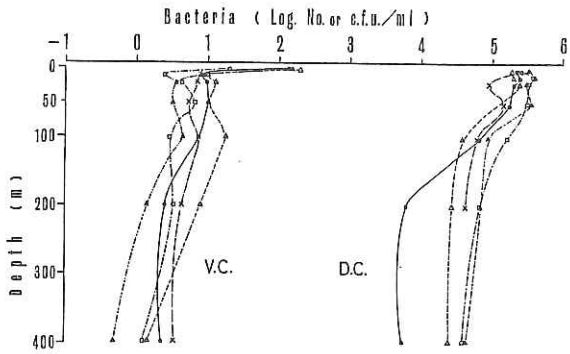

Fig. 17 Vertical profiles of Viable Count (VC) and Direct Count (DC) at stations on KH-77-2.

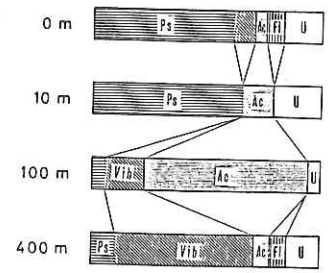

Fig. 18 Bacterial flora at Stn. 44: Ps, Pseudomonas; Vib, Vibrio; Ac, Acinetobacter; Fl, Flavobacterium; U, unknown strains.

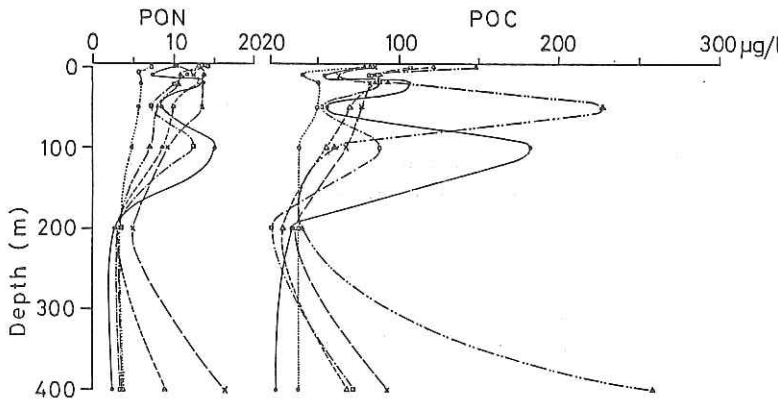

Fig. 19 Vertical profiles of POC and PON at stations on KH-77-2.

Table 9 Mean concentrations of Th-234 and Be-7, residence time of thorium and input rate of Be-7 in the surface water of the Kuroshio region.

Sampling station	Th-234 (dpm/l)	Residence time of thorium (day)	Be-7 (dpm/1000 l)	Estimated input rate of Be-7 (atoms/cm^{2}sec)
St. 16	2.0	175	870	1.0×10^{-1}
St. 41	1.4	45	470	1.1×10^{-1}
St. 78(14)	1.2	35	280	7.4×10^{-2}
cf. Silker et al.(1973)				3.6×10^{-2}

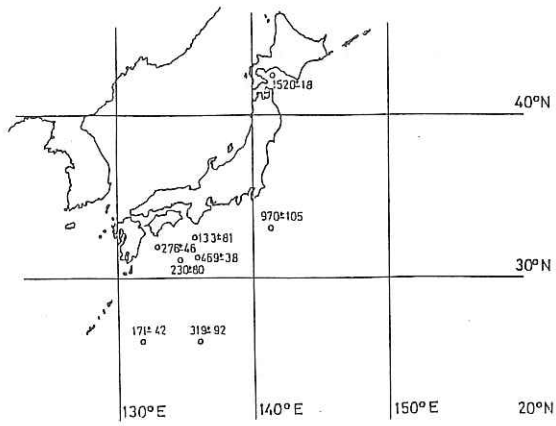

Fig. 20 Concentration of Be-7 in the surface water of the Kuroshio region.

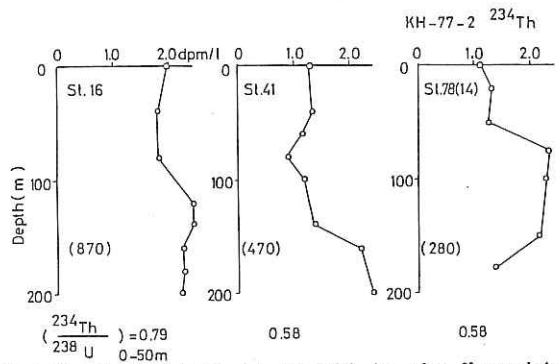

Fig. 21 Vertical profiles of Th-234 in the Kuroshio region. The concentration of Be-7 in parenthesis in the unit of dpm/1000 l and the activity ratio of Th-234/U-238 in the surface 50 m are also given.

Table 10 Standing stock of phytoplankton chlorophyll a and the ratio of blue-green algae at Stns. 72 and 78.

Depth (m)	Stn. 72 Chlorophyll a (μg/l)	Stn. 72 Blue-green algae (%)	Stn. 78 Chlorophyll a (μg/l)	Stn. 78 Blue-green algae (%)
0	0.077	58	0.256	100
10	0.075	68	0.268	100
20	0.077	100	0.193	77
30	0.096	60	0.125	4
50	0.087	56	0.207	0
60	0.100	28	-	-
65	-	-	0.431	0
70	0.129	5	-	-
75	-	-	0.523	0
85	0.358	0	0.346	0
100	0.247	0	0.161	0
125	0.133	0	0.061	0
150	0.062	0	0.034	0
200	0.012	0	-	-

Table 11 Pigment composition of phytoplankton at Stn. 72.

Depth (m)	Chl. a (μg/l)	Phaeo. a (μg/l)	Chl.c/Chl.a	Phycobilin
0	0.08	0.02	0.38	++*
10	0.07	0.02	0.45	+ *
85	0.35	0.18	0.77	+
100	0.24	0.13	0.77	±

* phycobilin attributed to pelagic blue-green algae

Table 12 List of sea truth parameters

Selected factors	Observation depth	Sampling apparatus and analyzer
(1) Temperature	Surface, 5m, 10m, 20m, 30m	Nansen reversing water bottle
(2) Salinity	Surface, 5m, 10m, 20m, 30m	Nansen reversing water bottle
(3) Water color	---	Forel and Ule's satandard color solution
(4) Transparency	---	Secchi's disc
(5) Chlorophyll a(μg/l)	Surface, 5m, 10m, 20m, 30m	Fluorometer
(6) Seston(μg/kg)	Surface	Nuclepore filter (0.4μ,47mm)
(7) Plankton	Transparency depth to 0m	Twin NORPAC Net (Mesh size:GG64 and XX13)
(8) Neuston	0-10cm layer,10-30cm layer	ONI Neuston Net (only St.3 and St.9)

Table 13 Flight conditions in remote sensing observations

Flight date	1977. 7. 14.
Flight time	9:04 - 9:58 (JMT)
Flight altitude	10,300 feet
Flight speed	151 - 170 kt/hour
Flight course No. (Flight direction)	7714M01(140°), 7714M03(140°), 7714M04(140°), 7714M05(320°)
Aircraft	Cessna 402B
MSS	JSCAN-AT-XM

Table 14 Selected channel numbers and wavelengths.

MSS channel No.	Wavelength (m)
1	0.35 - 0.40
3	0.45 - 0.50
5	0.55 - 0.60
7	0.65 - 0.70
9	0.80 - 0.90
11	10.50 -12.50

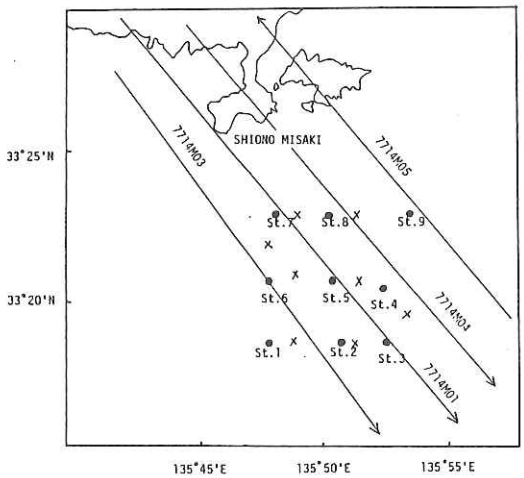

Fig. 22 Flight courses and sea-truth stations in studied area off Siono-Misaki on July 14, 1977.
(x: surface observation stations)

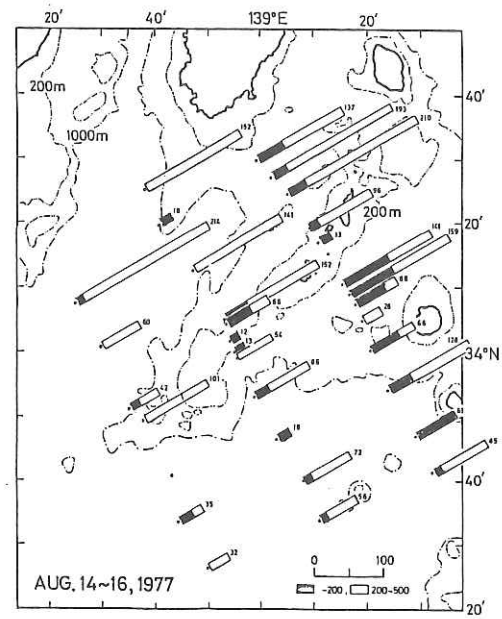

Fig. 23 Accumulated thickness of thermal uniform layer illustrated by length of column and numeral (m). Black and white columns denote the thickness in a water shallower than 200 m and in a water of 200-500 m depth, respectively.

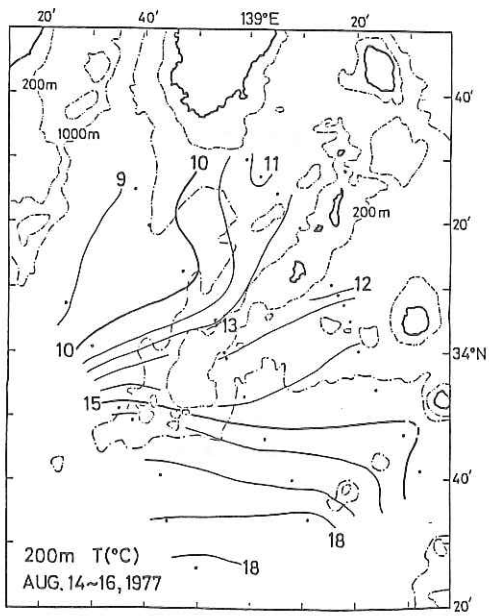

Fig. 24 Distribution of water temperature at 200 m on August 14-16, 1977.

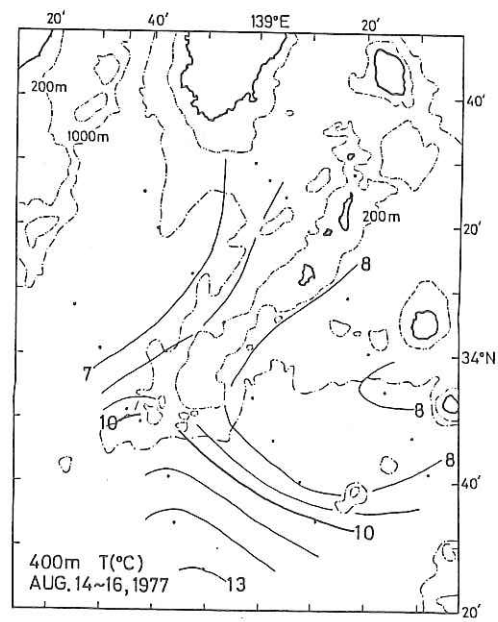

Fig. 25 Distribution of water temperature at 400 m on August 14-16, 1977.

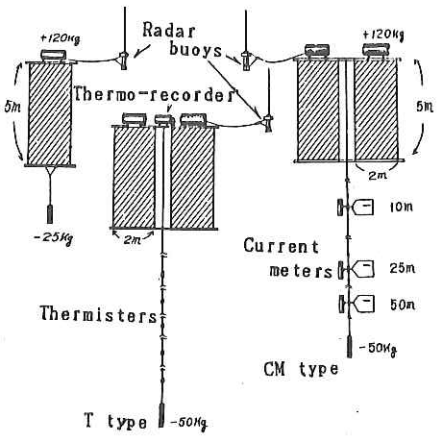

Fig. 26 Various types of the drifter used in the tracking of the Kuroshio surface water.

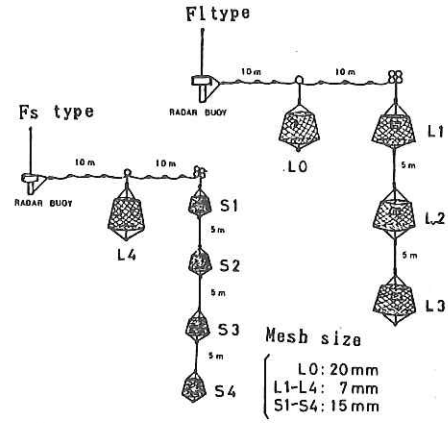

Fig. 27 Drifting trap nets

Table 15 Summary of the experimental data

Run	Station name	Date	Time	Position start	end	r_{max}
Exp.1	KH 78-21	1977.8.10	00:00-02:00	31° 53′ 7N 134° 06′ 0E	31° 55′ 2N 134° 09′ 0E	-
Exp.2	KH 78-24	8.10	14:00-14:35	31° 45′ 3N 134° 28′ 7E	-	0.24(IV)
Exp.3	KH 78-26	8.10	22:00-22:35	31° 30′ 9N 134° 40′ 9E	-	0.26(V)
Exp.4-i	KH 78-35	8.12	16:00-18:20	30° 17′ 8N 136° 39′ 7E	-	0.32(I)
Exp.4-ii	KH 78-35	8.12	18:20-19:20	-	-	0.32(II)
Exp.4-iii	KH 78-35	8.12	19:20-21:00	-	30° 16′ 9N 137° 03′ 1E	0.37(III)

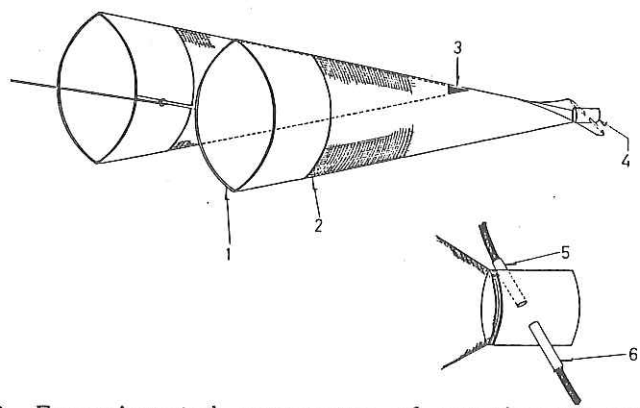

Fig. 29 Experimental apparatus of continuous counter.
1: ring 2: plankton net 3: bucket 4: counter
5: Cd-S photoresistor 6: light beam

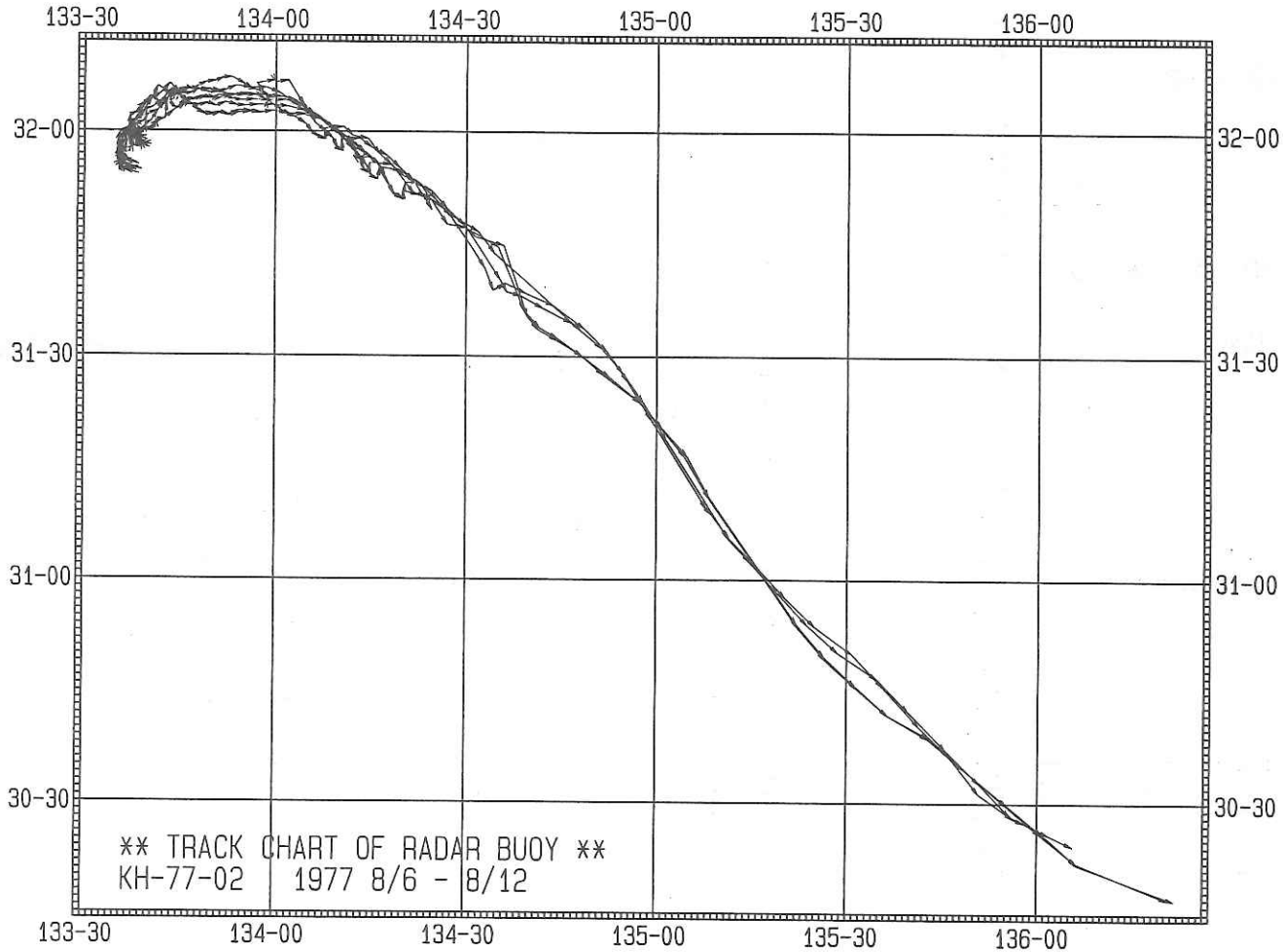

Fig. 28 Result of the tracking of drifting buoys in the surface water of the Kuroshio.

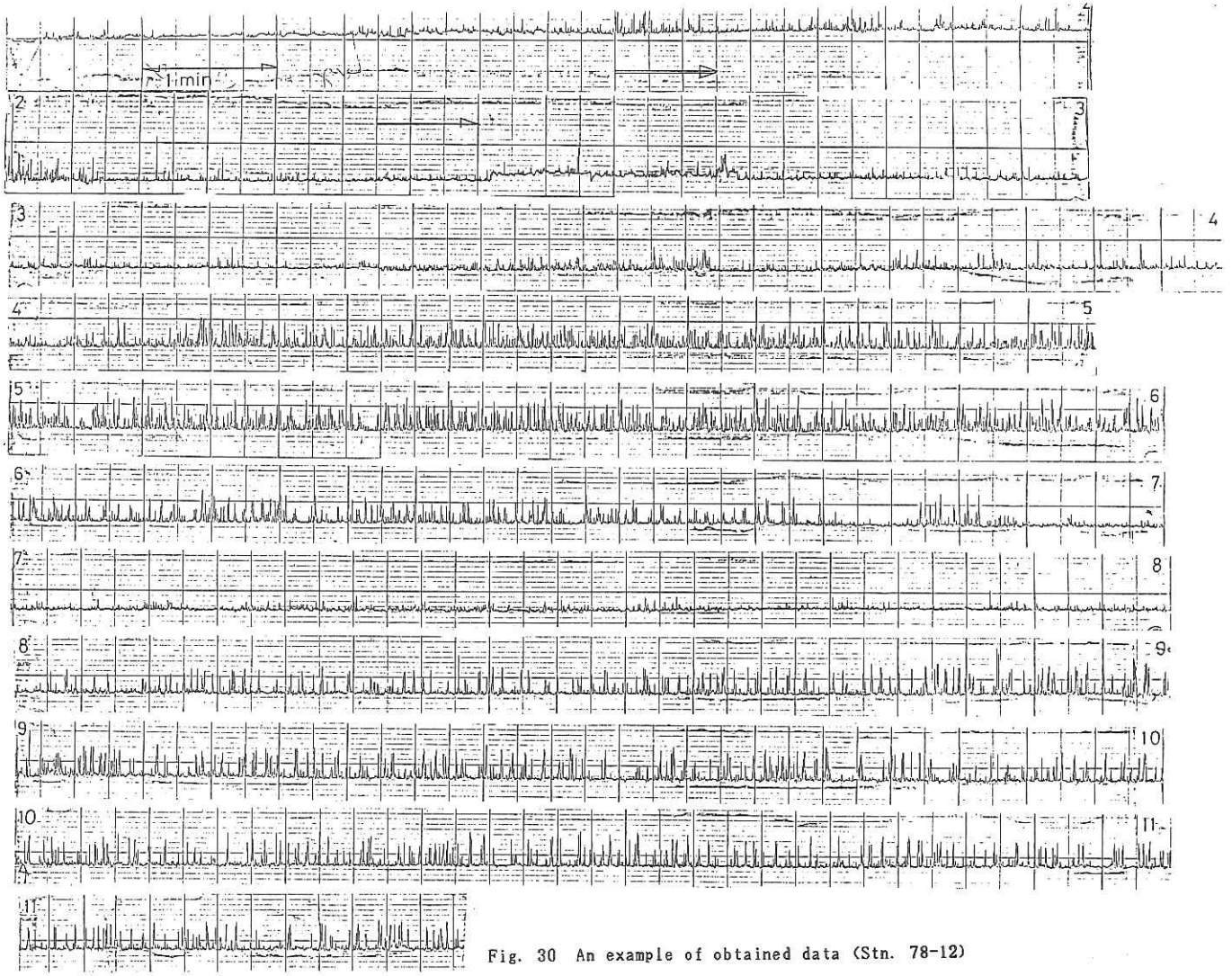

Fig. 30 An example of obtained data (Stn. 78-12)

Station	Latitude	Longitude	Date	Time	Depth
1	34-49.9 N 34-50.0 N	140-00.2 E 140-00.2 E	JUL.06, 1977	15:53 16:48	1050

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	24.839	34.385	22.947	492.7	492.4	0.0
10	23.423	34.393	23.373	452.0	452.1	0.047
20	20.046	34.531	24.412	352.9	353.3	0.087
30	17.377	34.328	24.929	303.7	304.3	0.120
50	15.277	34.438	25.497	249.6	250.8	0.175
75	13.394	34.458	25.912	210.2	211.9	0.232
100	12.778	34.460	26.038	198.2	200.4	0.282
125	12.703	34.473	26.063	195.9	198.8	0.333
150	12.214	34.446	26.137	188.8	192.2	0.381
200	11.614	34.406	26.220	180.9	185.3	0.476
250	10.245	34.355	26.426	161.3	166.4	0.563
300	9.428	34.328	26.543	150.2	155.9	0.644
400	7.663	34.276	26.776	128.1	134.5	0.792
500	6.291	34.236	26.934	113.2	119.7	0.919
600	5.140	34.258	27.093	98.1	104.6	1.032
700	4.243	34.291	27.219	86.1	92.3	1.129
800	3.713	34.337	27.310	77.5	83.7	1.218
900	3.411	34.353	27.353	73.5	79.9	1.299
1000	3.211	34.369	27.385	70.4	77.1	1.378

Station	Latitude	Longitude	Date	Time	Depth
2	34-36.4 N 34-37.0 N	140-16.8 E 140-17.7 E	JUL.07, 1977	04:58 05:47	2950

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	25.239	34.127	22.631	522.9	522.6	0.0
10	25.188	34.291	22.770	509.6	509.7	0.051
20	24.736	34.372	22.968	490.7	491.2	0.101
30	24.010	34.404	23.209	467.7	468.5	0.149
50	22.485	34.578	23.781	413.1	414.6	0.236
75	21.964	34.609	23.952	396.9	399.3	0.337
100	20.438	34.648	24.397	354.4	357.6	0.432
125	17.808	34.615	25.042	293.0	296.7	0.514
150	16.407	34.601	25.366	262.0	266.4	0.583
200	13.289	34.470	25.943	207.2	212.2	0.706
250	11.180	34.389	26.287	174.5	180.0	0.802
300	9.960	34.333	26.459	158.3	164.2	0.888
400	8.144	34.277	26.706	134.8	141.5	1.041
500	6.306	34.225	26.923	114.2	120.7	1.174
600	5.237	34.232	27.062	101.1	107.6	1.287
700	4.810	34.251	27.125	95.0	102.1	1.392
800	4.407	34.277	27.191	88.8	96.3	1.492
900	3.578	34.321	27.311	77.4	84.1	1.584
1000	3.202	34.372	27.387	70.2	76.9	1.664

Station	Latitude	Longitude	Date	Time	Depth
3	34-21.6 N 34-22.0 N	140-38.9 E 140-38.4 E	JUL.07, 1977	17:09 17:54	3750

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	26.373	34.334	22.436	541.5	541.2	0.0
10	26.383	34.376	22.465	538.8	538.9	0.054
20	26.368	34.380	22.473	538.0	538.5	0.107
30	25.836	34.391	22.646	521.4	522.3	0.160
50	24.390	34.570	23.221	466.5	468.1	0.259
75	23.638	34.635	23.493	440.6	443.2	0.374
100	22.642	34.705	23.833	408.1	411.5	0.481
125	21.954	34.718	24.036	388.8	393.1	0.582
150	20.439	34.682	24.422	351.9	356.9	0.676
200	17.505	34.661	25.152	282.4	288.6	0.839
250	14.510	34.582	25.775	223.2	229.9	0.965
300	12.961	34.511	26.041	197.9	205.3	1.075
400	10.106	34.377	26.467	157.4	165.6	1.257
500	7.969	34.297	26.748	130.8	139.1	1.409
600	6.612	34.252	26.904	116.0	124.3	1.542
700	5.453	34.257	27.055	101.7	109.7	1.660
800	4.492	34.287	27.189	88.9	96.5	1.763
900	4.021	34.319	27.265	81.8	89.4	1.856
1000	3.660	34.345	27.322	76.4	84.1	1.943

Station	Latitude	Longitude	Date	Time	Depth
4	34-08.6 N 34-08.6 N	140-56.0 E 140-55.9 E	JUL.08, 1977	03:00 03:55	4170

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	25.928	34.292	22.543	531.3	531.0	0.0
10	25.936	34.330	22.570	528.7	528.8	0.053
20	25.952	34.347	22.578	528.0	528.5	0.105
30	25.950	34.379	22.602	525.7	526.5	0.158
50	25.005	34.462	22.954	492.0	493.6	0.260
75	23.543	34.571	23.472	442.7	445.2	0.378
100	21.976	34.654	23.982	393.9	397.3	0.483
125	20.846	34.683	24.314	362.3	366.5	0.580
150	19.672	34.720	24.653	329.9	334.8	0.667
200	16.492	34.628	25.366	262.0	267.9	0.819
250	14.941	34.591	25.688	231.4	238.3	0.944
300	13.119	34.511	26.009	200.9	208.5	1.056
400	10.407	34.369	26.409	162.9	171.3	1.245
500	7.790	34.275	26.757	129.9	138.0	1.396
600	6.355	34.245	26.932	113.3	121.3	1.525
700	5.289	34.257	27.075	99.8	107.6	1.639
800	4.596	34.285	27.177	90.1	97.9	1.742
900	4.005	34.317	27.265	81.8	89.4	1.835
1000	3.429	34.356	27.353	73.4	80.6	1.919

Station	Latitude	Longitude	Date	Time	Depth
5	33-54.9 N 33-54.7 N	141-15.0 E 141-15.3 E	JUL.08, 1977	12:04 12:58	5000

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	25.516	34.365	22.725	513.9	513.6	0.0
10	25.526	34.396	22.746	511.9	512.0	0.051
20	25.528	34.401	22.749	511.6	512.1	0.102
30	25.472	34.451	22.804	506.4	507.3	0.153
50	25.223	34.484	22.905	496.7	498.3	0.254
75	24.224	34.646	23.328	456.4	459.0	0.374
100	23.189	34.667	23.647	425.8	429.3	0.485
125	22.107	34.710	23.988	393.4	397.7	0.588
150	21.596	34.743	24.154	377.4	382.6	0.685
200	20.064	34.721	24.551	339.6	346.3	0.869
250	18.054	34.690	25.040	293.0	300.9	1.029
300	14.813	34.569	25.699	230.4	238.6	1.167
400	10.752	34.372	26.350	168.5	177.1	1.371
500	7.942	34.261	26.723	133.1	141.3	1.530
600	6.296	34.253	26.946	112.0	119.9	1.658
700	5.450	34.247	27.048	102.4	110.4	1.774
800	4.630	34.244	27.140	93.6	101.4	1.879
900	4.000	34.290	27.244	83.7	91.3	1.976
1000	3.673	34.345	27.321	76.5	84.2	2.065

Station	Latitude	Longitude	Date	Time	Depth
6	33-42.1 N 33-42.9 N	141-33.3 E 141-33.8 E	JUL.08, 1977	23:16 00:20	7100

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	25.669	34.374	22.685	517.7	517.4	0.0
10	25.671	34.401	22.705	515.8	515.9	0.051
20	25.616	34.419	22.735	512.9	513.4	0.103
30	25.574	34.435	22.761	510.5	511.3	0.154
50	24.228	34.581	23.278	461.1	462.7	0.252
75	22.825	34.674	23.757	415.4	417.9	0.361
100	21.581	34.738	24.155	377.4	380.7	0.461
125	20.589	34.768	24.448	349.5	353.7	0.552
150	20.298	34.770	24.527	342.0	346.9	0.639
200	18.560	34.718	24.936	303.0	309.3	0.802
250	17.454	34.719	25.209	277.0	284.8	0.950
300	15.875	34.651	25.527	246.8	255.5	1.086
400	13.195	34.496	25.983	203.4	213.6	1.322
500	9.611	34.291	26.484	155.8	165.5	1.505
600	6.962	34.163	26.786	127.2	135.8	1.654
700	5.524	34.187	26.991	107.7	115.8	1.780
800	4.304	34.133	27.088	98.6	105.7	1.891
900	4.403	34.289	27.201	87.8	96.2	1.992
1000	3.840	34.328	27.291	79.3	87.4	2.084

Station	Latitude	Longitude	Date	Time	Depth
7	33-27.0 N 33-27.1 N	141-52.9 E 141-53.0 E	JUL.09, 1977	03:16 04:05	8200

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	24.183	34.329	23.101	478.0	477.7	0.0
10	23.994	34.341	23.165	471.8	471.9	0.047
20	23.010	34.469	23.549	435.2	435.6	0.092
30	21.924	34.515	23.891	402.5	403.3	0.134
50	21.124	34.681	24.237	369.6	371.0	0.211
75	19.873	34.748	24.622	333.0	335.3	0.299
100	19.061	34.760	24.841	312.0	315.1	0.380
125	18.589	34.763	24.963	300.5	304.3	0.458
150	18.292	34.752	25.029	294.2	298.8	0.533
200	17.474	34.747	25.226	275.4	281.6	0.677
250	16.930	34.734	25.346	264.0	271.6	0.815
300	16.490	34.699	25.422	256.7	265.7	0.949
400	15.036	34.614	25.685	231.7	243.0	1.205
500	11.973	34.391	26.141	188.4	200.1	1.427
600	8.964	34.202	26.520	152.4	163.3	1.607
700	6.529	34.125	26.815	124.4	133.9	1.754
800	5.211	34.124	26.979	108.8	117.5	1.879
900	4.284	34.182	27.128	94.7	102.7	1.989
1000	3.792	34.238	27.224	85.6	93.5	2.088

Station	Latitude	Longitude	Date	Time	Depth
8	33-14.6 N 33-15.0 N	142-10.9 E 142-11.5 E	JUL.09, 1977	08:55 09:49	8500

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	24.630	34.335	22.972	490.3	490.0	0.0
10	24.613	34.351	22.989	488.6	488.7	0.048
20	23.379	34.409	23.397	449.7	450.1	0.095
30	21.748	34.620	24.019	390.3	391.1	0.138
50	19.895	34.700	24.579	336.9	338.4	0.209
75	18.841	34.748	24.888	307.6	309.9	0.290
100	18.341	34.753	25.017	295.2	298.3	0.366
125	17.965	34.764	25.119	285.7	289.5	0.439
150	17.662	34.752	25.183	279.5	284.0	0.511
200	17.114	34.697	25.273	270.9	276.9	0.651
250	16.901	34.713	25.336	264.9	272.5	0.788
300	16.547	34.727	25.430	256.0	265.0	0.922
400	15.381	34.635	25.625	237.4	248.9	1.179
500	12.900	34.445	26.002	201.6	214.1	1.412
600	10.242	34.281	26.370	166.7	179.0	1.607
700	7.480	34.158	26.710	134.4	145.2	1.769
800	5.127	33.978	26.873	118.9	127.3	1.905
900	4.921	34.175	27.053	101.8	111.1	2.024
1000	3.984	34.205	27.178	90.0	98.2	2.128

Station	Latitude	Lontitude	Date	Time	Depth
9	33-00.0 N 33-00.8 N	142-29.8 E 142-30.4 E	JUL.09, 1977	16:17 17:05	7480

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	24.682	34.336	22.957	491.7	491.4	0.0
10	24.683	34.365	22.979	489.7	489.7	0.049
20	24.573	34.335	22.989	488.7	489.1	0.098
30	23.494	34.456	23.400	449.4	450.3	0.145
50	21.519	34.638	24.096	383.0	384.5	0.228
75	20.090	34.685	24.517	342.9	345.3	0.319
100	19.261	34.722	24.761	319.6	322.8	0.402
125	18.529	34.750	24.968	300.0	303.9	0.481
150	18.147	34.766	25.075	289.8	294.4	0.555
200	17.423	34.736	25.229	275.1	281.2	0.699
250	16.970	34.732	25.334	265.1	272.6	0.837
300	16.614	34.720	25.408	258.0	267.0	0.972
400	15.849	34.668	25.545	245.0	256.7	1.235
500	14.072	34.538	25.834	217.5	230.9	1.480
600	11.145	34.328	26.246	178.5	191.7	1.691
700	8.415	34.181	26.589	145.8	157.9	1.867
800	5.640	33.970	26.806	125.3	134.5	2.013
900	4.058	33.973	26.987	108.2	115.4	2.137
1000	4.159	34.143	27.111	96.4	104.9	2.245

Station	Latitude	Lontitude	Date	Time	Depth
10	32-47.1 N 32-47.5 N	141-45.2 E 141-45.0 E	JUL.10, 1977	05:31 06:18	7000

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	25.203	34.313	22.782	508.4	508.1	0.0
10	25.173	34.341	22.812	505.5	505.6	0.050
20	24.463	34.323	23.013	486.4	486.9	0.100
30	22.741	34.362	23.545	435.6	436.4	0.146
50	20.228	34.723	24.509	343.6	345.1	0.222
75	19.021	34.739	24.836	312.6	314.9	0.305
100	18.235	34.732	25.027	294.3	297.3	0.381
125	17.794	34.755	25.154	282.3	286.1	0.454
150	17.456	34.752	25.233	274.7	279.2	0.524
200	16.982	34.734	25.333	265.2	271.3	0.662
250	16.546	34.732	25.434	255.6	263.0	0.796
300	16.190	34.714	25.502	249.1	257.9	0.926
400	15.040	34.627	25.694	230.9	242.1	1.177
500	13.264	34.496	25.968	204.8	217.6	1.408
600	9.891	34.246	26.402	163.6	175.6	1.604
700	7.436	34.134	26.697	135.6	146.4	1.764
800	5.504	34.108	26.931	113.4	122.5	1.898
900	4.555	34.143	27.069	100.4	108.9	2.013
1000	3.977	34.219	27.190	88.9	97.2	2.116

Station	Latitude	Lontitude	Date	Time	Depth
11	32-35.0 N 32-34.8 N	141-00.5 E 141-00.7 E	JUL.10, 1977	09:46 10:39	2620

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	26.143	34.359	22.527	532.9	532.5	0.0
10	26.093	34.374	22.554	530.3	530.4	0.053
20	25.965	34.393	22.608	525.1	525.6	0.106
30	25.829	34.376	22.637	522.3	523.2	0.158
50	23.696	34.522	23.390	450.3	451.9	0.254
75	22.299	34.695	23.922	399.7	402.1	0.362
100	21.494	34.727	24.170	375.9	379.2	0.459
125	20.704	34.752	24.405	353.6	357.8	0.552
150	20.296	34.746	24.509	343.7	348.6	0.640
200	19.156	34.774	24.828	313.3	319.8	0.806
250	18.070	34.743	25.077	289.6	297.5	0.961
300	17.252	34.725	25.262	272.0	281.2	1.106
400	15.142	34.618	25.665	233.6	244.9	1.372
500	12.583	34.458	26.075	194.7	206.9	1.599
600	9.310	34.299	26.540	150.5	161.9	1.786
700	7.394	34.226	26.776	128.2	138.9	1.936
800	5.870	34.202	26.961	110.6	120.4	2.067
900	4.294	34.171	27.119	95.6	103.6	2.179
1000	3.757	34.240	27.229	85.2	93.0	2.277

Station	Latitude	Lontitude	Date	Time	Depth
12	32-21.5 N 32-21.8 N	140-15.0 E 140-14.9 E	JUL.10, 1977	15:19 16:05	1850

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	25.679	34.284	22.615	524.4	524.1	0.0
10	25.639	34.271	22.617	524.2	524.3	0.052
20	24.617	34.313	22.959	491.5	492.0	0.103
30	23.963	34.436	23.247	464.1	464.9	0.151
50	22.653	34.587	23.740	417.0	418.5	0.239
75	22.091	34.685	23.973	394.8	397.3	0.341
100	21.316	34.714	24.210	372.1	375.4	0.437
125	20.764	34.753	24.389	355.1	359.3	0.529
150	20.015	34.767	24.599	335.1	340.0	0.616
200	19.201	34.760	24.805	315.4	321.9	0.783
250	18.269	34.732	25.019	295.1	303.0	0.939
300	17.472	34.740	25.220	275.9	285.2	1.085
400	16.064	34.678	25.504	248.9	260.7	1.362
500	13.590	34.497	25.903	211.0	224.0	1.608
600	10.267	34.355	26.423	161.7	174.1	1.808
700	7.440	34.253	26.791	126.7	137.6	1.965
800	5.362	34.267	27.074	99.9	108.9	2.086
900	4.304	34.301	27.221	86.0	94.1	2.187
1000	3.740	34.345	27.314	77.1	85.0	2.276

Station	Latitude	Lontitude	Date	Time	Depth
13	32-08.4 N 32-08.1 N	139-29.8 E 139-29.9 E	JUL.10, 1977	19:54 22:42	1240

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	25.796	34.215	22.527	532.9	532.6	0.0
10	25.772	34.215	22.534	532.2	532.2	0.053
20	25.032	34.263	22.797	507.0	507.5	0.105
30	24.588	34.345	22.992	488.3	489.2	0.155
50	23.715	34.568	23.419	447.6	449.2	0.248
75	22.367	34.730	23.930	398.9	401.4	0.354
100	21.651	34.757	24.150	377.9	381.2	0.451
125	21.077	34.744	24.298	363.8	368.0	0.545
150	20.244	34.767	24.539	340.8	345.8	0.634
200	19.289	34.772	24.792	316.7	323.2	0.800
250	18.645	34.761	24.947	301.9	309.9	0.959
300	17.542	34.739	25.203	277.6	286.9	1.109
400	15.542	34.627	25.583	241.4	252.9	1.381
500	13.558	34.509	25.918	209.6	222.6	1.616
600	10.564	34.314	26.339	169.6	182.3	1.819
700	8.042	34.227	26.682	137.0	148.7	1.985
800	5.946	34.255	26.993	107.6	117.6	2.115
900	4.510	34.296	27.195	88.4	97.0	2.220
1000	3.993	34.335	27.281	80.3	88.8	2.312

Station	Latitude	Lontitude	Date	Time	Depth
14	32-01.0 N 32-01.6 N	138-58.3 E 138-58.0 E	JUL.11, 1977	00:15 01:05	1990

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	25.325	34.256	22.702	516.1	515.8	0.0
10	25.204	34.270	22.749	511.6	511.6	0.051
20	24.450	34.340	23.030	484.8	485.2	0.101
30	23.821	34.395	23.257	463.0	463.9	0.148
50	22.623	34.591	23.752	415.8	417.4	0.236
75	21.919	34.639	23.987	393.5	396.0	0.338
100	21.162	34.687	24.231	370.1	373.4	0.434
125	20.232	34.727	24.512	343.5	347.6	0.524
150	19.452	34.758	24.739	321.7	326.5	0.608
200	18.759	34.759	24.917	304.8	311.2	0.768
250	18.101	34.746	25.071	290.1	298.0	0.920
300	17.371	34.729	25.236	274.4	283.7	1.066
400	15.895	34.680	25.544	245.2	256.9	1.336
500	13.309	34.505	25.966	205.0	217.8	1.573
600	10.421	34.343	26.387	165.1	177.6	1.770
700	8.064	34.213	26.667	138.4	150.1	1.934
800	6.294	34.180	26.889	117.4	127.9	2.074
900	4.587	34.206	27.115	96.0	104.6	2.190
1000	4.162	34.329	27.258	82.4	91.3	2.288

Station	Latitude	Lontitude	Date	Time	Depth
15	31-54.3 N 31-53.8 N	138-40.0 E 138-40.0 E	JUL.11, 1977	02:41 03:26	2400

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.135	34.306	22.173	566.7	566.4	0.0
10	26.649	34.334	22.349	549.8	549.9	0.055
20	26.068	34.391	22.574	528.3	528.8	0.109
30	25.440	34.210	22.632	522.8	523.6	0.162
50	24.003	34.617	23.372	452.1	453.7	0.258
75	22.692	34.718	23.828	408.6	411.1	0.366
100	21.837	34.755	24.097	382.9	386.3	0.465
125	21.061	34.760	24.314	362.3	366.5	0.560
150	20.479	34.746	24.460	348.3	353.3	0.650
200	19.203	34.766	24.809	315.0	321.5	0.816
250	18.190	34.759	25.059	291.2	299.2	0.971
300	17.427	34.744	25.234	274.6	283.9	1.116
400	15.723	34.666	25.572	242.5	254.1	1.384
500	13.294	34.504	25.968	204.8	217.6	1.622
600	10.416	34.333	26.380	165.7	178.3	1.822
700	8.146	34.216	26.658	139.4	151.1	1.986
800	6.162	34.173	26.901	116.3	126.6	2.123
900	5.029	34.226	27.081	99.2	108.7	2.240
1000	4.422	34.309	27.215	86.5	95.9	2.342

Station	Latitude	Lontitude	Date	Time	Depth
16	31-45.8 N 31-46.1 N	138-09.4 E 138-08.9 E	JUL.11, 1977	06:11 06:55	3700

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.114	34.299	22.175	566.5	566.2	0.0
10	27.134	34.329	22.191	565.0	565.1	0.056
20	27.135	34.313	22.179	566.1	566.6	0.113
30	25.798	34.377	22.648	521.3	522.1	0.167
50	24.140	34.613	23.328	456.3	457.9	0.264
75	22.647	34.733	23.853	406.3	408.8	0.373
100	21.901	34.747	24.073	385.2	388.5	0.472
125	21.191	34.761	24.280	365.6	369.8	0.567
150	20.515	34.776	24.474	347.0	352.0	0.656
200	19.590	34.771	24.713	324.2	330.7	0.828
250	18.824	34.768	24.907	305.7	313.8	0.989
300	17.704	34.746	25.169	280.8	290.2	1.141
400	15.349	34.626	25.625	237.4	248.8	1.409
500	13.041	34.484	26.004	201.4	214.0	1.643
600	10.284	34.317	26.391	164.7	177.1	1.837
700	7.970	34.231	26.696	135.7	147.3	1.999
800	5.984	34.170	26.921	114.4	124.4	2.134
900	4.901	34.178	27.057	101.5	110.7	2.250
1000	4.282	34.296	27.219	86.1	95.2	2.354

Station	Latitude	Lontitude	Date	Time	Depth
17	31-37.1 N 31-38.9 N	137-39.9 E 137-39.6 E	JUL.11, 1977	14:15 15:04	3200

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.168	34.295	21.831	599.4	599.1	0.0
10	28.118	34.335	21.877	595.0	595.1	0.059
20	27.551	34.441	22.141	569.7	570.3	0.118
30	26.433	34.573	22.597	526.1	527.0	0.172
50	24.707	34.801	23.300	458.9	460.6	0.270
75	23.183	34.801	23.750	416.1	418.6	0.380
100	22.387	34.829	23.999	392.3	395.7	0.481
125	21.647	34.856	24.227	370.6	374.9	0.578
150	20.817	34.849	24.448	349.5	354.5	0.669
200	19.397	34.800	24.786	317.3	323.8	0.838
250	18.319	34.779	25.043	292.8	300.8	0.994
300	16.726	34.725	25.386	260.1	269.2	1.136
400	13.596	34.534	25.930	208.4	218.8	1.381
500	10.308	34.288	26.364	167.3	177.6	1.580
600	8.593	34.293	26.650	140.1	150.8	1.743
700	6.424	34.235	26.916	114.9	124.3	1.879
800	5.184	34.275	27.102	97.3	106.0	1.994
900	4.571	34.332	27.217	86.4	95.1	2.094
1000	4.076	34.368	27.298	78.6	87.3	2.186

Station	Latitude	Lontitude	Date	Time	Depth
18	31-24.4 N 31-24.9 N	136-59.3 E 136-58.2 E	JUL.11, 1977	18:50 19:39	4000

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.412	34.167	21.980	585.1	584.8	0.0
10	27.390	34.182	21.999	583.4	583.5	0.058
20	26.058	34.107	22.364	548.5	548.9	0.115
30	24.702	34.201	22.849	502.0	502.9	0.167
50	22.382	34.376	23.657	424.8	426.4	0.261
75	20.657	34.598	24.300	363.6	366.0	0.359
100	19.440	34.601	24.623	332.8	335.9	0.447
125	18.297	34.656	24.955	301.3	305.1	0.526
150	17.359	34.597	25.138	283.7	288.2	0.600
200	15.704	34.613	25.536	245.9	251.6	0.733
250	14.466	34.575	25.778	222.9	229.6	0.854
300	12.563	34.464	26.084	193.8	201.1	0.961
400	8.920	34.284	26.591	145.7	152.9	1.138
500	7.109	34.269	26.850	121.1	128.5	1.277
600	5.636	34.233	27.014	105.6	112.7	1.397
700	5.009	34.327	27.163	91.4	98.9	1.502
800	4.124	34.357	27.285	79.9	86.9	1.594
900	3.634	34.387	27.358	73.0	79.9	1.677
1000	3.336	34.401	27.398	69.1	76.2	1.755

Station	Latitude	Lontitude	Date	Time	Depth
19	31-18.5 N 31-19.1 N	136-40.0 E 136-37.7 E	JUL.11, 1977	23:31 00:19	4400

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.016	34.037	22.010	582.3	582.0	0.0
10	27.013	34.068	22.034	580.0	580.1	0.058
20	26.228	33.942	22.187	565.4	565.9	0.115
30	23.371	34.121	23.182	470.2	471.1	0.167
50	21.684	34.450	23.908	400.9	402.4	0.253
75	19.646	34.438	24.445	349.8	352.1	0.347
100	18.200	34.548	24.896	306.8	309.8	0.428
125	16.867	34.594	25.253	272.9	276.6	0.501
150	16.046	34.584	25.436	255.4	259.6	0.568
200	14.739	34.602	25.740	226.5	231.9	0.690
250	13.395	34.508	25.951	206.4	212.8	0.803
300	11.874	34.435	26.194	183.4	190.3	0.904
400	8.654	34.310	26.653	139.8	146.9	1.068
500	6.772	34.244	26.876	118.6	125.7	1.203
600	5.467	34.299	27.087	98.6	105.6	1.317
700	4.686	34.319	27.193	88.6	95.5	1.418
800	4.049	34.368	27.301	78.4	85.3	1.508
900	3.505	34.379	27.364	72.4	79.1	1.590
1000	3.215	34.413	27.419	67.2	74.0	1.667

Station	Latitude	Lontitude	Date	Time	Depth
20	31-12.4 N 31-12.2 N	136-19.2 E 136-18.2 E	JUL.12, 1977	01:51 02:37	4300

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.145	34.056	21.983	584.9	584.6	0.0
10	26.643	34.057	22.143	569.6	569.7	0.057
20	25.363	34.167	22.624	523.6	524.0	0.112
30	23.499	34.143	23.161	472.2	473.0	0.162
50	21.080	34.381	24.021	390.1	391.6	0.247
75	19.132	34.543	24.658	329.6	331.8	0.337
100	17.949	34.589	24.989	297.9	300.9	0.415
125	17.015	34.609	25.229	275.2	278.8	0.488
150	15.827	34.585	25.486	250.6	254.8	0.554
200	14.853	34.621	25.730	227.4	232.9	0.675
250	13.026	34.515	26.031	198.8	205.0	0.785
300	11.090	34.423	26.330	170.5	177.0	0.880
400	7.994	34.256	26.712	134.2	140.8	1.040
500	6.291	34.247	26.943	112.3	118.9	1.168
600	5.205	34.274	27.099	97.5	104.1	1.280
700	4.618	34.334	27.213	86.7	93.6	1.378
800	3.936	34.361	27.307	77.8	84.5	1.467
900	3.576	34.378	27.357	73.1	79.9	1.549
1000	3.247	34.420	27.421	67.0	73.8	1.626

Station	Latitude	Lontitude	Date	Time	Depth
21	31-06.0 N 31-05.4 N	136-00.4 E 136-00.3 E	JUL.12, 1977	06:51 07:37	4420

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.352	34.015	21.886	594.2	593.9	0.0
10	27.012	33.866	21.883	594.5	594.6	0.059
20	24.672	34.006	22.712	515.1	515.6	0.114
30	23.824	34.081	23.020	485.7	486.6	0.165
50	22.448	34.379	23.641	426.4	427.9	0.255
75	20.596	34.444	24.200	373.2	375.6	0.355
100	19.127	34.569	24.679	327.4	330.5	0.443
125	17.901	34.614	25.020	295.1	298.9	0.522
150	16.995	34.613	25.237	274.3	278.7	0.593
200	15.218	34.613	25.644	235.6	241.2	0.721
250	14.003	34.579	25.880	213.2	219.8	0.836
300	12.252	34.438	26.124	190.1	197.2	0.941
400	9.355	34.376	26.593	145.5	153.1	1.116
500	6.810	34.251	26.877	118.6	125.7	1.256
600	5.534	34.257	27.046	102.6	109.5	1.373
700	4.823	34.281	27.148	92.9	100.0	1.476
800	3.840	34.291	27.261	82.1	88.6	1.569
900	3.693	34.376	27.343	74.4	81.4	1.653
1000	3.327	34.410	27.406	68.4	75.4	1.732

Station	Latitude	Lontitude	Date	Time	Depth
22	30-59.8 N 30-58.3 N	135-41.2 E 135-40.5 E	JUL.12, 1977	10:25 11:13	3650

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.754	34.150	21.857	596.9	596.6	0.0
10	27.689	34.191	21.909	592.0	592.0	0.059
20	27.153	34.163	22.060	577.5	578.0	0.117
30	25.761	34.307	22.607	525.2	526.1	0.173
50	24.419	34.456	23.126	475.5	477.1	0.274
75	23.001	34.601	23.651	425.5	428.0	0.386
100	21.508	34.602	24.072	385.3	388.6	0.488
125	20.604	34.714	24.403	353.9	358.0	0.581
150	19.147	34.594	24.693	326.1	330.9	0.667
200	16.949	34.657	25.281	270.1	276.1	0.818
250	15.294	34.609	25.624	237.5	244.5	0.947
300	13.629	34.540	25.927	208.7	216.5	1.062
400	10.477	34.382	26.407	163.1	171.5	1.254
500	8.132	34.280	26.710	134.4	142.8	1.411
600	6.270	34.217	26.922	114.3	122.2	1.543
700	4.952	34.226	27.090	98.4	105.7	1.656
800	4.427	34.316	27.220	86.1	93.6	1.756
900	3.943	34.354	27.301	78.4	85.9	1.845
1000	3.585	34.377	27.355	73.3	80.9	1.928

Station	Latitude	Lontitude	Date	Time	Depth
23	30-45.5 N 30-45.3 N	134-50.0 E 134-50.6 E	JUL.12, 1977	16:30 17:18	4410

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.210	34.331	21.844	598.2	597.9	0.0
10	28.251	34.353	21.847	597.9	598.0	0.059
20	28.035	34.226	21.823	600.2	600.7	0.119
30	26.433	34.359	22.436	541.5	542.4	0.176
50	24.973	34.647	23.103	477.7	479.4	0.278
75	23.388	34.811	23.698	421.1	423.6	0.390
100	22.001	34.758	24.054	387.0	390.4	0.492
125	21.048	34.777	24.331	360.7	364.9	0.587
150	20.346	34.765	24.510	343.5	348.5	0.675
200	19.092	34.784	24.852	311.0	317.5	0.841
250	18.089	34.782	25.102	287.2	295.1	0.994
300	17.028	34.751	25.335	265.0	274.1	1.136
400	14.884	34.632	25.732	227.2	238.4	1.392
500	12.152	34.446	26.149	187.6	199.5	1.610
600	9.673	34.290	26.473	156.8	168.6	1.794
700	7.530	34.303	26.816	124.3	135.3	1.945
800	6.056	34.309	27.022	104.8	115.1	2.071
900	4.932	34.338	27.181	89.7	99.2	2.178
1000	4.146	34.372	27.294	79.0	87.9	2.272

Station	Latitude	Lontitude	Date	Time	Depth
24	30-29.8 N 30-30.6 N	134-00.0 E 134-01.2 E	JUL.13, 1977	01:23 02:12	4470

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.668	34.341	21.701	611.9	611.6	0.0
10	28.639	34.367	21.730	609.1	609.2	0.061
20	27.969	34.442	22.007	582.6	583.1	0.120
30	26.962	34.514	22.385	546.4	547.3	0.177
50	24.718	34.659	23.190	469.4	471.1	0.278
75	23.375	34.755	23.659	424.8	427.3	0.391
100	22.223	34.799	24.022	390.0	393.4	0.492
125	21.590	34.827	24.220	371.3	375.5	0.589
150	20.879	34.825	24.413	352.8	357.9	0.680
200	19.313	34.793	24.801	315.8	322.3	0.849
250	18.536	34.787	24.994	297.5	305.5	1.007
300	17.572	34.772	25.220	275.9	285.3	1.155
400	15.578	34.671	25.608	239.0	250.5	1.422
500	12.753	34.465	26.047	197.4	209.7	1.653
600	10.162	34.320	26.414	162.5	174.8	1.845
700	7.813	34.241	26.727	132.8	144.2	2.004
800	6.052	34.211	26.945	112.1	122.3	2.137
900	5.471	34.346	27.123	95.2	105.7	2.250
1000	4.303	34.357	27.265	81.8	91.0	2.348

Station	Latitude	Longitude	Date	Time	Depth
25	31-06.0 N 31-06.9 N	134-22.7 E 134-24.2 E	JUL.13, 1977	09:05 09:57	4360

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.753	34.468	21.768	605.5	605.2	0.0
10	28.751	34.500	21.793	603.1	603.2	0.060
20	28.728	34.506	21.805	602.0	602.5	0.120
30	28.179	34.399	21.906	592.3	593.2	0.180
50	25.130	34.612	23.029	484.8	486.5	0.286
75	23.272	34.766	23.698	421.1	423.6	0.399
100	21.900	34.755	24.079	384.6	387.9	0.500
125	20.924	34.790	24.374	356.6	360.8	0.594
150	19.949	34.795	24.638	331.4	336.3	0.681
200	18.653	34.788	24.966	300.1	306.6	0.840
250	17.270	34.785	25.303	268.0	275.7	0.987
300	16.534	34.729	25.434	255.6	264.5	1.123
400	13.330	34.503	25.960	205.6	215.8	1.361
500	10.476	34.315	26.355	168.1	178.6	1.555
600	7.594	34.234	26.753	130.3	139.8	1.713
700	6.024	34.232	26.965	110.2	119.0	1.842
800	5.456	34.337	27.118	95.7	105.0	1.956
900	4.433	34.362	27.255	82.7	91.3	2.053
1000	3.828	34.373	27.327	75.9	84.0	2.141

Station	Latitude	Longitude	Date	Time	Depth
26	31-40.4 N 31-42.3 N	134-39.8 E 134-41.4 E	JUL.13, 1977	12:41 13:37	4350

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.715	34.437	21.757	606.5	606.2	0.0
10	28.706	34.467	21.782	604.1	604.2	0.060
20	28.519	34.433	21.819	600.6	601.1	0.120
30	27.858	34.497	22.084	575.2	576.2	0.179
50	24.593	34.664	23.231	465.6	467.2	0.284
75	22.889	34.765	23.807	410.7	413.2	0.394
100	21.743	34.774	24.137	379.0	382.4	0.493
125	20.620	34.802	24.465	347.9	352.0	0.584
150	19.885	34.804	24.661	329.1	334.1	0.670
200	18.793	34.804	24.943	302.4	308.8	0.832
250	17.410	34.784	25.268	271.3	279.1	0.978
300	15.558	34.688	25.626	237.3	246.0	1.109
400	12.214	34.446	26.138	188.7	198.3	1.331
500	9.225	34.391	26.626	142.4	151.8	1.509
600	6.259	34.240	26.941	112.5	120.3	1.641
700	5.324	34.321	27.122	95.4	103.3	1.753
800	4.304	34.305	27.224	85.7	92.9	1.851
900	4.041	34.366	27.300	78.5	86.2	1.940
1000	3.662	34.398	27.364	72.4	80.2	2.024

Station	Latitude	Longitude	Date	Time	Depth
27	32-00.8 N 32-02.6 N	134-53.3 E 134-54.5 E	JUL.13, 1977	15:55 16:52	4270

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.373	34.370	21.820	600.5	600.2	0.0
10	28.373	34.388	21.834	599.2	599.3	0.060
20	28.356	34.380	21.833	599.3	599.8	0.119
30	27.730	34.190	21.895	593.3	594.2	0.179
50	26.440	34.556	22.582	527.5	529.2	0.290
75	23.006	34.703	23.727	418.3	420.8	0.408
100	21.562	34.761	24.177	375.3	378.6	0.507
125	20.499	34.783	24.483	346.2	350.3	0.598
150	19.336	34.767	24.776	318.2	323.0	0.682
200	18.183	34.788	25.083	289.0	295.3	0.836
250	17.015	34.742	25.331	265.4	273.0	0.978
300	15.143	34.605	25.655	234.6	243.0	1.108
400	12.080	34.429	26.150	187.6	197.0	1.327
500	8.532	34.280	26.649	140.2	149.0	1.498
600	6.684	34.233	26.879	118.4	126.7	1.635
700	5.425	34.271	27.070	100.3	108.3	1.752
800	4.892	34.337	27.185	89.4	97.7	1.855
900	4.110	34.351	27.281	80.3	88.1	1.947
1000	3.705	34.412	27.371	71.7	79.7	2.031

Station	Latitude	Longitude	Date	Time	Depth
28	32-20.4 N 32-21.5 N	135-04.4 E 135-05.5 E	JUL.13, 1977	18:20 19:18	4800

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.001	34.321	21.905	592.4	592.1	0.0
10	27.999	34.341	21.921	590.9	591.0	0.059
20	27.930	34.351	21.951	588.0	588.5	0.118
30	27.148	34.326	22.185	565.6	566.5	0.175
50	25.756	34.534	22.779	508.8	510.4	0.284
75	23.297	34.700	23.640	426.6	429.1	0.400
100	21.402	34.712	24.185	374.5	377.8	0.500
125	19.806	34.657	24.570	337.9	341.9	0.589
150	19.555	34.662	24.640	331.2	336.0	0.673
200	17.573	34.766	25.215	276.4	282.5	0.827
250	16.203	34.674	25.469	252.3	259.6	0.962
300	14.944	34.591	25.687	231.5	239.8	1.087
400	10.889	34.438	26.378	165.9	174.6	1.293
500	8.475	34.278	26.656	139.5	148.2	1.454
600	6.866	34.268	26.882	118.0	126.7	1.592
700	5.887	34.325	27.056	101.6	110.4	1.712
800	4.567	34.321	27.208	87.2	94.9	1.815
900	3.999	34.358	27.298	78.6	86.3	1.906
1000	3.689	34.391	27.356	73.2	81.0	1.989

Station	Latitude	Longitude	Date	Time	Depth
29	32-41.6 N 39-43.0 N	135-14.5 E 135-16.8 E	JUL.13, 1977	20:58 22:00	3450

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	26.081	34.171	22.405	544.5	544.2	0.0
10	25.831	34.187	22.494	536.0	536.0	0.054
20	25.445	34.470	22.826	504.2	504.7	0.106
30	25.486	34.527	22.857	501.3	502.1	0.156
50	23.248	34.427	23.449	444.7	446.3	0.252
75	22.275	34.594	23.853	406.3	408.7	0.359
100	20.531	34.468	24.235	369.7	372.9	0.457
125	19.685	34.709	24.642	331.1	335.1	0.545
150	18.565	34.735	24.947	301.9	306.6	0.626
200	16.851	34.631	25.285	269.8	275.7	0.773
250	15.895	34.705	25.563	243.3	250.6	0.904
300	14.615	34.598	25.764	224.2	232.4	1.025
400	12.011	34.460	26.187	184.0	193.5	1.238
500	9.017	34.360	26.635	141.5	150.7	1.409
600	6.744	34.269	26.900	116.4	124.9	1.546
700	5.715	34.302	27.059	101.3	109.8	1.663
800	4.250	34.250	27.186	89.3	96.4	1.766
900	4.156	34.404	27.318	76.7	84.7	1.856
1000	3.428	34.388	27.379	71.0	78.3	1.938

Station	Latitude	Longitude	Date	Time	Depth
30	33-01.5 N 33-02.0 N	135-29.9 E 135-31.9 E	JUL.14, 1977	00:22 01:15	2350

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.810	34.383	22.014	582.0	581.7	0.0
10	27.804	34.407	22.034	580.0	580.1	0.058
20	27.254	34.313	22.141	569.7	570.2	0.115
30	25.695	34.325	22.640	522.0	522.9	0.170
50	24.398	34.653	23.281	460.8	462.4	0.268
75	22.443	34.644	23.843	407.3	409.7	0.377
100	20.937	34.724	24.320	361.6	364.9	0.476
125	20.171	34.767	24.558	339.0	343.1	0.564
150	19.588	34.761	24.706	324.8	329.7	0.648
200	18.373	34.763	25.017	295.3	301.6	0.805
250	16.980	34.703	25.310	267.4	275.0	0.949
300	15.587	34.652	25.592	240.6	249.2	1.080
400	12.075	34.477	26.188	184.0	193.5	1.305
500	9.026	34.311	26.595	145.3	154.5	1.478
600	7.000	34.287	26.879	118.3	127.2	1.618
700	5.594	34.312	27.081	99.2	107.5	1.734
800	4.555	34.339	27.224	85.7	93.5	1.834
900	3.982	34.386	27.322	76.4	84.0	1.923
1000	3.381	34.398	27.391	69.8	77.0	2.003

Station	Latitude	Longitude	Date	Time	Depth
31	33-20.4 N 33-20.1 N	135-43.0 E 135-46.0 E	JUL.14, 1977	07:23 08:28	1550

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.474	34.267	22.036	579.9	579.5	0.0
10	26.727	34.316	22.311	553.5	553.6	0.056
20	25.209	34.562	22.968	490.7	491.1	0.108
30	25.183	34.574	22.985	489.1	489.9	0.158
50	24.248	34.566	23.260	462.8	464.4	0.254
75	22.860	34.595	23.687	422.1	424.6	0.365
100	20.942	34.667	24.276	365.9	369.1	0.463
125	19.517	34.683	24.665	328.8	332.8	0.551
150	18.131	34.567	24.927	303.8	308.4	0.631
200	16.798	34.685	25.339	264.6	270.6	0.773
250	15.300	34.602	25.617	238.2	245.2	0.902
300	12.984	34.452	25.990	202.7	210.2	1.017
400	8.223	34.298	26.710	134.4	141.2	1.184
500	6.020	34.286	27.008	106.1	112.4	1.308
600	5.060	34.277	27.118	95.7	102.1	1.415
700	4.270	34.320	27.239	84.2	90.5	1.512
800	3.666	34.365	27.337	74.9	81.1	1.598
900	3.342	34.402	27.398	69.2	75.5	1.677
1000	3.078	34.429	27.445	64.8	71.3	1.752

Station	Latitude	Longitude	Date	Time	Depth
32	33-29.8 N 33-29.4 N	136-14.5 E 136-14.3 E	JUL.14 1977	18:45 19:31	1900

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	24.533	34.169	22.876	499.4	499.1	0.0
10	23.373	34.053	23.130	475.2	475.3	0.048
20	20.217	34.387	24.257	367.6	368.0	0.090
30	19.858	34.460	24.407	353.4	354.1	0.127
50	17.043	34.548	25.176	280.1	281.4	0.194
75	15.885	34.576	25.466	252.7	254.6	0.262
100	14.249	34.557	25.811	219.7	222.2	0.321
125	13.639	34.528	25.916	209.8	212.9	0.376
150	12.613	34.467	26.076	194.6	198.1	0.427
200	11.230	34.395	26.282	175.0	179.3	0.521
250	9.688	34.356	26.522	152.3	157.1	0.604
300	8.614	34.316	26.664	138.7	144.0	0.680
400	7.262	34.284	26.840	122.1	128.1	0.815
500	5.717	34.263	27.028	104.3	110.3	0.934
600	4.833	34.288	27.152	92.5	98.6	1.038
700	4.228	34.335	27.256	82.7	88.9	1.131
800	3.897	34.373	27.320	76.5	83.2	1.217
900	3.465	34.400	27.385	70.4	77.0	1.297
1000	3.191	34.423	27.429	66.2	72.9	1.371

Station	Latitude	Longitude	Date	Time	Depth
33	33-00.0 N 33-00.4 N	136-13.6 E 136-15.0 E	JUL.14, 1977	22:23 23:14	3550

Depth	Temp	Sal	σt	Δst	Δst	ΔD
0	27.973	34.349	21.935	589.5	589.2	0.0
10	27.338	34.336	22.131	570.7	570.8	0.058
20	25.893	34.445	22.669	519.2	519.7	0.112
30	25.163	34.435	22.886	498.5	499.4	0.163
50	23.572	34.653	23.525	437.5	439.1	0.256
75	21.962	34.727	24.041	388.4	390.8	0.359
100	20.903	34.761	24.358	358.0	361.3	0.453
125	19.807	34.770	24.656	329.7	333.8	0.541
150	18.933	34.777	24.886	307.7	312.5	0.622
200	17.728	34.774	25.184	279.3	285.5	0.771
250	16.807	34.743	25.381	260.6	268.2	0.909
300	15.771	34.692	25.581	241.6	250.3	1.039
400	12.753	34.448	26.034	198.6	208.5	1.269
500	9.990	34.348	26.465	157.7	167.8	1.456
600	7.310	34.287	26.835	122.5	131.7	1.604
700	5.637	34.258	27.034	103.7	112.0	1.725
800	4.850	34.333	27.186	89.3	97.5	1.830
900	3.930	34.326	27.280	80.3	87.8	1.923
1000	3.630	34.369	27.344	74.3	82.0	2.008

Station	Latitude	Longitude	Date	Time	Depth
34	32-30.2 N 32-30.6 N	136-14.3 E 136-14.3 E	JUL.15, 1977	04:00 04:48	4520

Depth	Temp	Sal	σt	Δst	Δst	ΔD
0	27.585	34.221	21.965	586.6	586.3	0.0
10	27.548	34.206	21.966	586.5	586.6	0.058
20	25.872	34.134	22.442	541.0	541.5	0.115
30	24.644	34.324	22.959	491.5	492.4	0.166
50	22.716	34.578	23.716	419.3	420.8	0.257
75	21.520	34.738	24.172	375.8	378.3	0.357
100	20.874	34.766	24.369	357.0	360.2	0.449
125	19.928	34.768	24.623	332.9	336.9	0.536
150	19.209	34.767	24.808	315.1	320.0	0.618
200	18.122	34.746	25.066	290.6	296.9	0.772
250	17.126	34.742	25.305	267.9	275.5	0.914
300	16.447	34.715	25.444	254.6	263.6	1.048
400	14.521	34.602	25.788	222.0	232.9	1.297
500	10.995	34.349	26.290	174.3	185.2	1.509
600	8.003	34.239	26.697	135.6	145.5	1.676
700	6.183	34.240	26.951	111.6	120.7	1.807
800	5.350	34.270	27.078	99.5	108.6	1.921
900	4.741	34.290	27.165	91.3	100.3	2.027
1000	4.248	34.318	27.241	84.1	93.1	2.123

Station	Latitude	Longitude	Date	Time	Depth
35	31-59.5 N 31-59.2 N	136-12.2 E 136-11.3 E	JUL.15, 1977	12:13 13:15	4310

Depth	Temp	Sal	σt	Δst	Δst	ΔD
0	27.983	34.273	21.875	595.3	595.0	0.0
10	27.969	34.273	21.879	594.8	594.9	0.059
20	27.563	34.220	21.972	586.0	586.5	0.118
30	26.255	34.396	22.520	533.5	534.4	0.174
50	25.164	34.488	22.926	494.7	496.3	0.278
75	23.504	34.669	23.557	434.5	437.1	0.394
100	22.387	34.686	23.891	402.6	406.0	0.499
125	21.092	34.671	24.238	369.5	373.7	0.596
150	20.026	34.702	24.547	340.0	344.9	0.686
200	17.966	34.635	25.020	295.0	301.2	0.847
250	16.259	34.618	25.413	257.6	264.9	0.988
300	14.560	34.593	25.773	223.4	231.6	1.112
400	11.921	34.454	26.200	182.8	192.2	1.325
500	8.967	34.315	26.608	144.1	153.3	1.495
600	7.053	34.277	26.863	119.9	128.7	1.636
700	5.501	34.271	27.060	101.2	109.3	1.754
800	4.507	34.255	27.163	91.5	99.1	1.859
900	4.078	34.326	27.265	81.8	89.6	1.953
1000	3.623	34.351	27.331	75.6	83.2	2.039

Station	Latitude	Longitude	Date	Time	Depth
36	31-40.3 N 31-39.9 N	136-14.3 E 136-13.5 E	JUL.15, 1977	15:02 15:49	4140

Depth	Temp	Sal	σt	Δst	Δst	ΔD
0	27.872	34.127	21.802	602.3	602.0	0.0
10	27.838	34.122	21.809	601.6	601.6	0.060
20	27.210	34.062	21.966	586.5	587.0	0.119
30	24.726	34.266	22.891	498.0	498.8	0.173
50	22.744	34.468	23.624	428.0	429.5	0.266
75	21.161	34.497	24.087	383.9	386.3	0.369
100	19.867	34.530	24.458	348.5	351.7	0.460
125	18.916	34.612	24.766	319.3	323.2	0.545
150	18.117	34.605	24.960	300.7	305.3	0.623
200	16.090	34.631	25.462	252.9	258.7	0.762
250	14.516	34.589	25.779	222.8	229.6	0.884
300	12.987	34.495	26.024	199.5	207.0	0.994
400	10.171	34.381	26.460	158.1	166.3	1.180
500	7.523	34.267	26.790	126.8	134.6	1.329
600	6.044	34.252	26.979	108.9	116.5	1.454
700	5.147	34.319	27.140	93.6	101.2	1.563
800	4.492	34.335	27.227	85.3	93.0	1.660
900	3.879	34.359	27.311	77.4	84.8	1.748
1000	3.404	34.368	27.366	72.2	79.4	1.830

Station	Latitude	Longitude	Date	Time	Depth
37	31-20.0 N 31-19.6 N	136-16.0 E 136-16.0 E	JUL.15, 1977	17:37 18:24	3920

Depth	Temp	Sal	σt	Δst	Δst	ΔD
0	27.531	34.078	21.875	595.2	594.9	0.0
10	27.642	34.097	21.854	597.3	597.4	0.059
20	26.807	33.955	22.014	581.9	582.4	0.118
30	24.540	34.010	22.754	511.1	512.0	0.173
50	21.571	34.412	23.911	400.7	402.2	0.263
75	19.170	34.518	24.628	332.4	334.6	0.355
100	17.275	34.574	25.141	283.5	286.4	0.432
125	16.201	34.655	25.455	253.7	257.2	0.500
150	15.310	34.640	25.645	235.5	239.7	0.562
200	14.087	34.585	25.867	214.4	219.7	0.677
250	12.431	34.492	26.131	189.3	195.3	0.781
300	10.512	34.397	26.413	162.6	168.9	0.872
400	8.131	34.297	26.723	133.2	139.8	1.025
500	6.673	34.273	26.912	115.2	122.2	1.156
600	5.274	34.283	27.097	97.7	104.4	1.268
700	4.601	34.338	27.218	86.3	93.1	1.367
800	3.983	34.381	27.318	76.7	83.5	1.454
900	3.517	34.394	27.375	71.4	78.1	1.535
1000	3.252	34.421	27.422	66.9	73.8	1.611

Station	Latitude	Longitude	Date	Time	Depth
38	31-00.4 N 30-58.7 N	136-14.2 E 136-13.9 E	JUL.15, 1977	21:03 21:52	4800

Depth	Temp	Sal	σt	Δst	Δst	ΔD
0	27.627	34.083	21.848	597.8	597.5	0.0
10	26.953	34.015	22.013	582.0	582.1	0.059
20	24.054	34.141	22.997	487.9	488.3	0.112
30	21.453	34.345	23.892	402.4	403.2	0.157
50	19.158	34.570	24.671	328.2	329.6	0.229
75	17.157	34.580	25.173	280.5	282.6	0.306
100	15.710	34.618	25.538	245.7	248.4	0.371
125	14.902	34.599	25.703	230.1	233.4	0.432
150	14.138	34.584	25.856	215.5	219.4	0.488
200	12.706	34.476	26.065	195.6	200.4	0.594
250	10.868	34.401	26.352	168.3	173.7	0.686
300	9.537	34.317	26.516	152.8	158.5	0.769
400	7.501	34.273	26.797	126.1	132.3	0.914
500	6.014	34.279	27.004	106.5	112.9	1.034
600	5.149	34.313	27.136	94.0	100.6	1.140
700	4.221	34.350	27.268	81.5	87.7	1.233
800	3.798	34.377	27.334	75.3	81.7	1.318
900	3.385	34.403	27.395	69.4	75.9	1.397
1000	3.093	34.430	27.444	64.8	71.3	1.470

Station	Latitude	Longitude	Date	Time	Depth
39	30-39.5 N 30-38.7 N	136-14.6 E 136-14.8 E	JUL.16, 1977	00:12 00:57	4250

Depth	Temp	Sal	σt	Δst	Δst	ΔD
0	27.719	34.044	21.790	603.4	603.1	0.0
10	27.613	34.005	21.794	603.0	603.0	0.060
20	25.582	33.898	22.354	549.4	549.8	0.118
30	23.488	34.044	23.090	479.0	479.8	0.169
50	19.598	34.524	24.524	342.2	343.6	0.249
75	16.959	34.607	25.241	274.0	276.1	0.326
100	15.697	34.607	25.532	246.2	248.9	0.391
125	14.932	34.639	25.727	227.8	231.2	0.451
150	14.235	34.589	25.839	217.1	221.0	0.507
200	12.469	34.493	26.124	190.0	194.8	0.611
250	10.506	34.401	26.417	162.2	167.4	0.702
300	9.248	34.392	26.623	142.7	148.3	0.781
400	6.980	34.287	26.882	118.1	123.9	0.917
500	5.733	34.283	27.042	102.9	109.0	1.033
600	4.814	34.309	27.171	90.7	96.8	1.135
700	4.178	34.359	27.280	80.4	86.6	1.227
800	3.586	34.381	27.358	73.0	79.0	1.310
900	3.206	34.423	27.428	66.3	72.4	1.386
1000	3.038	34.451	27.466	62.7	69.2	1.457

Station	Latitude	Longitude	Date	Time	Depth
40	30-20.0 N 30-19.1 N	136-15.1 E 136-15.4 E	JUL.16, 1977	03:10 03:57	4220

Depth	Temp	Sal	σt	Δst	Δst	ΔD
0	27.436	34.059	21.892	593.6	593.3	0.0
10	27.533	34.060	21.861	596.5	596.6	0.059
20	26.409	34.085	22.237	560.5	561.0	0.117
30	24.442	34.030	22.799	506.9	507.7	0.170
50	19.910	34.460	24.394	354.6	356.1	0.254
75	17.326	34.566	25.122	285.4	287.5	0.333
100	16.190	34.640	25.446	254.5	257.2	0.400
125	15.265	34.601	25.625	237.5	240.9	0.463
150	14.564	34.579	25.761	224.5	228.5	0.521
200	12.999	34.511	26.034	198.6	203.5	0.629
250	11.441	34.441	26.279	175.3	180.8	0.725
300	9.760	34.384	26.532	151.3	157.2	0.810
400	6.574	34.257	26.913	115.1	120.6	0.946
500	5.266	34.250	27.072	100.1	105.6	1.058
600	4.744	34.309	27.179	89.9	95.9	1.158
700	4.013	34.344	27.285	79.8	85.8	1.249
800	3.570	34.387	27.364	72.4	78.4	1.331
900	3.255	34.418	27.419	67.1	73.3	1.407
1000	3.072	34.430	27.446	64.6	71.1	1.479

Station	Latitude	Longitude	Date	Time	Depth
41	29-59.4 N 29-58.8 N	136-15.6 E 136-16.2 E	JUL.16, 1977	07:32 08:22	4360

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.734	34.126	21.846	598.1	597.8	0.0
10	27.718	34.129	21.853	597.3	597.4	0.059
20	26.846	33.989	22.028	580.6	581.1	0.118
30	23.953	34.097	22.994	488.2	489.0	0.172
50	21.577	34.425	23.919	399.9	401.4	0.260
75	18.968	34.454	24.631	332.1	334.3	0.351
100	17.506	34.583	25.092	288.2	291.1	0.429
125	16.147	34.590	25.417	257.3	260.8	0.498
150	15.373	34.592	25.593	240.4	244.5	0.561
200	14.173	34.573	25.840	217.0	222.3	0.677
250	12.353	34.480	26.137	188.8	194.7	0.782
300	10.274	34.371	26.434	160.6	166.7	0.873
400	7.400	34.270	26.810	124.9	131.1	1.019
500	5.850	34.211	26.970	109.7	115.8	1.143
600	5.154	34.298	27.123	95.2	101.7	1.251
700	4.411	34.341	27.241	84.1	90.6	1.346
800	3.875	34.360	27.313	77.2	83.8	1.433
900	3.469	34.395	27.380	70.8	77.5	1.514
1000	3.187	34.405	27.415	67.6	74.3	1.589

Station	Latitude	Longitude	Date	Time	Depth
42	29-29.5 N 29-28.8 N	136-15.6 E 136-17.0 E	JUL.16, 1977	12:59 13:45	4630

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.081	34.321	21.879	594.8	594.5	0.0
10	28.049	34.309	21.880	594.7	594.8	0.059
20	27.526	34.217	21.982	585.0	585.5	0.118
30	25.840	34.199	22.501	535.3	536.2	0.174
50	23.748	34.397	23.280	460.9	462.5	0.275
75	21.686	34.385	23.857	405.9	408.3	0.384
100	20.104	34.487	24.363	357.6	360.7	0.479
125	19.127	34.624	24.720	323.6	327.5	0.565
150	17.840	34.602	25.026	294.4	299.0	0.643
200	15.885	34.597	25.483	250.9	256.7	0.781
250	14.404	34.593	25.806	220.2	226.9	0.902
300	12.807	34.503	26.065	195.6	203.0	1.010
400	9.917	34.373	26.497	154.6	162.6	1.192
500	7.121	34.256	26.837	122.3	129.7	1.338
600	5.962	34.273	27.005	106.4	113.9	1.460
700	4.978	34.321	27.161	91.6	99.0	1.566
800	4.239	34.346	27.264	81.9	89.1	1.660
900	3.689	34.375	27.343	74.4	81.4	1.744
1000	3.357	34.406	27.400	69.0	76.1	1.824

Station	Latitude	Longitude	Date	Time	Depth
43	29-00.5 N 29-00.5 N	136-15.0 E 136-16.0 E	JUL.16, 1977	17:03 17:51	4550

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.443	34.250	21.707	611.3	611.0	0.0
10	28.365	34.265	21.744	607.8	607.9	0.061
20	27.877	34.161	21.826	600.0	600.5	0.121
30	26.324	34.396	22.498	535.6	536.4	0.178
50	25.292	34.450	22.858	501.2	502.8	0.282
75	23.606	34.650	23.513	438.7	441.3	0.400
100	22.441	34.684	23.874	404.2	407.6	0.505
125	20.984	34.622	24.230	370.3	374.5	0.604
150	19.952	34.718	24.579	337.0	341.9	0.693
200	18.366	34.745	25.005	296.4	302.7	0.854
250	16.496	34.680	25.406	258.3	265.7	0.997
300	15.133	34.599	25.652	234.8	243.3	1.124
400	11.902	34.441	26.193	183.5	192.8	1.342
500	9.035	34.272	26.563	148.3	157.5	1.516
600	7.353	34.285	26.828	123.2	132.4	1.659
700	5.817	34.287	27.034	103.6	112.3	1.783
800	4.943	34.319	27.164	91.3	99.7	1.887
900	4.190	34.364	27.283	80.1	88.1	1.982
1000	3.610	34.394	27.366	72.2	79.8	2.066

Station	Latitude	Longitude	Date	Time	Depth
44	28-30.1 N 28-29.5 N	136-16.2 E 136-16.9 E	JUL.16, 1977	20:25 21:19	4400

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.586	34.436	21.799	602.5	602.2	0.0
10	28.565	34.448	21.815	601.0	601.1	0.060
20	27.269	34.152	22.015	581.8	582.3	0.119
30	26.239	34.372	22.507	534.8	535.6	0.175
50	25.029	34.570	23.029	484.9	486.5	0.277
75	23.244	34.665	23.630	427.6	430.1	0.392
100	21.860	34.706	24.053	387.1	390.4	0.494
125	20.793	34.745	24.375	356.5	360.6	0.587
150	20.263	34.753	24.523	342.3	347.3	0.676
200	19.009	34.784	24.873	309.0	315.5	0.840
250	17.958	34.779	25.132	284.3	292.2	0.993
300	16.997	34.752	25.343	264.3	273.4	1.134
400	15.075	34.649	25.703	230.0	241.3	1.391
500	12.734	34.485	26.066	195.5	207.9	1.616
600	9.398	34.291	26.520	152.5	164.0	1.802
700	7.280	34.298	26.849	121.2	131.9	1.950
800	5.640	34.270	27.043	102.8	112.3	2.072
900	4.668	34.308	27.187	89.2	98.1	2.178
1000	4.085	34.344	27.278	80.5	89.2	2.272

Station	Latitude	Longitude	Date	Time	Depth
45	27-59.6 N 27-59.2 N	136-15.0 E 136-15.3 E	JUL.17, 1977	03:52 04:42	4600

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.660	34.313	21.683	613.7	613.4	0.0
10	28.168	34.333	21.859	596.7	596.8	0.060
20	27.867	34.364	21.981	585.1	585.6	0.119
30	27.124	34.387	22.238	560.5	561.4	0.177
50	24.366	34.705	23.330	456.1	457.7	0.277
75	22.521	34.743	23.896	402.2	404.7	0.384
100	21.423	34.779	24.230	370.3	373.6	0.481
125	20.886	34.783	24.379	356.1	360.3	0.573
150	20.322	34.765	24.517	342.9	347.9	0.662
200	19.210	34.781	24.819	314.1	320.7	0.828
250	18.676	34.767	24.944	302.2	310.3	0.985
300	17.791	34.785	25.177	280.0	289.4	1.135
400	15.922	34.683	25.540	245.5	257.2	1.408
500	13.376	34.507	25.954	206.1	219.0	1.645
600	10.585	34.342	26.357	167.9	180.6	1.845
700	7.795	34.231	26.722	133.3	144.6	2.006
800	6.272	34.265	26.959	110.7	121.3	2.138
900	5.037	34.293	27.133	94.3	103.9	2.250
1000	4.307	34.374	27.278	80.5	89.8	2.347

Station	Latitude	Longitude	Date	Time	Depth
46	27-01.2 N 27-01.6 N	133-59.3 E 133-59.1 E	JUL.17, 1977	22:26 23:17	4750

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.767	34.299	21.636	618.1	617.8	0.0
10	28.557	34.350	21.744	607.8	607.9	0.061
20	27.480	34.308	22.064	577.1	577.6	0.120
30	26.309	34.467	22.556	530.0	530.9	0.176
50	23.691	34.746	23.561	434.1	435.7	0.271
75	22.086	34.781	24.047	387.7	390.2	0.374
100	21.227	34.815	24.311	362.5	365.9	0.468
125	20.494	34.809	24.504	344.2	348.3	0.558
150	19.894	34.792	24.650	330.2	335.1	0.643
200	18.913	34.793	24.904	306.0	312.5	0.804
250	18.313	34.790	25.052	291.9	299.9	0.958
300	17.393	34.761	25.255	272.6	281.9	1.103
400	15.579	34.683	25.617	238.2	249.7	1.367
500	12.799	34.492	26.058	196.2	208.7	1.598
600	10.290	34.328	26.398	164.0	176.5	1.789
700	8.037	34.252	26.702	135.2	146.8	1.948
800	6.486	34.342	26.992	107.7	118.7	2.078
900	5.071	34.233	27.081	99.2	108.8	2.192
1000	4.252	34.339	27.256	82.6	91.6	2.290

Station	Latitude	Longitude	Date	Time	Depth
47	25-59.7 N 25-59.8 N	132-00.7 E 132-00.5 E	JUL.18, 1977	11:15 12:04	3000

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.189	34.449	21.608	620.8	620.5	0.0
10	29.102	34.466	21.650	616.8	616.9	0.061
20	28.714	34.372	21.709	611.2	611.7	0.123
30	27.267	34.326	22.147	569.2	570.1	0.182
50	23.697	34.684	23.512	438.7	440.3	0.280
75	21.621	34.803	24.194	373.8	376.2	0.381
100	20.505	34.827	24.515	343.1	346.3	0.471
125	19.929	34.807	24.652	330.1	334.1	0.557
150	19.292	34.802	24.814	314.6	319.4	0.638
200	18.535	34.801	25.005	296.4	302.7	0.794
250	17.385	34.770	25.264	271.7	279.4	0.940
300	16.241	34.722	25.497	249.6	258.4	1.075
400	14.365	34.599	25.819	219.0	229.8	1.318
500	11.603	34.414	26.229	180.1	191.6	1.532
600	8.697	34.278	26.621	142.8	153.5	1.705
700	6.215	34.262	26.964	110.3	119.5	1.839
800	5.120	34.269	27.105	97.0	105.6	1.951
900	4.249	34.310	27.234	84.7	92.8	2.048
1000	3.724	34.384	27.346	74.1	82.0	2.134

Station	Latitude	Longitude	Date	Time	Depth
48	26-21.8 N 26-21.6 N	131-29.7 E 131-29.5 E	JUL.19, 1977	05:43 06:35	2810

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.366	34.471	21.565	624.9	624.6	0.0
10	28.968	34.433	21.670	614.9	615.0	0.062
20	26.973	34.462	22.343	550.5	551.0	0.120
30	25.238	34.581	22.974	490.1	491.0	0.172
50	23.220	34.755	23.704	420.4	421.9	0.263
75	21.590	34.798	24.197	373.4	375.8	0.363
100	20.684	34.791	24.440	350.2	353.5	0.453
125	19.960	34.801	24.640	331.2	335.3	0.540
150	19.462	34.804	24.771	318.7	323.5	0.622
200	18.817	34.801	24.935	303.1	309.5	0.779
250	18.091	34.776	25.097	287.7	295.6	0.930
300	17.120	34.761	25.321	266.4	275.5	1.072
400	14.837	34.627	25.739	226.6	237.7	1.330
500	11.945	34.404	26.156	186.9	198.7	1.547
600	9.396	34.292	26.520	152.4	163.9	1.727
700	7.291	34.262	26.819	124.1	134.8	1.875
800	5.593	34.255	27.037	103.4	112.8	1.997
900	4.763	34.321	27.186	89.3	98.4	2.101
1000	3.967	34.357	27.301	78.4	86.8	2.193

Station	Latitude	Longitude	Date	Time	Depth
49	26-43.5 N 26-42.8 N	131-00.5 E 130-59.8 E	JUL.19 1977	09:33 10:19	4300

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.159	34.448	21.617	620.0	619.7	0.0
10	29.134	34.448	21.625	619.2	619.3	0.062
20	28.873	34.483	21.739	608.3	608.8	0.123
30	26.721	34.552	22.490	536.3	537.2	0.180
50	24.386	34.651	23.284	460.5	462.1	0.279
75	22.371	34.772	23.960	396.0	398.5	0.386
100	21.342	34.797	24.266	366.8	370.1	0.482
125	20.590	34.806	24.477	346.8	351.0	0.572
150	20.064	34.797	24.609	334.1	339.0	0.658
200	19.012	34.795	24.881	308.3	314.7	0.822
250	17.945	34.790	25.143	283.3	291.1	0.973
300	16.719	34.748	25.405	258.3	267.4	1.112
400	14.552	34.595	25.776	223.1	234.1	1.363
500	11.539	34.360	26.198	183.0	194.3	1.578
600	8.524	34.224	26.606	144.3	154.7	1.751
700	7.143	34.205	26.794	126.4	136.8	1.898
800	5.664	34.247	27.021	104.9	114.4	2.023
900	4.841	34.311	27.169	90.9	100.1	2.130
1000	4.135	34.356	27.282	80.2	89.0	2.225

Station	Latitude	Longitude	Date	Time	Depth
50	27-06.8 N 27-07.3 N	130-30.4 E 130-30.3 E	JUL.19, 1977	14:15 15:00	5550

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.613	34.324	21.371	643.5	643.2	0.0
10	29.322	34.398	21.525	628.7	628.9	0.063
20	28.018	34.587	22.099	573.7	574.2	0.123
30	26.270	34.659	22.713	515.1	516.0	0.178
50	25.234	34.744	23.097	478.3	480.0	0.277
75	23.251	34.758	23.698	421.1	423.6	0.390
100	21.896	34.786	24.104	382.2	385.6	0.491
125	21.127	34.782	24.313	362.4	366.6	0.585
150	20.457	34.767	24.482	346.2	351.2	0.674
200	19.301	34.804	24.813	314.7	321.2	0.842
250	18.383	34.788	25.033	293.7	301.7	0.997
300	16.997	34.758	25.347	263.8	273.0	1.140
400	14.998	34.645	25.717	228.6	239.9	1.398
500	12.272	34.444	26.125	190.0	202.0	1.621
600	9.065	34.259	26.549	149.7	160.8	1.801
700	7.211	34.191	26.774	128.4	138.8	1.949
800	6.020	34.293	27.014	105.6	115.8	2.074
900	5.258	34.378	27.174	90.4	100.5	2.182
1000	4.202	34.351	27.271	81.2	90.1	2.277

Station	Latitude	Longitude	Date	Time	Depth
51	27-30.2 N 27-30.7 N	129-59.4 E 130-00.4 E	JUL.19, 1977	22:41 23:23	1800

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.024	34.413	21.637	618.1	617.8	0.0
10	27.014	34.448	22.319	552.7	552.8	0.058
20	25.414	34.649	22.971	490.4	490.9	0.110
30	24.679	34.670	23.210	467.6	468.4	0.158
50	23.960	34.752	23.486	441.2	442.8	0.249
75	22.843	34.768	23.823	409.2	411.7	0.356
100	21.782	34.789	24.138	379.0	382.3	0.455
125	21.081	34.798	24.337	360.1	364.3	0.548
150	20.288	34.812	24.561	338.6	343.6	0.637
200	18.577	34.793	24.989	298.0	304.3	0.799
250	17.010	34.760	25.346	263.9	271.5	0.941
300	16.206	34.722	25.505	248.8	257.7	1.074
400	14.202	34.570	25.831	217.9	228.6	1.319
500	11.406	34.391	26.247	178.3	189.6	1.530
600	8.762	34.247	26.588	146.0	156.8	1.701
700	6.645	34.205	26.862	119.9	129.7	1.845
800	5.869	34.323	27.056	101.6	111.5	1.966
900	5.428	34.397	27.169	90.9	101.4	2.072
1000	4.662	34.429	27.283	80.1	90.1	2.168

Station	Latitude	Longitude	Date	Time	Depth
52	27-50.8 N 27-50.6 N	129-30.4 E 129-29.5 E	JUL.20, 1977	03:11 04:00	1090

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.787	34.336	21.657	616.1	615.8	0.0
10	28.776	34.338	21.663	615.6	615.7	0.061
20	28.234	34.430	21.911	591.8	592.3	0.122
30	27.504	34.485	22.190	565.1	566.0	0.179
50	24.567	34.662	23.237	464.9	466.6	0.283
75	23.333	34.780	23.689	421.9	424.4	0.394
100	22.627	34.758	23.877	403.9	407.3	0.498
125	21.218	34.757	24.269	366.6	370.8	0.594
150	20.079	34.775	24.588	336.1	341.0	0.683
200	19.046	34.772	24.854	310.8	317.2	0.846
250	17.845	34.756	25.142	283.4	291.2	0.997
300	17.030	34.742	25.328	265.7	274.9	1.138
400	14.808	34.615	25.736	226.9	238.0	1.396
500	11.599	34.426	26.239	179.1	190.6	1.609
600	9.306	34.305	26.545	150.1	161.5	1.786
700	7.048	34.265	26.855	120.7	131.0	1.934
800	5.439	34.359	27.138	93.9	103.2	2.053
900	4.358	34.409	27.301	78.4	86.8	2.148
1000	3.969	34.442	27.368	72.1	80.6	2.232

Station	Latitude	Longitude	Date	Time	Depth
52-A	29-10.6 N 29-10.3 N	130-00.7 E 130-01.6 E	JUL.20, 1977	11:35 12:25	1400

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.979	34.123	21.096	669.9	669.6	0.0
10	29.368	34.102	21.288	651.5	651.6	0.066
20	29.030	34.274	21.530	628.3	628.8	0.130
30	28.243	34.426	21.905	592.4	593.3	0.191
50	26.836	34.550	22.452	540.0	541.7	0.306
75	25.532	34.664	22.946	492.9	495.5	0.435
100	24.623	34.692	23.243	464.4	467.9	0.557
125	23.027	34.758	23.762	414.9	419.3	0.668
150	22.033	34.817	24.089	383.6	388.8	0.768
200	19.718	34.752	24.665	328.7	335.3	0.951
250	18.177	34.770	25.071	290.1	298.0	1.109
300	16.530	34.724	25.432	255.8	264.8	1.247
400	14.327	34.596	25.825	218.4	229.3	1.493
500	10.872	34.406	26.356	168.0	178.9	1.703
600	8.307	34.383	26.764	129.3	139.7	1.858
700	6.064	34.393	27.087	98.7	107.7	1.984
800	4.110	34.413	27.330	75.6	82.6	2.080
900	3.548	34.426	27.397	69.2	76.0	2.159
1000	3.135	34.462	27.465	62.8	69.5	2.231

Station	Latitude	Longitude	Date	Time	Depth
52-B	29-05.0 N 29-05.4 N	129-40.0 E 129-40.3 E	JUL.20, 1977	14:25 15:08	975

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.792	34.249	21.255	654.7	654.4	0.0
10	29.693	34.277	21.309	649.5	649.6	0.065
20	28.692	34.190	21.580	623.5	624.0	0.128
30	27.278	34.459	22.243	560.0	560.9	0.188
50	25.159	34.625	23.030	484.7	486.4	0.292
75	24.194	34.723	23.395	450.0	452.6	0.408
100	23.263	34.763	23.698	420.9	424.4	0.518
125	22.486	34.788	23.940	398.0	402.3	0.621
150	21.920	34.804	24.111	381.5	386.7	0.720
200	20.944	34.804	24.379	356.0	362.9	0.907
250	18.859	34.766	24.897	306.7	314.8	1.079
300	17.980	34.777	25.125	285.0	294.5	1.231
400	15.626	34.662	25.591	240.7	252.2	1.507
500	12.176	34.472	26.165	186.1	198.1	1.733
600	9.788	34.403	26.542	150.3	162.3	1.910
700	7.592	34.370	26.860	120.1	131.3	2.059
800	5.418	34.365	27.145	93.1	102.4	2.177
900	3.923	34.390	27.332	75.5	83.0	2.267

Station	Latitude	Longitude	Date	Time	Depth
52-C	28-53.6 N 28-53.3 N	129-26.4 E 129-26.7 E	JUL.20, 1977	16:52 16:26	650

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.535	34.371	21.432	637.6	637.3	0.0
10	29.059	34.381	21.600	621.5	621.6	0.063
20	28.772	34.393	21.705	611.5	612.0	0.124
30	28.053	34.372	21.927	590.3	591.2	0.184
50	25.940	34.603	22.773	509.3	510.9	0.292
75	25.405	34.649	22.973	490.2	492.9	0.417
100	24.513	34.651	23.246	464.2	467.7	0.538
125	22.970	34.748	23.772	414.0	418.4	0.648
150	21.690	34.722	24.113	381.4	386.6	0.749
200	20.603	34.771	24.446	349.6	356.4	0.933
250	18.866	34.739	24.875	308.8	316.9	1.101
300	17.400	34.741	25.238	274.2	283.5	1.249
400	14.927	34.594	25.694	230.9	242.0	1.510
500	12.099	34.470	26.178	184.9	196.8	1.725
600	8.544	34.351	26.703	135.1	145.7	1.890

Station	Latitude	Longitude	Date	Time	Depth
52-D	28-41.0 N 28-40.9 N	129-13.7 E 129-13.8 E	JUL.20, 1977	19:05 19:44	800

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.822	34.378	21.340	646.4	646.1	0.0
10	29.424	34.369	21.469	634.1	634.2	0.064
20	28.650	34.369	21.728	609.3	609.9	0.126
30	27.885	34.446	22.037	579.8	580.7	0.185
50	25.893	34.583	22.773	509.3	511.0	0.295
75	23.808	34.713	23.502	439.8	442.4	0.414
100	23.030	34.765	23.767	414.4	417.9	0.521
125	21.977	34.777	24.075	385.1	389.4	0.622
150	20.703	34.779	24.425	351.6	356.7	0.716
200	20.072	34.807	24.615	333.6	340.3	0.889
250	18.971	34.793	24.889	307.4	315.6	1.054
300	17.664	34.774	25.200	277.9	287.3	1.206
400	15.151	34.584	25.637	236.3	247.6	1.472
500	11.465	34.449	26.281	175.1	186.5	1.689
600	9.028	34.360	26.633	141.7	152.8	1.860
700	7.257	34.370	26.908	115.6	126.4	1.996

Station	Latitude	Longitude	Date	Time	Depth
52-E	28-30.2 N 28-30.4 N	128-59.4 E 128-58.6 E	JUL.20, 1977	21:22 22:09	960

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	30.719	34.410	21.056	673.7	673.4	0.0
10	30.080	34.380	21.254	654.7	654.8	0.066
20	29.580	34.405	21.443	636.6	637.1	0.131
30	29.228	34.387	21.548	626.5	627.5	0.194
50	28.232	34.422	21.906	592.3	594.0	0.315
75	25.889	34.539	22.741	512.4	515.1	0.455
100	23.754	34.694	23.503	439.6	443.1	0.573
125	22.539	34.728	23.879	403.8	408.1	0.680
150	21.547	34.781	24.197	373.4	378.5	0.778
200	19.985	34.758	24.601	334.9	341.6	0.959
250	18.553	34.769	24.976	299.1	307.2	1.121
300	17.444	34.741	25.227	275.2	284.5	1.268
400	15.092	34.569	25.638	236.2	247.4	1.535
500	11.169	34.384	26.285	174.7	185.8	1.747
600	8.978	34.360	26.641	140.9	152.0	1.916
700	7.173	34.375	26.924	114.1	124.7	2.056
800	6.019	34.387	27.088	98.6	108.9	2.172
900	5.398	34.413	27.185	89.4	99.8	2.277

Station	Latitude	Longitude	Date	Time	Depth
53	28-09.6 N 28-09.0 N	129-00.3 E 129-00.6 E	JUL.21, 1977	01:34 02:16	810

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.266	34.433	21.902	592.6	592.3	0.0
10	27.705	34.430	22.083	575.3	575.4	0.058
20	27.296	34.459	22.237	560.6	561.1	0.115
30	27.094	34.478	22.316	553.1	554.0	0.171
50	25.855	34.460	22.693	517.0	518.7	0.278
75	24.261	34.638	23.311	458.0	460.6	0.398
100	23.725	34.689	23.508	439.1	442.6	0.510
125	22.156	34.701	23.967	395.4	399.7	0.615
150	21.618	34.712	24.125	380.2	385.4	0.712
200	20.441	34.736	24.463	348.0	354.7	0.895
250	18.773	34.774	24.925	304.0	312.1	1.059
300	16.590	34.696	25.396	259.2	268.2	1.203
400	13.646	34.516	25.905	210.8	221.2	1.448
500	10.311	34.401	26.451	159.0	169.4	1.641
600	8.457	34.406	26.759	129.7	140.3	1.794
700	7.154	34.391	26.939	112.7	123.3	1.925

Station	Latitude	Longitude	Date	Time	Depth
54	28-32.1 N 28-32.0 N	128-30.0 E 128-29.9 E	JUL.21, 1977	07:32 08:15	930

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	30.029	34.425	21.305	649.8	649.5	0.0
10	29.994	34.432	21.322	648.2	648.3	0.064
20	29.830	34.405	21.358	644.7	645.3	0.129
30	29.573	34.384	21.430	637.9	638.8	0.193
50	26.857	34.462	22.379	547.0	548.7	0.312
75	25.327	34.596	22.957	491.8	494.4	0.441
100	23.272	34.712	23.657	424.9	428.3	0.557
125	22.478	34.783	23.939	398.1	402.5	0.660
150	21.830	34.794	24.129	379.9	385.1	0.759
200	20.752	34.796	24.425	351.7	358.5	0.945
250	19.299	34.808	24.816	314.4	322.6	1.115
300	17.953	34.751	25.111	286.3	295.8	1.268
400	15.962	34.702	25.546	245.0	256.7	1.542
500	13.116	34.521	26.017	200.1	212.8	1.781
600	9.920	34.351	26.479	156.3	168.4	1.972
700	7.091	34.388	26.946	112.1	122.6	2.116
800	5.732	34.397	27.131	94.4	104.3	2.228
900	5.027	34.437	27.248	83.4	93.2	2.327

Station	Latitude	Longitude	Date	Time	Depth
55	28-45.5 N 28-45.6 N	128-11.5 E 128-11.3 E	JUL.21, 1977	11:37 12:28	1050

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	30.307	34.428	21.212	658.8	658.5	0.0
10	30.003	34.401	21.296	650.7	650.8	0.065
20	29.288	34.401	21.539	627.5	628.0	0.129
30	29.007	34.430	21.655	616.3	617.2	0.191
50	28.288	34.456	21.912	591.6	593.4	0.313
75	27.159	34.513	22.321	552.6	555.3	0.457
100	25.145	34.654	23.057	482.2	485.8	0.587
125	22.545	34.755	23.898	402.0	406.3	0.698
150	21.170	34.759	24.284	365.1	370.2	0.794
200	19.188	34.791	24.832	312.8	319.4	0.965
250	18.082	34.780	25.102	287.2	295.1	1.117
300	16.863	34.723	25.353	263.3	272.4	1.260
400	15.393	34.678	25.655	234.6	246.0	1.517
500	12.536	34.469	26.092	193.0	205.3	1.749
600	8.897	34.293	26.602	144.7	155.6	1.927
700	7.044	34.367	26.935	113.0	123.5	2.062
800	5.541	34.394	27.152	92.4	101.9	2.176
900	5.050	34.416	27.229	85.2	95.0	2.273
1000	4.749	34.432	27.275	80.8	91.0	2.366

Station	Latitude	Longitude	Date	Time	Depth
56	28-57.8 N 28-58.5 N	127-54.9 E 127-56.2 E	JUL.22, 1977	00:06 00:57	1150

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.945	34.380	21.300	650.3	650.0	0.0
10	29.945	34.388	21.306	649.7	649.8	0.065
20	29.652	34.353	21.379	642.7	643.3	0.129
30	28.511	34.405	21.801	602.4	603.3	0.192
50	27.107	34.527	22.349	549.9	551.6	0.307
75	25.333	34.558	22.927	494.7	497.3	0.439
100	23.138	34.634	23.637	426.8	430.3	0.555
125	21.314	34.721	24.216	371.7	375.9	0.656
150	20.494	34.804	24.500	344.5	349.5	0.746
200	18.557	34.774	24.979	298.9	305.3	0.910
250	17.190	34.751	25.297	268.7	276.3	1.055
300	15.891	34.698	25.558	243.8	252.5	1.186
400	12.529	34.463	26.089	193.3	203.0	1.416
500	9.623	34.335	26.517	152.7	162.5	1.598
600	7.624	34.355	26.844	121.7	131.3	1.743
700	6.731	34.376	26.986	108.3	118.3	1.867
800	6.031	34.381	27.081	99.2	109.5	1.982
900	5.411	34.383	27.160	91.7	102.2	2.087
1000	4.834	34.395	27.237	84.4	94.8	2.185

Station	Latitude	Longitude	Date	Time	Depth
58	29-24.6 N 29-24.6 N	127-18.0 E 127-18.0 E	JUL.22, 1977	19:33 19:41	178

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.818	31.807	19.420	830.9	830.6	0.0
10	29.143	32.266	19.990	776.1	776.2	0.080
20	26.719	33.738	21.879	594.8	595.3	0.148
30	26.086	33.997	22.273	557.2	558.0	0.206
50	25.199	34.193	22.693	516.9	518.6	0.314
75	23.311	34.380	23.395	450.0	452.5	0.434
100	19.936	34.425	24.360	357.8	361.0	0.537
125	17.693	34.591	25.053	291.9	295.7	0.617
150	15.390	34.516	25.531	246.3	250.5	0.686

Station	Latitude	Longitude	Date	Time	Depth
57	29-11.5 N 29-12.1 N	127-35.4 E 127-36.2 E	JUL.22, 1977	09:20 10:08	1080

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.800	34.075	21.121	667.5	667.2	0.0
10	29.762	34.064	21.126	667.0	667.1	0.066
20	28.975	33.911	21.276	652.6	653.1	0.132
30	27.768	33.954	21.705	611.5	612.4	0.196
50	25.164	34.413	22.869	500.1	501.7	0.306
75	22.956	34.539	23.617	428.8	431.3	0.423
100	20.928	34.700	24.305	363.1	366.4	0.522
125	19.701	34.666	24.605	334.6	338.6	0.611
150	18.316	34.705	24.987	298.1	302.8	0.691
200	16.470	34.697	25.425	256.4	262.3	0.829
250	14.975	34.615	25.700	230.3	237.3	0.954
300	13.065	34.523	26.030	199.0	206.5	1.064
400	9.713	34.363	26.523	152.1	160.0	1.246
500	7.927	34.372	26.812	124.7	133.0	1.390
600	6.846	34.380	26.973	109.4	118.1	1.515
700	6.053	34.399	27.093	98.1	107.1	1.629
800	5.646	34.400	27.145	93.1	102.8	1.734
900	5.145	34.408	27.211	86.9	96.8	1.835
1000	4.944	34.421	27.245	83.7	94.3	1.931

Station	Latitude	Longitude	Date	Time	Depth
59	29-38.1 N 29-38.2 N	127-00.1 E 126-59.9 E	JUL.23, 1977	00:07 00:14	111

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.573	31.287	19.114	860.4	860.1	0.0
10	29.550	31.409	19.213	850.8	850.9	0.085
20	28.063	32.535	20.546	722.6	723.1	0.164
30	25.701	33.776	22.226	561.7	562.5	0.228
50	23.447	34.403	23.373	452.0	453.6	0.328
75	20.405	34.427	24.231	370.3	372.6	0.433
100	17.241	34.658	25.213	276.6	279.4	0.511

Station	Latitude	Longitude	Date	Time	Depth
60	29-49.0 N 29-49.0 N	126-45.6 E 126-45.6 E	JUL.23, 1977	05:12 05:18	100

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.685	30.890	18.780	892.5	892.2	0.0
10	29.339	31.341	19.233	848.9	849.0	0.087
20	26.580	33.133	21.469	634.1	634.6	0.161
30	25.085	33.999	22.582	527.6	528.5	0.219
50	21.555	34.195	23.750	416.0	417.4	0.316
75	17.738	34.592	25.042	292.9	295.1	0.401

Station	Latitude	Longitude	Date	Time	Depth
61	30-00.0 N 30-00.0 N	126-30.0 E 126-30.0 E	JUL.23, 1977	07:59 08:05	90

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.241	30.381	18.549	914.8	914.5	0.0
10	27.627	31.665	20.036	771.7	771.8	0.084
20	25.476	33.779	22.297	554.9	555.3	0.150
30	24.056	33.969	22.867	500.4	501.2	0.203
50	20.393	34.345	24.179	375.1	376.6	0.292
75	17.766	34.639	25.072	290.1	292.2	0.370

Station	Latitude	Longitude	Date	Time	Depth
62	31-41.3 N 31-41.3 N	127-19.7 E 127-19.7 E	JUL.23, 1977	19:12 19:21	125

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.679	29.289	17.588	1007.5	1007.2	0.0
10	28.236	33.063	20.886	690.1	690.2	0.084
20	25.490	34.114	22.545	531.1	531.6	0.146
30	22.191	34.298	23.652	425.4	426.1	0.193
50	18.100	34.029	24.524	342.2	343.5	0.269
75	17.552	34.204	24.791	316.9	319.0	0.351
100	14.138	33.801	25.252	272.9	275.3	0.426

Station	Latitude	Longitude	Date	Time	Depth
63	32-42.6 N 32-42.6 N	127-48.2 E 127-48.2 E	JUL.24, 1977	01:40 01:48	157

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.208	32.363	20.371	739.5	739.2	0.0
10	28.165	32.366	20.387	738.0	738.0	0.073
20	26.006	33.484	21.912	591.7	592.1	0.140
30	23.844	34.150	23.066	481.3	482.1	0.194
50	20.959	34.192	23.911	400.6	402.1	0.282
75	18.830	34.600	24.778	318.1	320.3	0.371
100	17.401	34.640	25.161	281.6	284.5	0.447
125	14.781	34.521	25.669	233.3	236.6	0.512
150	14.139	34.529	25.813	219.6	223.4	0.569

Station	Latitude	Longitude	Date	Time	Depth
65	30-31.4 N 30-32.1 N	131-21.4 E 131-21.3 E	AUG. 2, 1977	20:40 21:30	1050

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.345	33.699	21.326	647.8	647.5	0.0
10	28.159	33.824	21.481	633.0	633.1	0.064
20	27.791	34.022	21.749	607.3	607.8	0.126
30	26.888	34.096	22.094	574.2	575.1	0.185
50	25.033	34.248	22.785	508.2	509.8	0.294
75	22.365	34.442	23.710	419.9	422.3	0.411
100	20.666	34.546	24.258	367.5	370.8	0.508
125	19.974	34.592	24.477	346.8	350.8	0.599
150	18.498	34.564	24.834	312.7	317.4	0.682
200	13.247	34.524	25.994	202.4	207.4	0.807
250	10.797	34.429	26.388	165.0	170.3	0.902
300	9.130	34.358	26.615	143.4	148.9	0.982
400	7.254	34.301	26.854	120.7	126.7	1.119
500	5.636	34.307	27.073	100.0	105.9	1.233
600	5.063	34.320	27.151	92.6	99.0	1.335
700	4.288	34.365	27.273	81.0	87.4	1.429
800	3.801	34.400	27.352	73.5	80.0	1.513
900	3.488	34.421	27.399	69.0	75.7	1.591
1000	3.163	34.458	27.459	63.3	70.1	1.663

Station	Latitude	Longitude	Date	Time	Depth
66	30-19.9 N 30-22.6 N	131-36.2 E 131-37.6 E	AUG. 2, 1977	23:30 00:49	2430

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.287	34.465	21.587	622.8	622.5	0.0
10	29.305	34.488	21.598	621.8	621.9	0.062
20	29.262	34.481	21.607	620.9	621.4	0.124
30	28.943	34.441	21.684	613.5	614.4	0.186
50	27.765	34.512	22.125	571.3	573.0	0.304
75	26.439	34.559	22.584	527.5	530.2	0.442
100	24.376	34.623	23.265	462.3	465.8	0.568
125	21.702	34.657	24.059	386.6	390.9	0.676
150	19.553	34.694	24.664	328.9	333.7	0.766
200	17.060	34.629	25.234	274.6	280.6	0.919
250	14.961	34.605	25.695	230.8	237.7	1.045
300	13.220	34.536	26.008	201.0	208.6	1.159
400	9.760	34.432	26.569	147.7	155.7	1.342
500	6.936	34.316	26.910	115.4	122.7	1.482
600	5.313	34.319	27.121	95.4	102.2	1.593
700	4.518	34.396	27.273	81.0	87.8	1.687
800	3.891	34.417	27.356	73.1	79.8	1.770
900	3.242	34.437	27.436	65.6	71.8	1.846
1000	3.068	34.450	27.462	63.1	69.6	1.916

Station	Latitude	Longitude	Date	Time	Depth
67	30-10.0 N 30-11.4 N	131-54.3 E 131-55.7 E	AUG. 3, 1977	03:10 03:55	3170

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.263	34.467	21.596	621.9	621.6	0.0
10	29.133	34.476	21.647	617.1	617.2	0.061
20	28.894	34.484	21.732	608.9	609.4	0.123
30	28.636	34.456	21.797	602.7	603.6	0.183
50	27.966	34.480	22.036	579.8	581.6	0.302
75	26.292	34.548	22.622	523.9	526.5	0.443
100	23.048	34.580	23.622	428.2	431.6	0.565
125	21.655	34.741	24.137	379.2	383.5	0.665
150	20.466	34.739	24.459	348.4	353.4	0.757
200	18.981	34.798	24.891	307.3	313.8	0.921
250	17.846	34.776	25.157	281.9	289.8	1.073
300	16.603	34.750	25.434	255.6	264.6	1.211
400	13.616	34.554	25.941	207.4	217.8	1.452
500	10.466	34.331	26.370	166.7	177.2	1.653
600	8.063	34.304	26.739	131.7	141.7	1.810
700	6.268	34.316	27.000	106.9	116.2	1.940
800	5.492	34.383	27.150	92.7	102.1	2.048
900	3.902	34.367	27.315	77.0	84.5	2.141
1000	3.571	34.426	27.396	69.4	77.0	2.222

Station	Latitude	Longitude	Date	Time	Depth
68	29-59.5 N 30-00.3 N	132-15.5 E 132-16.1 E	AUG. 3, 1977	05:50 06:40	4330

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.765	34.415	21.724	609.7	609.4	0.0
10	28.781	34.437	21.735	608.6	608.8	0.060
20	28.750	34.415	21.729	609.2	609.7	0.121
30	28.509	34.350	21.760	606.3	607.2	0.182
50	25.182	34.626	23.024	485.3	486.9	0.291
75	22.500	34.748	23.905	401.3	403.8	0.402
100	21.247	34.774	24.274	366.0	369.3	0.498
125	20.476	34.795	24.498	344.8	348.9	0.588
150	19.935	34.806	24.650	330.2	335.1	0.673
200	19.227	34.798	24.828	313.3	319.8	0.836
250	18.658	34.802	24.975	299.3	307.3	0.993
300	17.653	34.792	25.216	276.3	285.7	1.141
400	15.145	34.652	25.690	231.2	242.5	1.403
500	12.622	34.477	26.082	194.0	206.3	1.629
600	9.947	34.324	26.453	158.7	170.8	1.815
700	7.529	34.259	26.782	127.5	138.5	1.969
800	6.322	34.288	26.971	109.7	120.4	2.098
900	5.069	34.294	27.130	94.6	104.3	2.210
1000	4.335	34.361	27.265	81.8	91.1	2.307

Station	Latitude	Longitude	Date	Time	Depth
69	29-51.7 N 29-51.7 N	132-37.1 E 132-36.9 E	AUG. 3, 1977	08:36 09:30	3500

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.845	34.500	21.762	606.1	605.8	0.0
10	28.787	34.494	21.776	604.7	604.8	0.060
20	28.402	34.409	21.840	598.6	599.1	0.120
30	26.006	34.499	22.675	518.7	519.5	0.176
50	24.336	34.653	23.299	459.0	460.6	0.274
75	22.443	34.758	23.929	399.0	401.5	0.382
100	21.522	34.788	24.209	372.2	375.5	0.479
125	20.823	34.787	24.400	354.1	358.3	0.571
150	20.303	34.781	24.534	341.2	346.2	0.659
200	19.321	34.803	24.808	315.2	321.7	0.824
250	18.914	34.812	24.918	304.6	312.8	0.983
300	18.605	34.806	24.991	297.7	307.4	1.138
400	16.270	34.732	25.498	249.5	261.4	1.422
500	14.396	34.593	25.808	220.1	233.7	1.671
600	11.597	34.408	26.225	180.4	194.2	1.884
700	8.699	34.249	26.599	145.0	157.5	2.058
800	6.860	34.248	26.868	119.4	130.9	2.202
900	5.792	34.274	27.028	104.3	115.3	2.325
1000	4.707	34.326	27.196	88.3	98.3	2.432

Station	Latitude	Longitude	Date	Time	Depth
70	29-38.7 N 29-39.5 N	132-58.7 E 132-58.3 E	AUG. 3, 1977	11:40 12:42	4210

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.928	34.546	21.768	605.5	605.2	0.0
10	28.740	34.534	21.821	600.4	600.5	0.060
20	27.427	34.453	22.191	565.0	565.5	0.118
30	25.467	34.638	22.946	492.7	493.6	0.171
50	23.626	34.731	23.568	433.3	434.9	0.263
75	21.640	34.788	24.177	375.4	377.9	0.364
100	20.829	34.792	24.401	353.9	357.2	0.455
125	20.361	34.813	24.543	340.5	344.6	0.543
150	19.887	34.814	24.668	328.5	333.4	0.628
200	19.318	34.810	24.813	314.7	321.2	0.791
250	18.997	34.812	24.897	306.7	314.9	0.950
300	18.792	34.803	24.942	302.4	312.2	1.106
400	17.211	34.767	25.304	268.0	280.4	1.402
500	15.321	34.680	25.673	232.9	247.2	1.666
600	12.675	34.466	26.063	195.8	210.6	1.894
700	10.223	34.350	26.426	161.3	175.8	2.085
800	7.855	34.281	26.752	130.4	143.5	2.245
900	5.795	34.239	27.000	106.9	117.9	2.376
1000	5.081	34.276	27.114	96.1	106.8	2.488

Station	Latitude	Longitude	Date	Time	Depth
71	29-29.4 N 29-29.4 N	133-18.8 E 133-18.7 E	AUG. 3, 1977	14:50 15:36	2900

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.121	34.531	21.692	612.8	612.5	0.0
10	28.937	34.517	21.743	607.9	608.0	0.061
20	28.857	34.520	21.772	605.1	605.6	0.121
30	27.230	34.407	22.219	562.3	563.2	0.180
50	24.686	34.743	23.263	462.5	464.2	0.281
75	22.503	34.764	23.916	400.2	402.7	0.390
100	21.300	34.778	24.263	367.1	370.4	0.486
125	20.629	34.772	24.440	350.3	354.4	0.577
150	20.165	34.803	24.587	336.2	341.2	0.663
200	19.439	34.797	24.772	318.6	325.1	0.830
250	19.091	34.804	24.867	309.5	317.7	0.990
300	18.925	34.799	24.906	305.9	315.7	1.149
400	17.836	34.787	25.168	280.9	293.6	1.459
500	15.932	34.703	25.553	244.3	259.0	1.733
600	13.269	34.519	25.985	203.2	218.6	1.974
700	10.710	34.350	26.341	169.4	184.4	2.176
800	8.477	34.302	26.675	137.7	151.8	2.343
900	6.517	34.247	26.913	115.2	127.5	2.484
1000	5.292	34.280	27.093	98.1	109.3	2.603

Station	Latitude	Longitude	Date	Time	Depth
72	29-21.9 N 29-22.1 N	133-37.3 E 133-37.2 E	AUG. 3, 1977	22:51 23:53	2770

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.944	34.571	21.781	604.3	603.9	0.0
10	28.761	34.551	21.827	599.8	599.9	0.060
20	27.168	34.436	22.260	558.3	558.8	0.118
30	25.262	34.627	23.001	487.6	488.4	0.170
50	23.362	34.727	23.642	426.3	427.9	0.261
75	22.120	34.779	24.036	388.8	391.3	0.364
100	21.172	34.794	24.309	362.7	366.0	0.458
125	20.607	34.803	24.469	347.5	351.6	0.548
150	20.139	34.814	24.602	334.7	339.7	0.634
200	19.427	34.812	24.787	317.2	323.8	0.800
250	19.122	34.817	24.869	309.4	317.5	0.960
300	18.930	34.811	24.914	305.1	314.9	1.118
400	17.865	34.787	25.161	281.6	294.3	1.427
500	15.941	34.705	25.553	244.3	259.0	1.702
600	13.589	34.550	25.944	207.1	222.8	1.944
700	10.635	34.363	26.365	167.1	182.1	2.144
800	7.968	34.252	26.712	134.2	147.4	2.308
900	6.254	34.254	26.953	111.4	123.2	2.444
1000	5.160	34.259	27.091	98.2	109.1	2.558

Station	Latitude	Longitude	Date	Time	Depth
73	29-47.0 N 29-47.0 N	133-40.0 E 133-40.9 E	AUG. 5, 1977	09:16 10:08	3360

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.875	34.582	21.813	601.2	600.9	0.0
10	28.850	34.584	21.822	600.3	600.4	0.060
20	27.954	34.462	22.027	580.7	581.2	0.119
30	25.469	34.631	22.940	493.3	494.2	0.172
50	23.064	34.754	23.749	416.1	417.7	0.263
75	21.837	34.786	24.120	380.8	383.2	0.364
100	21.202	34.801	24.307	362.9	366.2	0.457
125	20.501	34.802	24.497	344.9	349.0	0.547
150	19.918	34.809	24.657	329.5	334.5	0.632
200	19.299	34.813	24.821	314.0	320.5	0.795
250	19.035	34.815	24.890	307.4	315.6	0.954
300	18.894	34.810	24.921	304.4	314.2	1.111
400	17.616	34.789	25.223	275.6	288.2	1.419
500	15.866	34.705	25.569	242.7	257.4	1.694
600	13.090	34.516	26.019	200.0	215.2	1.931
700	10.296	34.360	26.421	161.8	176.3	2.127
800	8.354	34.292	26.686	136.7	150.5	2.293
900	6.384	34.250	26.933	113.3	125.3	2.432
1000	5.004	34.287	27.132	94.4	105.0	2.547

Station	Latitude	Longitude	Date	Time	Depth
74	30-13.0 N 30-13.1 N	133-39.5 E 133-40.8 E	AUG. 5, 1977	12:39 13:23	4490

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.312	34.461	21.575	623.9	623.6	0.0
10	29.179	34.455	21.616	620.1	620.2	0.062
20	28.216	34.282	21.806	601.9	602.4	0.123
30	25.582	34.547	22.842	502.7	503.6	0.178
50	22.944	34.725	23.761	414.9	416.5	0.271
75	21.434	34.793	24.237	369.6	372.0	0.368
100	20.593	34.784	24.459	348.4	351.6	0.458
125	19.956	34.805	24.644	330.9	334.9	0.544
150	19.682	34.802	24.713	324.2	329.1	0.627
200	19.126	34.807	24.860	310.2	316.7	0.788
250	18.948	34.808	24.907	305.8	313.9	0.945
300	18.774	34.813	24.954	301.2	311.0	1.102
400	17.046	34.749	25.329	265.6	277.9	1.398
500	14.550	34.600	25.780	222.7	236.5	1.654
600	11.382	34.396	26.255	177.6	191.1	1.867
700	8.752	34.285	26.619	143.1	155.7	2.040
800	6.940	34.239	26.849	121.2	132.8	2.184
900	5.475	34.289	27.078	99.5	109.9	2.304
1000	4.664	34.311	27.190	88.9	98.8	2.410

Station	Latitude	Longitude	Date	Time	Depth
75	30-39.7 N 30-39.5 N	133-40.4 E 133-41.5 E	AUG. 5, 1977	16:04 16:51	4370

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.201	34.435	21.593	622.2	621.9	0.0
10	29.168	34.433	21.603	621.3	621.4	0.062
20	28.958	34.435	21.675	614.4	614.9	0.124
30	28.652	34.374	21.731	609.0	609.9	0.185
50	27.134	34.458	22.288	555.7	557.4	0.301
75	24.409	34.681	23.298	459.2	461.8	0.430
100	22.395	34.808	23.981	394.0	397.4	0.536
125	21.253	34.811	24.300	363.6	367.8	0.632
150	20.403	34.818	24.536	341.1	346.1	0.721
200	19.344	34.815	24.810	314.9	321.5	0.887
250	18.575	34.792	24.988	298.0	306.0	1.044
300	17.366	34.767	25.267	271.5	280.8	1.192
400	15.349	34.664	25.655	234.6	246.0	1.455
500	12.504	34.459	26.091	193.2	205.4	1.680
600	9.615	34.324	26.509	153.5	165.2	1.865
700	7.667	34.266	26.768	128.9	140.1	2.018
800	5.854	34.276	27.021	104.9	114.8	2.146
900	4.751	34.309	27.178	90.0	99.1	2.253
1000	4.407	34.402	27.290	79.4	88.9	2.347

Station	Latitude	Longitude	Date	Time	Depth
76	31-05.3 N 31-04.3 N	133-41.7 E 133-44.7 E	AUG. 5, 1977	19:28 20:30	4550

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.789	34.329	21.652	616.6	616.3	0.0
10	28.812	34.321	21.638	617.9	618.0	0.061
20	28.628	34.452	21.797	602.7	603.2	0.122
30	28.444	34.477	21.877	595.0	596.0	0.182
50	27.368	34.519	22.259	558.5	560.2	0.299
75	26.210	34.586	22.677	518.6	521.3	0.434
100	24.329	34.679	23.321	456.9	460.5	0.560
125	22.989	34.710	23.736	417.4	421.8	0.670
150	20.873	34.696	24.317	362.0	367.0	0.769
200	18.048	34.636	25.000	296.9	303.1	0.938
250	16.247	34.683	25.465	252.6	259.9	1.077
300	14.941	34.609	25.702	230.1	238.4	1.202
400	11.859	34.464	26.219	181.0	190.3	1.416
500	9.267	34.390	26.618	143.1	152.7	1.589
600	6.774	34.271	26.897	116.7	125.2	1.725
700	5.774	34.319	27.065	100.8	109.3	1.841
800	4.633	34.335	27.212	86.8	94.7	1.942
900	4.003	34.376	27.312	77.3	85.0	2.031
1000	3.635	34.410	27.376	71.2	79.0	2.113

Station	Latitude	Longitude	Date	Time	Depth
77	31-32.6 N 31-31.7 N	133-41.5 E 133-44.1 E	AUG. 5, 1977	23:50 00:39	4870

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.727	34.152	21.539	627.4	627.1	0.0
10	28.736	34.163	21.545	626.8	626.9	0.062
20	28.384	34.095	21.610	620.6	621.1	0.125
30	26.895	34.151	22.134	570.4	571.3	0.184
50	23.779	34.383	23.261	462.7	464.3	0.289
75	21.902	34.495	23.882	403.5	405.9	0.399
100	20.079	34.594	24.451	349.2	352.4	0.494
125	18.330	34.572	24.881	308.3	312.1	0.576
150	17.007	34.609	25.231	274.9	279.3	0.649
200	15.102	34.601	25.661	234.0	239.6	0.778
250	13.396	34.553	25.986	203.2	209.5	0.890
300	11.931	34.458	26.201	182.7	189.7	0.990
400	8.531	34.324	26.684	136.9	143.9	1.156
500	6.655	34.349	26.974	109.3	116.3	1.287
600	5.400	34.369	27.150	92.7	99.6	1.395
700	4.183	34.365	27.284	79.9	86.2	1.487
800	3.819	34.402	27.352	73.6	80.1	1.571
900	3.464	34.415	27.397	69.3	75.9	1.649
1000	3.340	34.463	27.447	64.5	71.7	1.723

Station	Latitude	Longitude	Date	Time	Depth
78-2	31-56.7 N 31-56.7 N	133-41.7 E 133-41.7 E	AUG. 6, 1977	20:34 20:45	2990

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.068	34.182	21.448	636.1	635.8	0.0
10	29.039	34.185	21.460	635.0	635.1	0.063
20	28.799	34.138	21.505	630.7	631.2	0.126
30	26.885	34.395	22.321	552.6	553.5	0.186
50	24.639	34.391	23.011	486.6	488.2	0.290
75	21.678	34.514	23.958	396.3	398.7	0.400
100	19.050	34.514	24.656	329.6	332.7	0.491
125	17.622	34.617	25.090	288.4	292.1	0.568
150	16.354	34.638	25.406	258.2	262.6	0.637
200	15.251	34.639	25.657	234.4	240.0	0.764

Station	Latitude	Longitude	Date	Time	Depth
78	32-00.0 N 31-59.2 N	133-39.0 E 133-39.3 E	AUG. 6, 1977	05:42 07:03	1770

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.942	34.168	21.480	633.1	632.8	0.0
10	28.945	34.176	21.485	632.6	632.7	0.063
20	28.150	34.059	21.660	615.8	616.3	0.125
30	25.955	34.219	22.480	537.3	538.2	0.183
50	23.300	34.308	23.344	454.8	456.4	0.282
75	20.500	34.482	24.254	368.1	370.4	0.385
100	18.595	34.558	24.805	315.5	318.5	0.470
125	17.339	34.624	25.164	281.4	285.1	0.545
150	16.522	34.600	25.338	264.7	269.0	0.614
200	14.316	34.568	25.805	220.3	225.6	0.737
250	12.744	34.481	26.061	196.0	202.1	0.844
300	11.000	34.419	26.343	169.2	175.7	0.937
400	8.181	34.286	26.707	134.7	141.4	1.094
500	6.079	34.271	26.989	107.9	114.3	1.221
600	4.972	34.327	27.167	91.1	97.4	1.328
700	4.521	34.344	27.232	84.9	91.7	1.422
800	4.066	34.368	27.299	78.6	85.5	1.511
900	3.641	34.415	27.379	70.9	77.9	1.592
1000	3.408	34.447	27.428	66.3	73.6	1.668

Station	Latitude	Longitude	Date	Time	Depth
78-4	32-00.5 N 32-00.5 N	133-42.4 E 133-42.4 E	AUG. 7, 1977	04:37 05:25	2960

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.936	34.216	21.518	629.5	629.2	0.0
10	28.956	34.222	21.516	629.7	629.8	0.063
20	28.923	34.202	21.512	630.0	630.5	0.126
30	26.807	34.292	22.268	557.6	558.5	0.185
50	23.453	34.363	23.341	455.1	456.6	0.287
75	20.947	34.557	24.191	374.0	376.4	0.389
100	19.310	34.628	24.677	327.6	330.7	0.477
125	18.022	34.671	25.034	293.8	297.6	0.555
150	16.744	34.639	25.317	266.8	271.1	0.626
200	15.022	34.617	25.690	231.2	236.7	0.753
250	12.540	34.452	26.078	194.4	200.4	0.862
300	10.902	34.406	26.351	168.5	174.9	0.955
400	8.087	34.308	26.739	131.7	138.3	1.111
500	6.385	34.267	26.946	112.0	118.7	1.239
600	5.463	34.318	27.103	97.2	104.1	1.351
700	4.621	34.326	27.206	87.4	94.2	1.449
800	3.983	34.363	27.304	78.1	84.9	1.539
900	3.625	34.419	27.385	70.4	77.4	1.620
1000	3.283	34.456	27.447	64.6	71.6	1.694

Station	Latitude	Longitude	Date	Time	Depth
78-5	31-58.8 N 31-58.8 N	133-44.3 E 133-44.3 E	AUG. 7, 1977	08:50 08:59	2920

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.849	34.198	21.533	628.0	627.6	0.0
10	28.855	34.204	21.536	627.7	627.8	0.062
20	28.577	34.129	21.572	624.2	624.7	0.125
30	26.405	34.350	22.438	541.3	542.2	0.183
50	23.944	34.471	23.279	461.0	462.6	0.284
75	21.921	34.509	23.886	403.1	405.5	0.393
100	19.539	34.603	24.599	335.1	338.2	0.486
125	18.193	34.664	24.986	298.3	302.1	0.566
150	17.269	34.690	25.231	274.9	279.4	0.638
200	15.114	34.645	25.692	231.1	236.6	0.766

Station	Latitude	Longitude	Date	Time	Depth
78-8	32-03.1 N 32-03.1 N	133-43.6 E 133-43.6 E	AUG. 7, 1977	20:41 21:27	2420

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.141	34.221	21.453	635.7	635.3	0.0
10	29.095	34.222	21.470	634.1	634.2	0.063
20	28.671	34.190	21.586	622.9	623.4	0.126
30	26.747	34.314	22.303	554.2	555.1	0.185
50	22.973	34.406	23.512	438.8	440.3	0.282
75	20.990	34.539	24.166	376.4	378.8	0.384
100	19.558	34.730	24.691	326.3	329.5	0.472
125	18.588	34.738	24.945	302.3	306.1	0.552
150	17.117	34.608	25.205	277.4	281.8	0.625
200	15.137	34.623	25.670	233.2	238.7	0.754
250	13.259	34.543	26.006	201.2	207.5	0.866
300	11.328	34.411	26.277	175.5	182.1	0.963
400	8.432	34.311	26.689	136.4	143.3	1.124
500	6.356	34.238	26.927	113.9	120.5	1.255
600	5.577	34.300	27.074	99.9	107.0	1.368
700	4.644	34.358	27.229	85.2	92.2	1.467
800	4.109	34.386	27.309	77.6	84.6	1.556
900	3.748	34.435	27.385	70.4	77.7	1.637
1000	3.294	34.431	27.426	66.5	73.5	1.712

Station	Latitude	Longitude	Date	Time	Depth
78-7	32-01.5 N 32-01.5 N	133-42.4 E 133-42.4 E	AUG. 7, 1977	16:40 16:52	2700

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.448	34.217	21.347	645.8	645.5	0.0
10	29.067	34.213	21.472	633.8	633.9	0.064
20	28.157	34.155	21.730	609.1	609.6	0.126
30	26.056	34.398	22.584	527.4	528.3	0.183
50	23.873	34.493	23.316	457.5	459.0	0.280
75	20.961	34.526	24.164	376.6	379.0	0.385
100	19.344	34.657	24.690	326.4	329.5	0.473
125	18.102	34.698	25.035	293.7	297.5	0.552
150	16.723	34.626	25.311	267.3	271.7	0.623
200	14.848	34.627	25.736	226.8	232.3	0.749

Station	Latitude	Longitude	Date	Time	Depth
78-9	32-04.2 N 32-04.2 N	133-43.0 E 133-43.0 E	AUG. 8, 1977	00:35 00:50	2370

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	29.022	34.201	21.478	633.3	632.9	0.0
10	29.027	34.208	21.482	632.9	633.0	0.063
20	27.524	34.117	21.907	592.2	592.7	0.124
30	26.010	34.379	22.583	527.5	528.3	0.180
50	23.271	34.420	23.437	445.9	447.5	0.278
75	20.957	34.554	24.186	374.5	376.9	0.380
100	19.825	34.636	24.549	339.8	343.0	0.469
125	18.498	34.609	24.868	309.6	313.4	0.550
150	16.935	34.609	25.249	273.2	277.6	0.624
200	14.859	34.617	25.726	227.8	233.3	0.751
250	13.433	34.531	25.961	205.5	211.9	0.863
300	11.651	34.451	26.248	178.2	185.0	0.962

Station	Latitude	Longitude	Date	Time	Depth
78-10	32-07.0 N 32-07.0 N	133-46.5 E 133-46.5 E	AUG. 8, 1977	04:39 04:54	2650

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.958	34.215	21.510	630.2	629.9	0.0
10	28.964	34.223	21.514	629.8	629.9	0.063
20	28.062	34.144	21.753	607.0	607.5	0.124
30	25.192	34.280	22.760	510.5	511.4	0.180
50	23.682	34.538	23.406	448.8	450.4	0.275
75	21.137	34.506	24.100	382.7	385.1	0.381
100	19.238	34.570	24.651	330.1	333.2	0.469
125	17.613	34.662	25.126	284.9	288.7	0.548
150	16.660	34.683	25.370	261.7	266.1	0.616
200	14.950	34.611	25.701	230.2	235.7	0.741
250	13.084	34.508	26.014	200.5	206.7	0.852
300	11.118	34.469	26.360	167.6	174.2	0.948

Station	Latitude	Longitude	Date	Time	Depth
78-13	32-07.7 N 32-07.7 N	133-53.4 E 133-53.4 E	AUG. 8, 1977	16:15 17:05	2850

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.958	34.241	21.529	628.4	628.1	0.0
10	28.962	34.235	21.523	628.9	629.0	0.062
20	28.911	34.231	21.537	627.6	628.1	0.125
30	25.615	34.205	22.575	528.3	529.1	0.183
50	22.768	34.569	23.694	421.4	422.9	0.278
75	20.650	34.707	24.384	355.6	358.0	0.375
100	18.901	34.676	24.818	314.2	317.3	0.459
125	18.037	34.753	25.092	288.2	292.0	0.536
150	16.827	34.663	25.315	266.9	271.3	0.605
200	14.858	34.628	25.735	227.0	232.4	0.730
250	13.321	34.569	26.013	200.6	206.9	0.839
300	11.561	34.469	26.279	175.3	182.1	0.936
400	8.682	34.334	26.667	138.4	145.6	1.097
500	6.631	34.262	26.909	115.5	122.4	1.230
600	5.383	34.292	27.091	98.2	105.1	1.345
700	4.606	34.339	27.218	86.2	93.1	1.444
800	3.985	34.386	27.322	76.4	83.2	1.532
900	3.550	34.404	27.380	70.9	77.7	1.612
1000	3.176	34.443	27.446	64.6	71.3	1.687

Station	Latitude	Longitude	Date	Time	Depth
78-19	31-53.8 N 31-53.8 N	134-06.5 E 134-06.5 E	AUG. 9, 1977	17:55 18:43	4850

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.499	34.186	21.641	617.7	617.4	0.0
10	28.494	34.201	21.654	616.4	616.5	0.061
20	28.490	34.201	21.655	616.3	616.9	0.123
30	26.787	34.206	22.210	563.2	564.1	0.182
50	23.701	34.184	23.133	474.9	476.4	0.285
75	22.146	34.465	23.791	412.2	414.6	0.397
100	20.112	34.608	24.453	349.0	352.2	0.492
125	18.570	34.646	24.878	308.6	312.4	0.576
150	17.465	34.684	25.180	279.8	284.3	0.649
200	15.846	34.655	25.536	245.9	251.6	0.782
250	13.791	34.571	25.918	209.6	216.1	0.899
300	11.474	34.454	26.283	174.9	181.7	0.999
400	9.036	34.352	26.625	142.4	149.8	1.163
500	6.960	34.300	26.895	116.9	124.2	1.298
600	5.425	34.277	27.075	99.8	106.7	1.412
700	4.513	34.346	27.234	84.7	91.4	1.512
800	3.901	34.390	27.334	75.3	81.9	1.599
900	3.530	34.417	27.392	69.8	76.5	1.679
1000	3.232	34.451	27.448	64.5	71.4	1.753

Station	Latitude	Longitude	Date	Time	Depth
78-31	30-53.4 N 30-53.4 N	135-19.2 E 135-19.2 E	AUG.11, 1977	16:16 17:29	4400

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.680	34.117	21.529	628.4	628.0	0.0
10	28.393	34.140	21.641	617.6	617.7	0.062
20	28.117	34.154	21.742	608.0	608.5	0.123
30	27.591	34.205	21.951	588.0	588.9	0.183
50	25.235	34.334	22.789	507.8	509.5	0.292
75	22.423	34.477	23.722	418.8	421.3	0.408
100	20.222	34.667	24.469	347.5	350.7	0.504
125	18.739	34.659	24.846	311.7	315.6	0.587
150	17.941	34.709	25.082	289.0	293.6	0.663
200	16.159	34.658	25.467	252.5	258.3	0.801
250	14.567	34.626	25.796	221.2	228.0	0.921
300	12.681	34.511	26.096	192.6	200.0	1.028
400	9.194	34.398	26.636	141.4	148.9	1.199
500	7.072	34.354	26.921	114.3	121.8	1.331
600	5.275	34.320	27.127	94.9	101.6	1.443
700	4.443	34.357	27.251	83.1	89.8	1.539
800	3.882	34.407	27.349	73.8	80.5	1.623
900	3.470	34.431	27.409	68.1	74.8	1.701
1000	3.122	34.452	27.459	63.4	70.0	1.773

Station	Latitude	Longitude	Date	Time	Depth
78-34	30-33.3 N 30-33.3 N	135-54.8 E 135-54.8 E	AUG.12, 1977	04:35 05:23	4550

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	28.528	34.267	21.692	612.8	612.5	0.0
10	28.521	34.286	21.708	611.2	611.3	0.061
20	28.498	34.269	21.703	611.7	612.2	0.122
30	26.678	34.049	22.126	571.2	572.1	0.181
50	22.776	34.404	23.567	433.5	435.1	0.280
75	20.083	34.519	24.392	354.8	357.2	0.378
100	18.245	34.557	24.892	307.2	310.2	0.461
125	17.298	34.637	25.184	279.5	283.2	0.535
150	16.392	34.639	25.399	259.0	263.3	0.602
200	14.846	34.619	25.731	227.4	232.9	0.726
250	13.000	34.514	26.035	198.5	204.7	0.835
300	11.218	34.439	26.318	171.6	178.2	0.931
400	8.159	34.322	26.738	131.7	138.4	1.091
500	6.344	34.331	27.001	106.8	113.4	1.216
600	4.797	34.320	27.182	89.6	95.7	1.319
700	4.277	34.363	27.273	81.0	87.4	1.410
800	3.730	34.406	27.364	72.4	78.8	1.493
900	3.336	34.461	27.446	64.7	71.1	1.568
1000	2.994	34.461	27.478	61.6	67.9	1.638

Station	Latitude	Longitude	Date	Time	Depth
79	33-26.0 N 33-24.5 N	138-49.2 E 138-50.0 E	AUG.14, 1977	18:02 18:58	2240

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.547	34.244	21.995	583.7	583.4	0.0
10	27.522	34.270	22.022	581.1	581.2	0.058
20	27.102	34.281	22.166	567.4	567.9	0.115
30	25.164	34.532	22.959	491.5	492.4	0.168
50	23.046	34.738	23.742	416.8	418.4	0.260
75	21.329	34.799	24.270	366.5	368.9	0.358
100	20.360	34.820	24.548	339.9	343.1	0.446
125	19.555	34.811	24.753	320.5	324.5	0.530
150	18.918	34.811	24.916	304.8	309.6	0.609
200	17.829	34.784	25.167	280.9	287.2	0.759
250	16.880	34.770	25.385	260.3	267.9	0.896
300	16.043	34.719	25.540	245.5	254.3	1.027
400	13.052	34.521	26.030	198.9	209.0	1.259
500	10.327	34.360	26.416	162.3	172.7	1.449
600	8.078	34.312	26.743	131.2	141.3	1.605
700	6.128	34.286	26.994	107.5	116.5	1.732
800	5.127	34.316	27.141	93.5	102.3	1.840
900	4.213	34.361	27.278	80.5	88.6	1.936
1000	3.827	34.402	27.351	73.6	81.8	2.021

Station	Latitude	Longitude	Date	Time	Depth
80	33-40.6 N 33-40.4 N	138-43.0 E 138-47.1 E	AUG.14, 1977	21:08 22:21	2620

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.157	34.343	22.194	564.7	564.4	0.0
10	27.168	34.339	22.187	565.3	565.4	0.056
20	27.173	34.341	22.188	565.3	565.8	0.113
30	26.685	34.387	22.378	547.1	548.0	0.168
50	23.882	34.639	23.423	447.2	448.8	0.266
75	22.108	34.771	24.033	389.1	391.5	0.370
100	20.701	34.755	24.408	353.3	356.5	0.463
125	19.789	34.786	24.673	328.1	332.1	0.549
150	18.837	34.776	24.910	305.4	310.2	0.629
200	17.238	34.726	25.266	271.6	277.6	0.776
250	16.092	34.716	25.527	246.8	254.1	0.908
300	15.043	34.646	25.709	229.5	237.9	1.030
400	11.293	34.439	26.305	172.8	181.8	1.243
500	7.881	34.297	26.760	129.6	137.8	1.402
600	5.992	34.291	27.015	105.4	113.0	1.525
700	5.116	34.327	27.150	92.6	100.2	1.630
800	4.229	34.359	27.275	80.8	88.0	1.724
900	3.584	34.415	27.386	70.4	77.2	1.806
1000	3.279	34.440	27.434	65.7	72.7	1.881

Station	Latitude	Longitude	Date	Time	Depth
81	33-51.2 N 33-50.5 N	138-35.0 E 138-36.1 E	AUG.15, 1977	00:23 01:07	1550

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.563	34.371	22.085	575.2	574.9	0.0
10	27.566	34.386	22.095	574.2	574.3	0.057
20	27.578	34.380	22.086	575.0	575.5	0.115
30	27.564	34.382	22.093	574.4	575.3	0.172
50	25.757	34.188	22.518	533.7	535.3	0.285
75	21.970	34.570	23.918	400.1	402.5	0.399
100	19.954	34.787	24.630	332.1	335.3	0.489
125	18.586	34.775	24.973	299.6	303.4	0.569
150	17.478	34.766	25.238	274.2	278.7	0.642
200	15.873	34.693	25.559	243.7	249.4	0.775
250	13.326	34.550	25.998	202.0	208.4	0.890
300	11.403	34.430	26.278	175.4	182.1	0.988
400	9.199	34.270	26.535	151.0	158.5	1.155
500	7.509	34.284	26.805	125.4	133.2	1.302
600	5.637	34.333	27.093	98.1	105.3	1.420
700	4.759	34.312	27.180	89.9	96.9	1.522
800	4.113	34.365	27.292	79.2	86.2	1.613
900	3.718	34.407	27.366	72.2	79.4	1.697
1000	3.398	34.430	27.415	67.5	74.8	1.773

Station	Latitude	Longitude	Date	Time	Depth
82	34-07.4 N 34-07.0 N	138-24.4 E 138-23.9 E	AUG.15, 1977	03:36 04:21	3330

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	25.259	34.087	22.595	526.3	526.0	0.0
10	25.123	34.058	22.614	524.5	524.6	0.052
20	21.996	33.952	23.445	445.2	445.6	0.101
30	18.531	34.386	24.690	326.4	327.1	0.139
50	14.914	34.535	25.651	235.0	236.1	0.195
75	12.526	34.480	26.102	192.2	193.8	0.249
100	11.619	34.477	26.274	175.7	177.8	0.294
125	10.767	34.429	26.392	164.7	167.2	0.338
150	9.763	34.378	26.526	151.8	154.6	0.378
200	8.919	34.338	26.634	141.6	145.2	0.451
250	8.129	34.319	26.741	131.4	135.5	0.521
300	7.480	34.312	26.831	122.9	127.5	0.587
400	6.574	34.302	26.948	111.8	117.3	0.709
500	5.695	34.302	27.061	101.1	107.1	0.822
600	4.830	34.316	27.175	90.3	96.4	0.923
700	4.319	34.349	27.257	82.5	88.9	1.015
800	3.905	34.391	27.334	75.2	81.9	1.100
900	3.491	34.421	27.399	69.1	75.8	1.178
1000	3.167	34.456	27.458	63.5	70.3	1.252

Station	Latitude	Longitude	Date	Time	Depth
83	34-25.0 N 34-24.2 N	138-38.1 E 138-35.4 E	AUG.15, 1977	07:08 08:10	1900

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	25.599	34.168	22.552	530.5	530.2	0.0
10	25.588	34.172	22.558	529.9	530.0	0.053
20	25.471	34.114	22.550	530.6	531.1	0.106
30	21.795	33.923	23.478	441.9	442.7	0.154
50	15.390	34.581	25.582	241.6	242.7	0.217
75	12.953	34.536	26.062	196.0	197.6	0.271
100	12.501	34.527	26.144	188.1	190.3	0.319
125	11.872	34.476	26.226	180.4	183.2	0.366
150	10.783	34.425	26.386	165.1	168.2	0.410
200	9.065	34.353	26.622	142.7	146.3	0.486
250	8.180	34.334	26.745	131.1	135.2	0.557
300	7.641	34.305	26.802	125.7	130.3	0.624
400	6.289	34.304	26.987	108.1	113.3	0.746
500	5.500	34.313	27.094	98.0	103.8	0.854
600	4.830	34.330	27.186	89.3	95.4	0.953
700	4.443	34.343	27.239	84.2	90.8	1.047
800	4.094	34.376	27.303	78.2	85.2	1.135
900	3.724	34.398	27.358	73.0	80.1	1.218
1000	3.531	34.413	27.389	70.0	77.6	1.297

Station	Latitude	Longitude	Date	Time	Depth
84	34-12.5 N 34-13.6 N	138-47.0 E 138-48.5 E	AUG.15, 1977	10:22 11:17	1600

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.679	34.264	21.967	586.4	586.1	0.0
10	27.700	34.271	21.965	586.6	586.7	0.058
20	27.390	34.133	21.962	586.9	587.4	0.117
30	22.265	33.897	23.328	456.3	457.1	0.169
50	16.316	34.559	25.355	263.1	264.3	0.237
75	14.277	34.587	25.828	218.2	220.0	0.297
100	13.280	34.567	26.020	199.9	202.3	0.349
125	12.388	34.529	26.168	186.0	188.8	0.398
150	11.121	34.460	26.353	168.3	171.4	0.443
200	9.820	34.330	26.479	156.3	160.1	0.525
250	8.979	34.287	26.584	146.4	150.9	0.604
300	8.463	34.335	26.702	135.1	140.3	0.676
400	6.925	34.282	26.885	117.8	123.5	0.807
500	6.046	34.281	27.000	106.8	113.2	0.924
600	5.012	34.320	27.157	92.0	98.4	1.030
700	4.334	34.353	27.259	82.4	88.8	1.123
800	3.844	34.401	27.348	73.9	80.4	1.207
900	3.495	34.422	27.400	69.0	75.7	1.285
1000	3.334	34.436	27.426	66.5	73.6	1.361

Station	Latitude	Longitude	Date	Time	Depth
85	34-01.6 N 34-01.6 N	138-53.8 E 138-53.9 E	AUG.15, 1977	12:43 12:52	145

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.460	34.353	22.105	573.2	572.9	0.0
10	27.458	34.366	22.115	572.2	572.3	0.057
20	27.462	34.369	22.116	572.2	572.6	0.114
30	27.462	34.366	22.114	572.4	573.3	0.171
50	21.285	34.538	24.085	384.1	385.6	0.274
75	19.961	34.660	24.532	341.5	343.8	0.364
100	18.881	34.701	24.842	311.9	315.0	0.445
125	14.328	34.537	25.778	223.0	226.2	0.512

Station	Latitude	Longitude	Date	Time	Depth
86	33-53.2 N 33-54.0 N	138-58.7 E 138-57.8 E	AUG.15, 1977	13:54 14:44	1160

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.348	34.413	22.185	565.5	565.2	0.0
10	27.335	34.426	22.200	564.1	564.2	0.056
20	27.329	34.426	22.202	563.9	564.4	0.112
30	27.331	34.424	22.200	564.2	565.1	0.169
50	26.942	34.387	22.296	554.9	556.6	0.282
75	22.424	34.467	23.700	420.9	423.3	0.409
100	19.200	34.669	24.737	322.0	325.1	0.497
125	18.495	34.606	24.866	309.7	313.6	0.577
150	14.690	34.586	25.739	226.6	230.6	0.645
200	13.777	34.594	25.939	207.6	212.8	0.756
250	12.531	34.515	26.130	189.5	195.5	0.858
300	10.117	34.425	26.503	154.1	160.1	0.947
400	7.286	34.325	26.869	119.3	125.4	1.088
500	6.043	34.314	27.027	104.3	110.7	1.207
600	4.931	34.323	27.169	90.9	97.2	1.312
700	4.303	34.364	27.271	81.2	87.7	1.403
800	3.852	34.410	27.355	73.3	79.9	1.486
900	3.531	34.422	27.396	69.4	76.2	1.564
1000	3.324	34.442	27.432	66.0	73.1	1.639

Station	Latitude	Longitude	Date	Time	Depth
87	33-33.7 N 33-33.0 N	139-11.1 E 139-11.9 E	AUG.15, 1977	17:08 17:55	1950

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.368	34.429	22.191	565.0	564.7	0.0
10	27.361	34.438	22.201	564.0	564.1	0.056
20	27.345	34.436	22.204	563.8	564.3	0.112
30	27.312	34.435	22.214	562.8	563.7	0.169
50	25.086	34.451	22.922	495.1	496.7	0.278
75	22.883	34.625	23.703	420.6	423.1	0.392
100	21.605	34.760	24.165	376.4	379.7	0.491
125	20.364	34.762	24.503	344.3	348.4	0.583
150	19.524	34.774	24.733	322.3	327.2	0.666
200	18.254	34.797	25.072	290.0	296.3	0.822
250	16.263	34.654	25.440	255.0	262.4	0.963
300	14.393	34.602	25.815	219.4	227.5	1.085
400	10.031	34.346	26.456	158.5	166.6	1.284
500	7.389	34.304	26.838	122.3	130.0	1.427
600	5.845	34.321	27.057	101.5	108.9	1.543
700	4.417	34.357	27.253	82.9	89.5	1.642
800	3.866	34.412	27.354	73.3	79.9	1.727
900	3.415	34.442	27.423	66.8	73.3	1.803
1000	3.123	34.467	27.471	62.3	68.9	1.874

Station	Latitude	Longitude	Date	Time	Depth
88	33-40.9 N 33-40.2 N	139-32.1 E 139-33.0 E	AUG.15, 1977	19:55 20:45	1640

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	26.964	33.923	21.941	588.9	588.6	0.0
10	26.962	33.929	21.946	588.5	588.6	0.058
20	26.900	33.916	21.955	587.5	588.0	0.117
30	26.256	33.996	22.219	562.3	563.2	0.175
50	24.470	34.312	23.002	487.4	489.0	0.280
75	21.890	34.435	23.840	407.5	409.9	0.393
100	19.006	34.596	24.730	322.6	325.7	0.486
125	16.954	34.682	25.300	268.4	272.1	0.559
150	16.309	34.631	25.411	257.8	262.1	0.625
200	14.494	34.594	25.788	222.0	227.3	0.748
250	13.217	34.529	26.003	201.5	207.7	0.856
300	11.603	34.481	26.281	175.1	182.0	0.954
400	8.152	34.289	26.714	134.0	140.7	1.117
500	6.349	34.310	26.985	108.4	115.0	1.243
600	5.735	34.296	27.051	102.0	109.3	1.356
700	4.542	34.355	27.238	84.4	91.2	1.456
800	3.950	34.398	27.335	75.1	81.9	1.544
900	3.271	34.446	27.440	65.2	71.4	1.620
1000	3.002	34.468	27.483	61.1	67.5	1.689

Station	Latitude	Longitude	Date	Time	Depth
89	33-54.6 N 33-54.0 N	139-23.4 E 139-23.3 E	AUG.15, 1977	22:36 23:25	1220

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	26.479	33.958	22.120	571.8	571.4	0.0
10	26.481	33.963	22.123	571.4	571.5	0.057
20	26.385	33.969	22.158	568.2	568.6	0.114
30	25.710	34.048	22.428	542.3	543.2	0.169
50	22.944	34.345	23.474	442.3	443.9	0.266
75	19.706	34.549	24.512	343.5	345.7	0.364
100	17.440	34.690	25.190	278.8	281.7	0.440
125	16.503	34.659	25.388	260.0	263.6	0.509
150	15.808	34.635	25.529	246.5	250.7	0.573
200	14.733	34.623	25.758	224.7	230.2	0.693
250	12.975	34.530	26.053	196.8	203.0	0.801
300	10.723	34.418	26.392	164.6	171.0	0.895
400	8.381	34.348	26.725	132.9	139.8	1.047
500	6.495	34.287	26.947	111.9	118.7	1.175
600	4.699	34.339	27.208	87.2	93.2	1.282
700	4.232	34.376	27.288	79.6	85.9	1.371
800	3.939	34.396	27.334	75.2	81.9	1.455
900	3.702	34.413	27.372	71.7	78.8	1.536
1000	3.293	34.448	27.439	65.3	72.3	1.611

Station	Latitude	Longitude	Date	Time	Depth
90	34-07.9 N 34-07.6 N	139-16.7 E 139-16.6 E	AUG.16, 1977	01:06 01:25	390

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	26.636	34.473	22.458	539.5	539.2	0.0
10	27.621	34.333	22.038	579.7	579.7	0.056
20	27.574	34.299	22.027	580.6	581.1	0.114
30	24.311	34.229	22.987	488.9	489.7	0.167
50	17.111	34.608	25.206	277.3	278.6	0.241
75	16.540	34.659	25.379	260.9	262.9	0.308
100	16.216	34.661	25.456	253.5	256.3	0.373
125	15.668	34.596	25.530	246.5	249.9	0.437
150	14.804	34.594	25.721	228.4	232.4	0.496
200	13.459	34.556	25.975	204.2	209.2	0.607
250	11.805	34.487	26.247	178.3	184.1	0.704
300	10.201	34.410	26.477	156.5	162.7	0.791

Station	Latitude	Longitude	Date	Time	Depth
91	34-15.6 N 34-15.4 N	139-11.7 E 139-11.5 E	AUG.16, 1977	02:39 02:45	93

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	26.992	34.277	22.197	564.4	564.1	0.0
10	25.903	34.087	22.397	545.3	545.4	0.055
20	21.311	34.277	23.880	403.6	404.0	0.103
30	18.494	34.419	24.724	323.1	323.8	0.139
50	16.248	34.639	25.432	255.8	257.0	0.196
75	15.529	34.645	25.599	240.0	241.9	0.259

Station	Latitude	Longitude	Date	Time	Depth
92	34-24.9 N 34-24.7 N	139-04.4 E 139-03.7 E	AUG.16, 1977	04:05 04:35	720

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.372	34.316	22.105	573.2	572.9	0.0
10	27.372	34.321	22.109	572.8	572.9	0.057
20	27.372	34.329	22.115	572.3	572.8	0.114
30	25.758	33.876	22.283	556.1	557.0	0.171
50	17.726	34.441	24.930	303.5	304.8	0.253
75	14.340	34.534	25.774	223.4	225.2	0.317
100	13.556	34.559	25.958	205.8	208.2	0.371
125	12.844	34.533	26.081	194.2	197.1	0.422
150	12.517	34.510	26.128	189.6	193.1	0.471
200	11.616	34.480	26.277	175.5	179.9	0.564
250	11.163	34.399	26.298	173.5	179.0	0.653
300	9.620	34.366	26.541	150.4	156.2	0.736
400	8.220	34.314	26.723	133.1	139.9	0.882
500	6.525	34.296	26.950	111.6	118.5	1.009
600	5.395	34.305	27.100	97.4	104.3	1.120
700	4.518	34.350	27.236	84.5	91.2	1.218

Station	Latitude	Longitude	Date	Time	Depth
93	34-29.8 N 34-29.4 N	138-58.4 E 138-57.3 E	AUG.16, 1977	05:22 05:50	510

Depth	Temp	Sal	σt	Δst	Δstp	ΔD
0	27.350	34.284	22.088	574.8	574.5	0.0
10	27.354	34.285	22.088	574.8	574.9	0.057
20	27.331	34.280	22.091	574.5	575.0	0.115
30	26.786	34.129	22.152	568.7	569.6	0.172
50	16.796	34.480	25.182	279.5	280.8	0.250
75	14.982	34.624	25.705	229.9	231.8	0.312
100	13.682	34.579	25.947	206.8	209.3	0.368
125	12.742	34.537	26.105	191.9	194.8	0.418
150	12.035	34.480	26.198	183.0	186.4	0.466
200	11.253	34.462	26.330	170.4	174.8	0.555
250	10.452	34.425	26.445	159.6	164.8	0.640
300	9.693	34.385	26.543	150.2	156.0	0.720
400	7.289	34.301	26.849	121.2	127.2	0.864