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BOMB ^{14}C IN THE OCEAN SURFACE 1966-1981

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ABSTRACT. Bomb ^{14}C has been used as a tracer for CO_2 in ocean surface water to study CO_2 exchange between atmosphere and ocean. Using ordinary cargo ships for sampling, we have been able to cover some parts of the Atlantic, Pacific, and Indian Oceans for certain periods. A total number of 520 samples from 89 locations were measured during the last 15 years. The data are presented both in tables and graphs. A maximum ^{14}C concentration ($\Delta^{14}C$) of ca 20% was observed in temperate northern latitudes, and a few per cent lower at southern latitudes. A seasonal trend in the ^{14}C variation, with summer maximum and winter minimum, was observed both in downwelling and upwelling areas.

INTRODUCTION

The development of ^{14}C in the atmosphere after nuclear testing is governed by the exchange of CO_2 with the land biosphere and the ocean. The latter is regarded of major importance in the present exchange. One main purpose of tracing bomb ^{14}C is also to study the exchange of CO_2 between atmosphere and ocean. We realized that the exchange within the ocean was very complicated, and that cooperation among several laboratories would be necessary for many years. At this laboratory we decided only to sample the ocean surface, as this could be done quite easily from cargo ships on regular routes. The main idea was to observe the mean ^{14}C variation with time in the ocean surface, with a sampling program which gradually was extended to greater parts of the Atlantic, Pacific, and lastly, the Indian Oceans.

Complete tables and graphs of all our atmospheric ^{14}C data were previously presented (Nydal & Lövseth, 1983). The present paper is an attempt to make a similar presentation of all the oceanic ^{14}C data, which derive from 520 surface-water samples during the last 15 years. All data are regarded as final as they have been critically analyzed, recalculated, and in some cases, supplied with minor corrections. The paper is, only to a small extent, concerned with results from other laboratories.

SAMPLING AND LOCATION

In reviewing all the ocean data, we found it necessary to mark the widely scattered sampling with stations generally located within one or two degrees. Some earlier station symbols had to be replaced (Nydal, Lövseth, & Skogseth, 1980) with new station numbers (fig 1). The number of samples collected at each station may vary greatly, from 1 to >50. Also, the time interval between each sample may differ from one place to another, dependent on how often the ships passed the respective locations.

The Atlantic Ocean is covered with 28 stations (01 to 28) from the Barents Sea (74°N) to the south Atlantic Ocean (35°S). Sampling with cargo ships was done at two different periods, from 1966 to 1972, and from 1976 on. Several stations (17, 20, 28) were probably established too close to the continents where water upwelling occurs. The same effect may also

have occurred at stations 10, 11, and 16 on the Atlantic Ridge, and in the divergence area of the equatorial zone (0°-15°N/S). However, comparison of the results from these stations with those in the open ocean with a strong thermocline, is very useful. The most representative stations in the latter case are 15 and 16 in the Sargasso Sea and station 25 in the Southeastern Atlantic Basin.

The Indian Ocean is covered with 14 stations (31 to 45) from 1976 to the present. It was originally started with 5 regular stations (Nydal, Lövseth, and Skogseth, 1980), but change in the course of the shipping routes caused a scattering of sampling among several locations. In contrast to the Atlantic Ocean, all stations in the Indian Ocean were situated on the deep basins with depths of >3000m.

The Pacific Ocean was covered with 39 stations (51 to 88) from 1966 to 1977. The majority of stations in both hemispheres were located within the gyral circulation system between 15° and 35° latitudinal degrees with a fairly stable surface layer. Aside from the stations along the coast of North America (52, 54, and 73) and New Zealand (87 and 88) most are far from the continents where the ocean is >3000m deep. We were only able to obtain a continuous series of samples at a few locations in a 6- to 8-year period. The interval between each sample was generally 3 to 4 months.

TREATMENT OF SAMPLES

The treatment of samples changed with time. From 1966 to 1976, the collected samples were stored in 200L steel drums aboard the ships during the journeys. The air was removed from the drums before filling. Further processing was performed in the laboratory 2 to 4 months later. On reaching the laboratory, the drum was opened and 1L of sea water was put aside for salinity measurement. After the contents of the drum were acidified (pH <3) with 1L of concentrated sulfuric acid, the CO_2 was flushed out with nitrogen at room temperature and absorbed in an ammonia trap. A 1- to 2-day flushing followed. After further precipitation with $CaCl_2$, filtration of $CaCO_3$, and, finally, treatment with HCl, a maximum CO_2 amount of 5 to 6L was obtained.

Towards 1975 the sampling program in the Atlantic and Pacific Oceans was gradually decreased, partly due to a shipping crisis, and partly because of the inconvenient transportation of heavy drums to the laboratory. Also, there were some objections to storing the sea water on board for long periods before processing. The discovery of a seasonal trend in the ^{14}C concentration at some locations indicated a need for better geographically defined stations and shorter intervals between each sample.

In the revised sampling program of 1976, the removal of CO_2 from sea water was done on board immediately after collection. The flushing time with 600L of nitrogen was shortened to 1.5 hours. Four to 5L of CO_2 were still obtained. The CO_2 was absorbed in 2% NaOH (0.75L) during the flushing procedure. This solution was then received in the laboratory and directly treated with hydrocloric acid (HCl) for further CO_2 release. At the beginning of the new program, nine parallel samples (200L of sea water each) were stored on board as before in order to study the reliability

of earlier samples. Only in 1 of the 9 cases a stored sample (TR-39B) showed an important deviation (40 ± 10‰) from the other (TR-39A).

MEASUREMENTS AND CALCULATIONS

In the same way as for tropospheric CO_2 samples, ocean surface samples were measured at 2 atmospheres pressure in CO_2 proportional counters with effective volumes generally ranging between 1 and 2L. The ^{14}C samples collected before 1976 were generally measured with an accuracy of 10‰ during a counting period of 25 hours. Samples collected in the new program from 1976 on were counted with an accuracy of 5 to 7‰ during a counting time of at least 48 hours. The ^{14}C concentration given in the tables ($\Delta^{14}C$) was, as for tropospheric CO_2, (Nydal & Lövseth, 1983) calculated in per mil excess above a normal ^{14}C level according to the formula:

$$\Delta^{14}C = \delta^{14}C - 2(\delta^{13}C + 25)\left(1 + \frac{\delta^{14}C}{1000}\right)$$

The $\Delta^{14}C$ values are given relative to the standard (NBS oxalic acid) after normalization to a fixed $\delta^{13}C$ ratio of −25‰. No correction for the decay of the NBS standard (after 1950) has been performed.

From 1965 to 1976, flushing of CO_2 was performed in the laboratory at room temperature for 1 to 2 days (5-6L CO_2); a mean $\delta^{13}C$ value of +2.0 ± 1.5‰ was then observed. When the processing was performed later on board with a higher flushing speed, the $\delta^{13}C$ value changed to −6.5 ± 1.5‰. For the latter samples the flushing procedure for each sample was kept fairly constant during longer periods, and the $\delta^{13}C$ values were thus relatively stable.

The ocean temperature at the sampling depth was observed with an automatic recorder, located at the inlet of the water cooling system through which the samples were collected. The accuracy in the temperature recording was generally better than 0.5°C.

Salinity was measured at 22.5°C with an Inductor Salinometer (Industria Manufacturing Engineers LTD) at the Marine Biological Station in Trondheim. The result was calculated in per mil deviation from the international Salinity Standard (Standard Sea Water P91). The accuracy (one standard deviation) in each measurement was 0.003‰. Salinity measurements started in 1976; earlier samples were stored in glass bottles for several years before measurement. Later samples were measured immediately after arrival. Evaporation, due to a leak, was probably the cause for some unexpected high salinity values from a few bottles, stored earlier.

COMMENTS TO TABLES

All our ocean data are listed in five tables. Tables 1 and 2 contain data for, respectively, the northern and the southern Atlantic Ocean. Table 3 covers the Indian Ocean, and Tables 4 and 5 cover, respectively, the northern and southern Pacific Ocean.

Data are listed by station, 28 stations (01 to 28) for the Atlantic, 14 stations (31 to 45) for the Indian Ocean, 39 stations (51 to 88) for the Pa-

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cific. Each sample is numbered. The prefix SV (sea water) designates the samples collected from 1966 to 1976. Samples collected from 1976 to 1981 are designated TR, TO, and TB, which indicates the respective Wilhelmsen ships, *Tricolor, Torrens,* and *Tombarra.*

The second column (week no.) contains the date of collection given in number of weeks from the first week in January 1963. The third column indicates the date of collection by year, month, and day. The fourth column provides the location of each sample in latitudinal-longitudinal coordinates with an accuracy of one minute. The area covered by each station is indicated by the heading and includes the group of samples belonging to the respective station. Columns 5 to 7 give the depth of collection, salinity, and temperature of the sea water.

Columns 8 to 10 show values respectively of the uncorrected $\delta^{14}C$, $\delta^{13}C$, and the corrected $\Delta^{14}C$ values given in per mil. $\delta^{13}C$ was dependent on the flushing procedure for CO_2 and thus has only relative importance.

RESULTS AND DISCUSSION

According to some authors (Sverdrup, Johnson, & Fleming, 1942; Broecker, Peng, & Engh, 1980) the exchange of ocean surface water with water from intermediate layers is very complex, and far from fully understood. The mixing process in the ocean occurs both in vertical and horizontal directions and can roughly be described as follows:

In the equatorial area (0° to 15°N/S) the trade wind causes a divergence zone where water upwelling occurs. Chemical analysis of various constituents of the water may give some indication of its origin. Upwelling also occurs closer to the continents or at the border between shallow and deep water. There is generally a more stable surface layer (ca 75m) at temperate latitudes (15° to 45°N/S) where downwelling occurs. Closer to the Arctic and Antarctic areas (above 45°N/S) there is a much faster downwelling of water with low salinity, which influences the water towards lower latitudes. Antarctic water especially penetrates far into the intermediate water of the Atlantic, Pacific, and Indian Oceans.

In the present program samples are collected at 4 to 10m depth, and thus are very close to the surface. The three measured parameters, $\Delta^{14}C$, temperature, and salinity, may be dependent on local weather and the degree of mixing of the upper surface layer. All the obtained data are presented here in tables and graphs. The latter are designed as time series in dependence on latitude. The data for the Atlantic Ocean are divided into 5 graphs (figs 2-6), the Indian Ocean into 1 graph (fig 7), and the Pacific Ocean into 3 graphs (figs 8-10). Studies of the data have revealed 1) seasonal and periodic variations, and 2) latitudinal variation.

1) *Seasonal and periodic variations.* One of the most regular seasonal trends with a positive temperature correlation was found in the Sargasso Sea (stations 15 and 16, figs 2-3). The magnitude of the peak to bottom values (2-4‰) were, however, not well-defined in the data set, and the main purpose of the revised program after 1976 was to study such variations more closely. Broecker and Peng (1980) suggested an annual cycle of between 2.6 and 3.1‰ at temperate latitudes. They assumed that the

variation was due to a winter thickening of the surface layer. Unfortunately, it was not possible to further study the variation in the Sargasso Sea and most of the other stations in the Atlantic Ocean were influenced by water upwelling. For some stations (31 to 38) in the Indian Ocean (fig 7) a mean seasonal variation could be of the expected magnitude, but the measurements were too scanty and irregular, and a clear temperature correlation was not observed. Towards higher latitudes (south) in the Indian Ocean, the amplitude in variations increased. Measurements in the Pacific Ocean from 1970 to 1977 were also too few to support Broecker's hypothesis.

Seasonal variations with a positive temperature correlation were also observed in areas of water upwelling. This is especially the case for station 20 in the Atlantic Ocean outside Dakar, and at station 22 on the equator in the Guinea Basin (fig 4). The peak to bottom values at Dakar (6-10‰) were higher than at the equator (4-6‰).

Some of the most problematic $\Delta^{14}C$ variations are found in the Atlantic Ocean on the coast of Argentina (station 28, fig 5), and in the Pacific Ocean near Seattle (stations 52 and 54, fig 9). In both cases, there are periodic trends with peak to bottom values up to 20‰. The bottom values agree more with normal surface values at this latitude. However, the peak values coincide with abnormally low salinity, which indicates intrusion of low salinity water with high ^{14}C concentration. The most reasonable explanation is that the samples are locally influenced by the large rivers in the area.

There has been a tendency to explain erratic variations as errors in measurement. Such errors are now largely rejected due to parallel measurements. Thus, the ocean surface and internal mixing are not so regular as we would wish for modeling.

2) *Latitudinal variation*. Such variation is shown in the Indian and Pacific Oceans. Sampling in the Indian Ocean mainly followed a latitudinal band 6° to 41°S from 1976 to 1981, and a mean maximum $\Delta^{14}C$ value of 14 ± 0.5‰ above normal level was recorded at ca 30°S (fig 7). In close agreement with this trend is the result from the South Pacific Ocean from 1970 to 1977 (fig 10). The maximum mean value was probably slightly higher here. A very large peak (32 ± 2‰) was found in 1974 at station 84 (35°S, 180°E), and a peak with reduced amplitude (20.3 ± 1.3‰) was simultaneously seen at station 81 (29°S, 150°N).

Measurements in the North Pacific Ocean 1970-1975 show a latitudinal dependence with a maximum mean value of a few per cent higher (max 5‰) than in the southern hemisphere (fig 8). This maximum value of 18-20‰ above normal seems to appear in the 20° to 30°N latitudinal band, and agrees with other results (Linick, 1980; Broecker, Peng, & Engh, 1980; Tans, 1981).

The latitudinal dependence in the Atlantic Ocean is not satisfactorily recorded for the open ocean because most stations were located along the coast of Africa where upwelling occurs. The best locations for comparison with the result from the North Pacific Ocean (figs 8-9) are probably those from the Sargasso Sea (fig 2), where the agreement is satisfactory. The re-

sult from these stations (15, 16) in the period 1966 to 1970 is also in agreement with those obtained by others in the same area (Quay & Stuiver, 1980; Östlund, Dorsey, & Brescher, 1976).

In a previous paper (Nydal & Lövseth, 1983) all the ocean data are plotted versus time in one graph. Even the scattering of the data is large; a clear trend in the ocean measurement (40°N-40°S) is visible. $\Delta^{14}C$ in the ocean surface at mean latitude passed its maximum value ($\Delta^{14}C \sim 14‰$) during the years 1970-1972 and is now decreasing at an exponential rate of about the same magnitude as that of the atmosphere ($Ae^{-0,06t}$).

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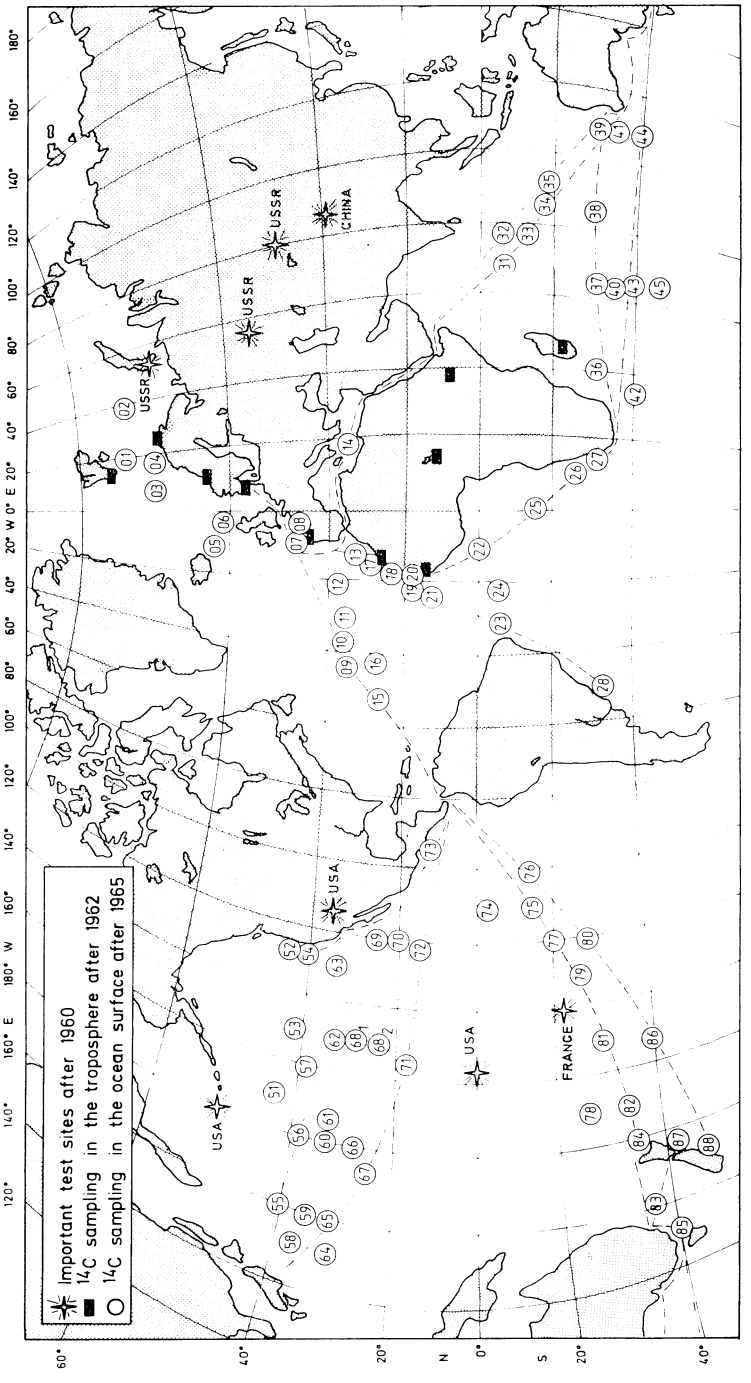

Fig 1. Sampling locations for ^{14}C in the troposphere and ocean surface

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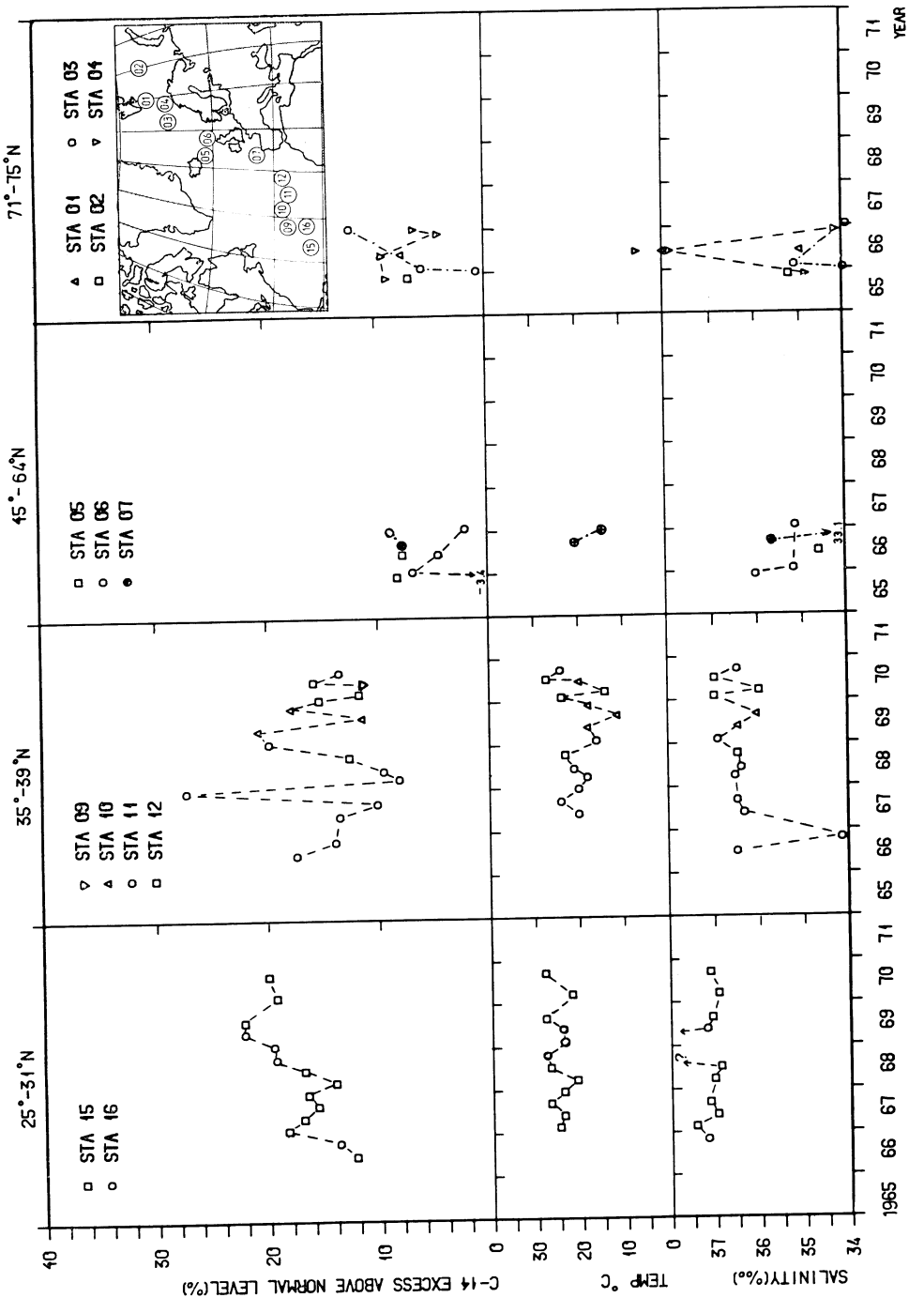

Fig 2. ^{14}C variation in surface water of the North Atlantic Ocean 1965-1971

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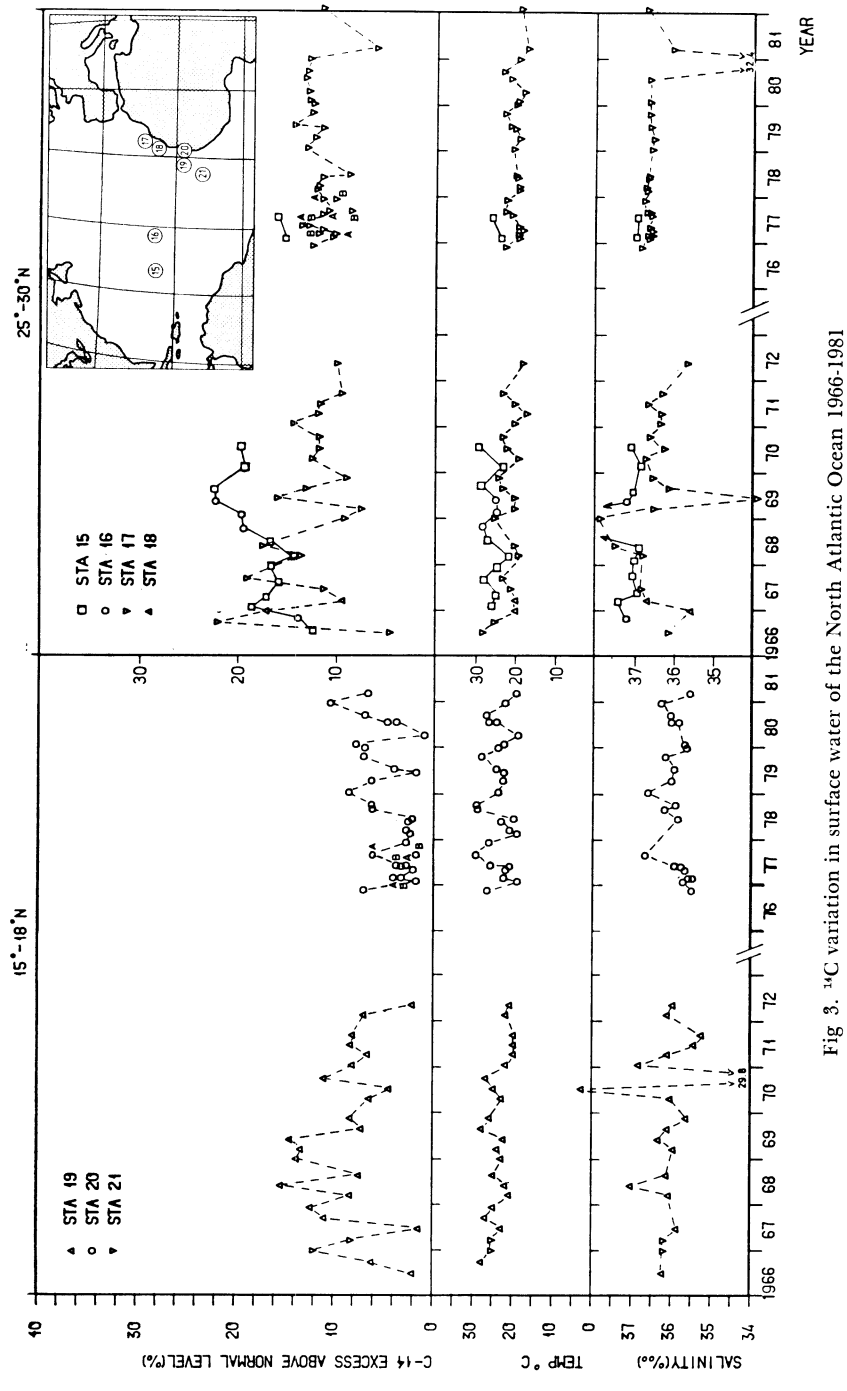

Fig 3. ^{14}C variation in surface water of the North Atlantic Ocean 1966-1981

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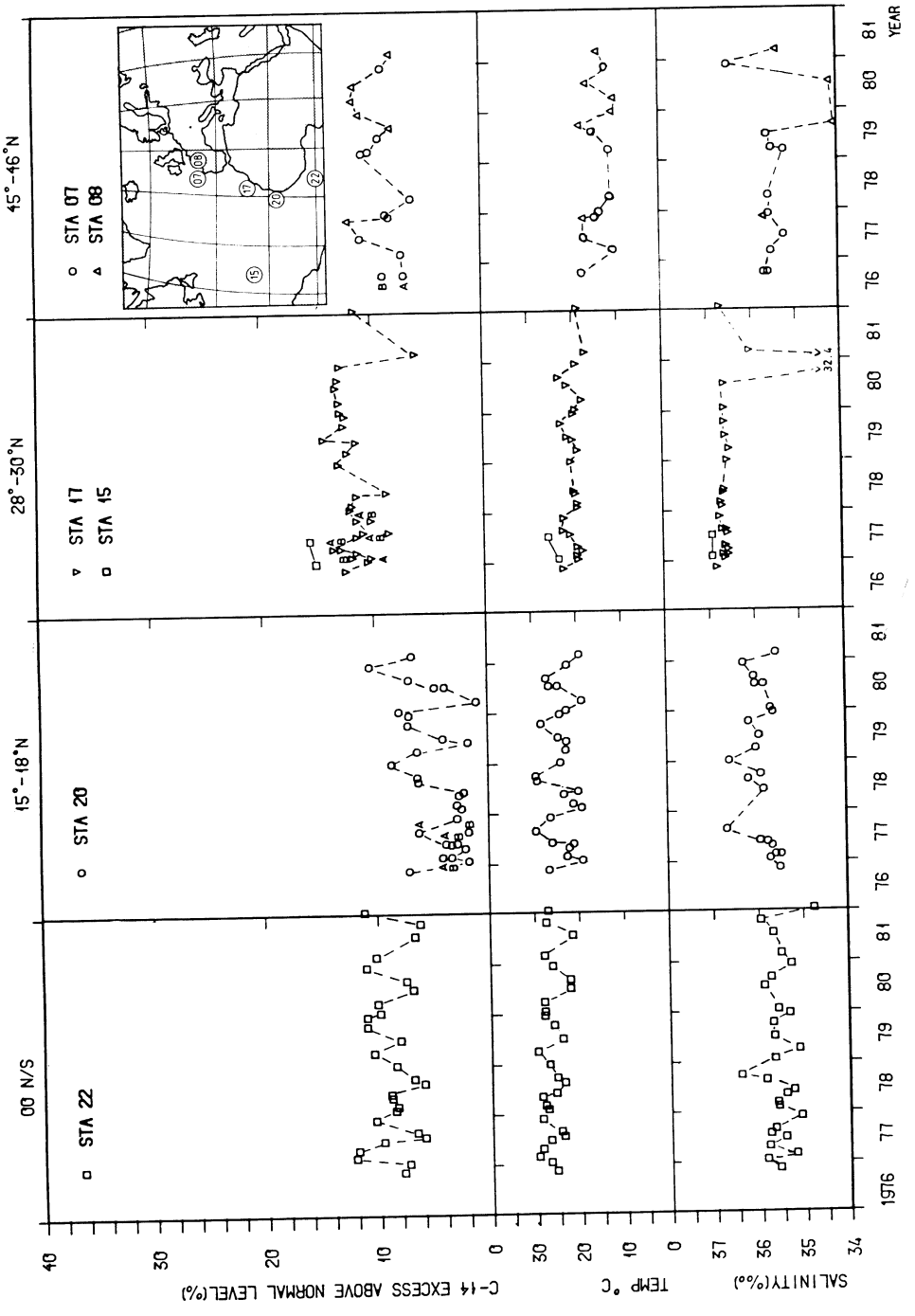

Fig 4. ^{14}C variation in surface water of the North Atlantic Ocean 1976-1981

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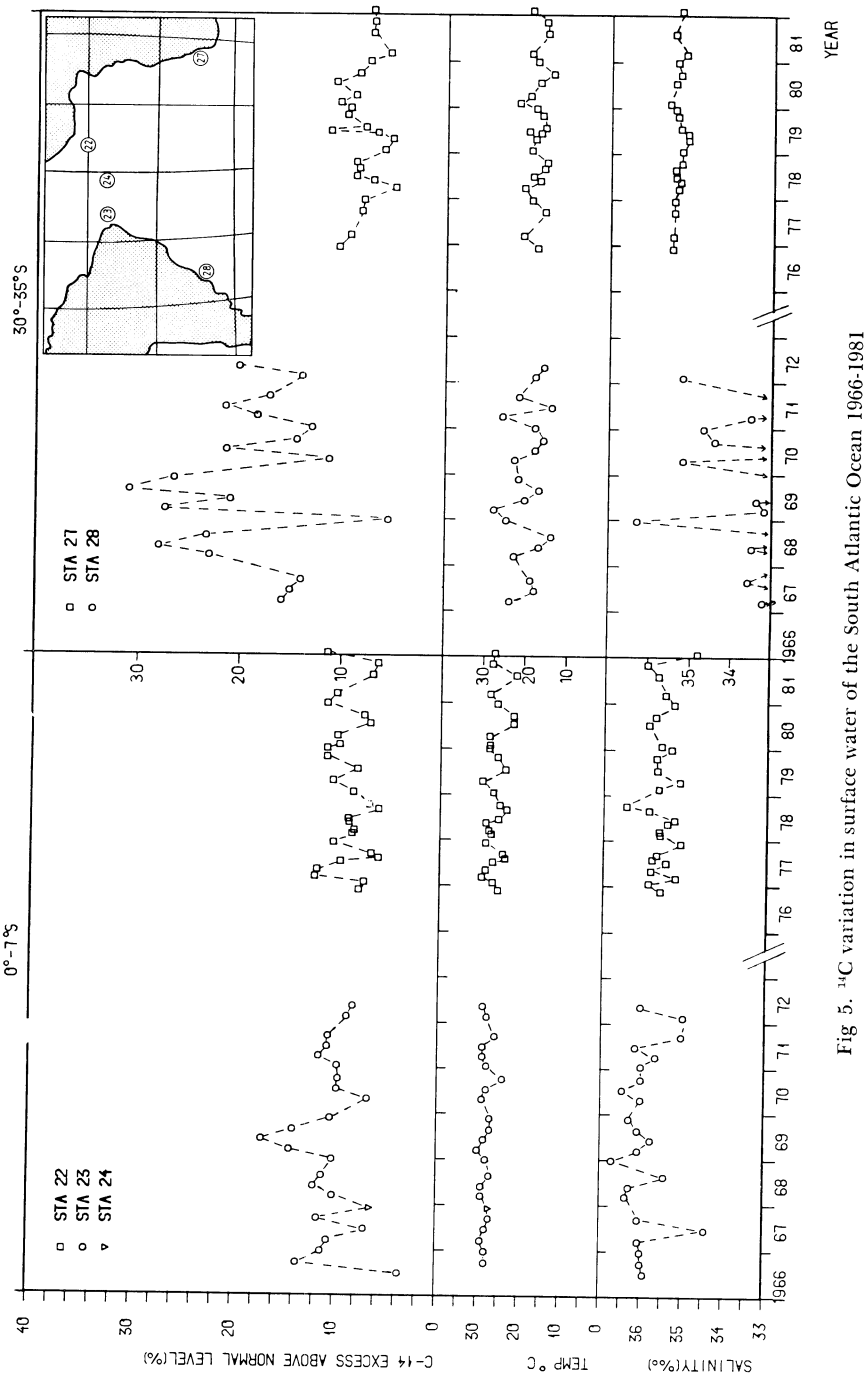

Fig 5. ^{14}C variation in surface water of the South Atlantic Ocean 1966-1981

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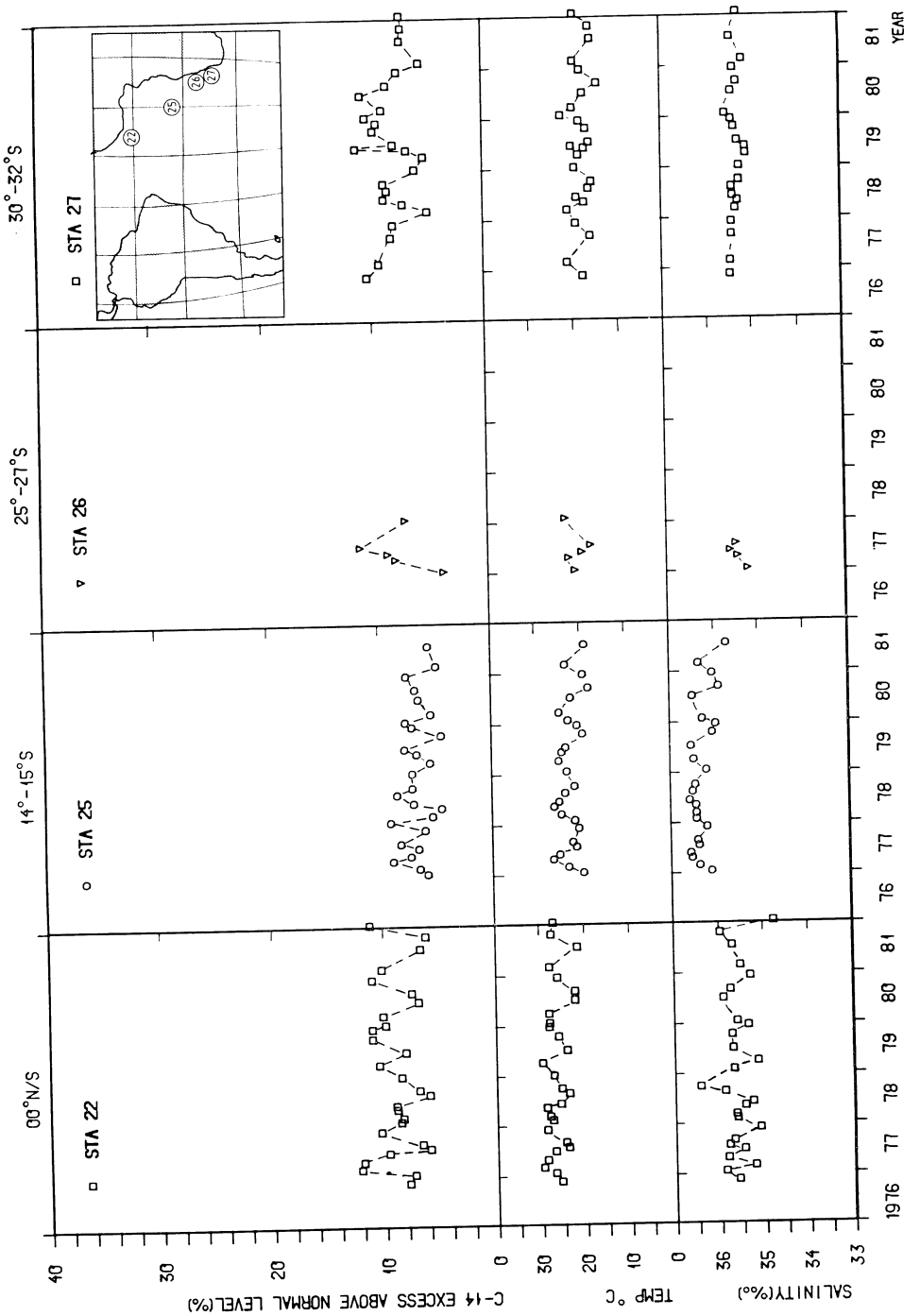

Fig 6. ^{14}C variation in surface water of the South Atlantic Ocean 1976-1981

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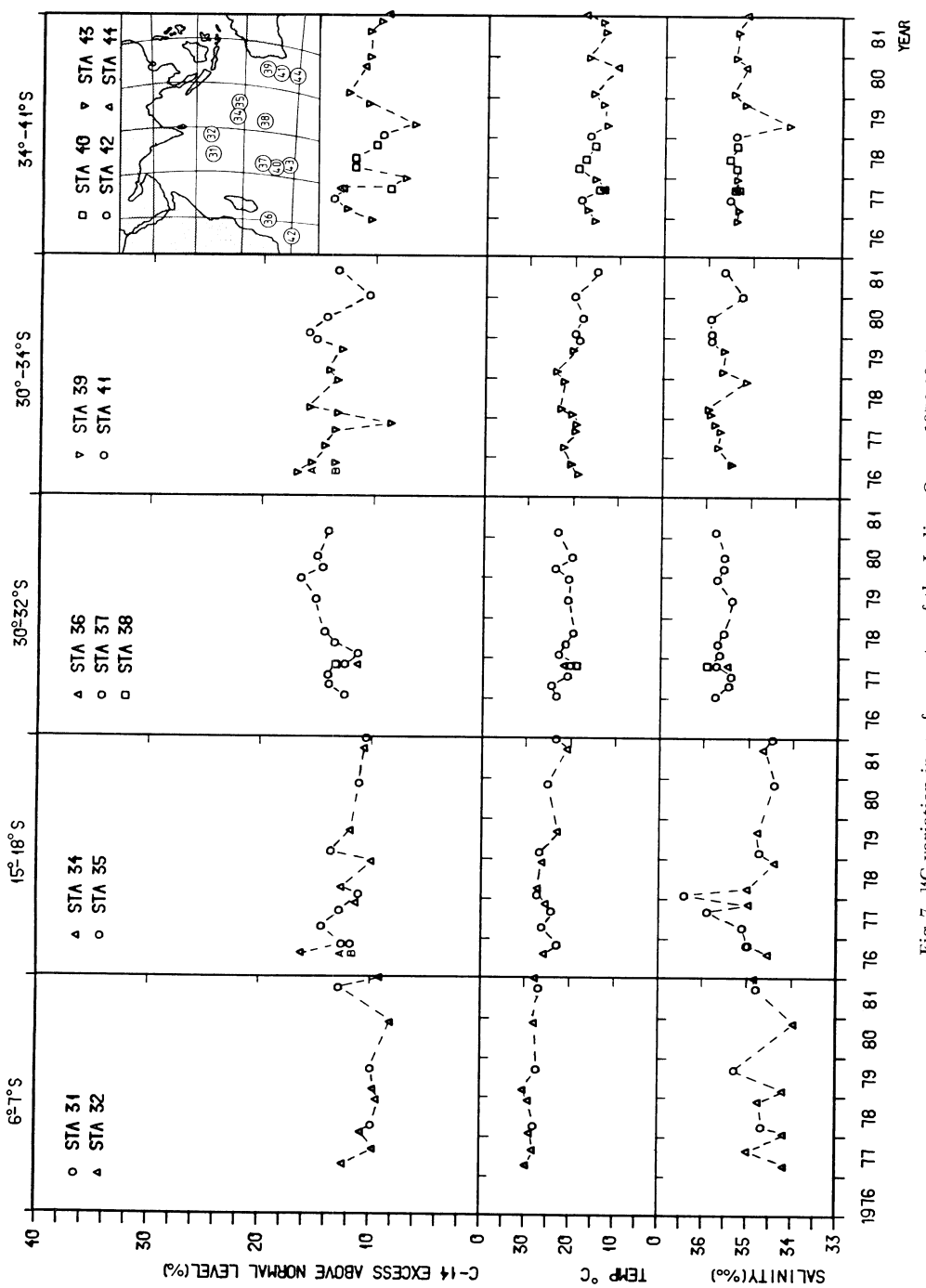

Fig 7. ^{14}C variation in surface water of the Indian Ocean 1976-1981

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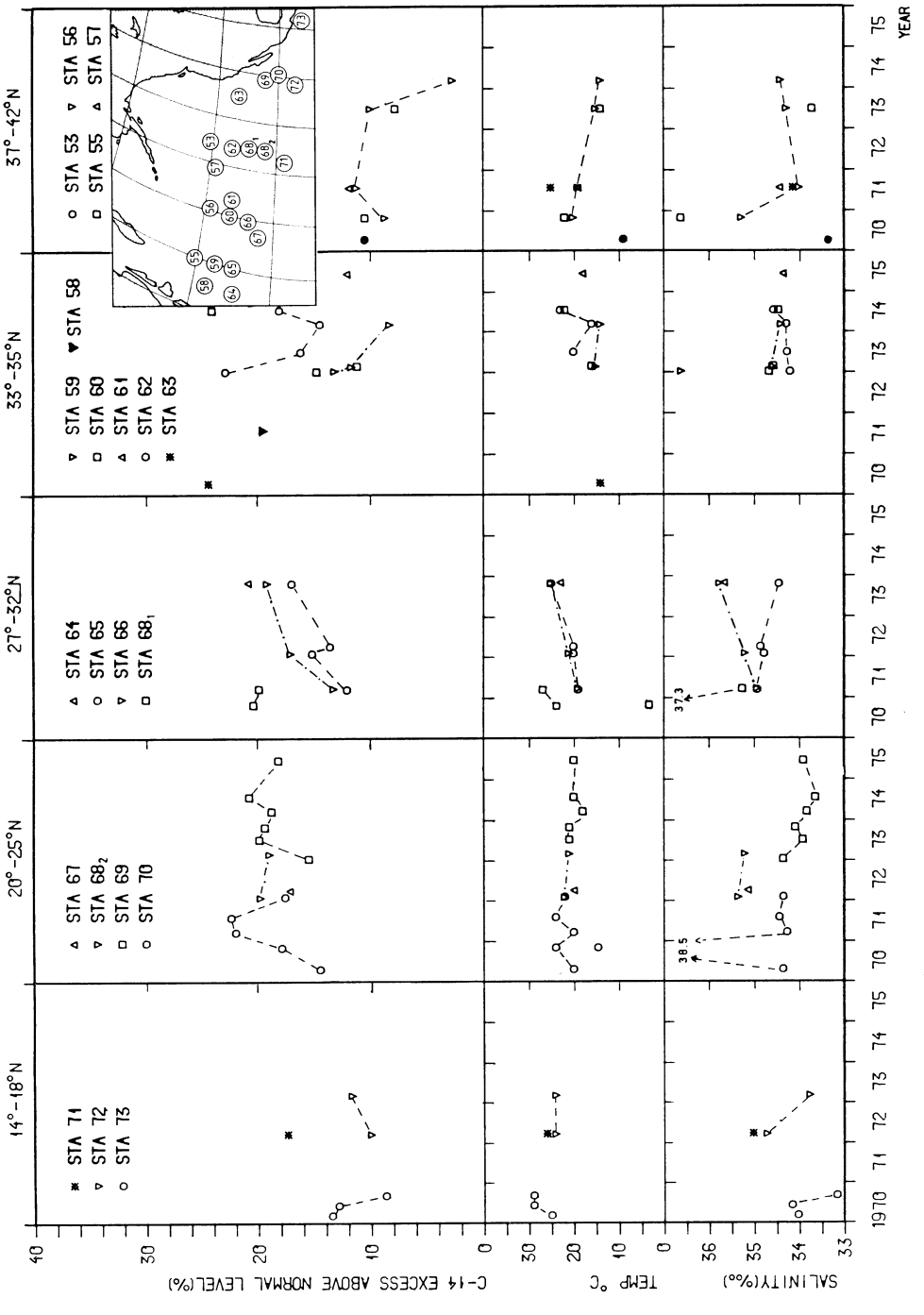

Fig 8. ^{14}C variation in surface water of the North Pacific Ocean 1970-1975

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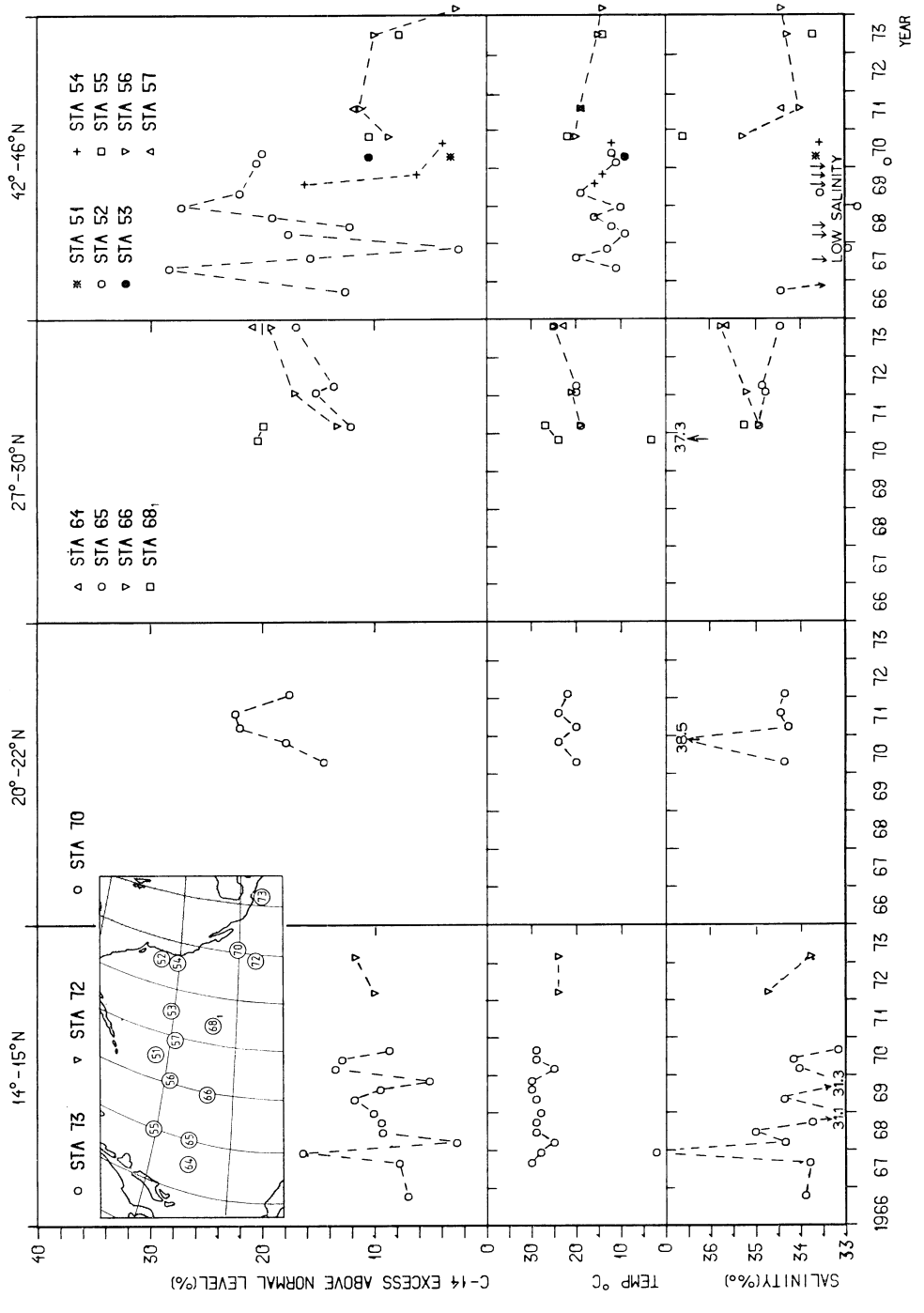

Fig 9. ^{14}C variation in surface water of the North Pacific Ocean 1966-1973

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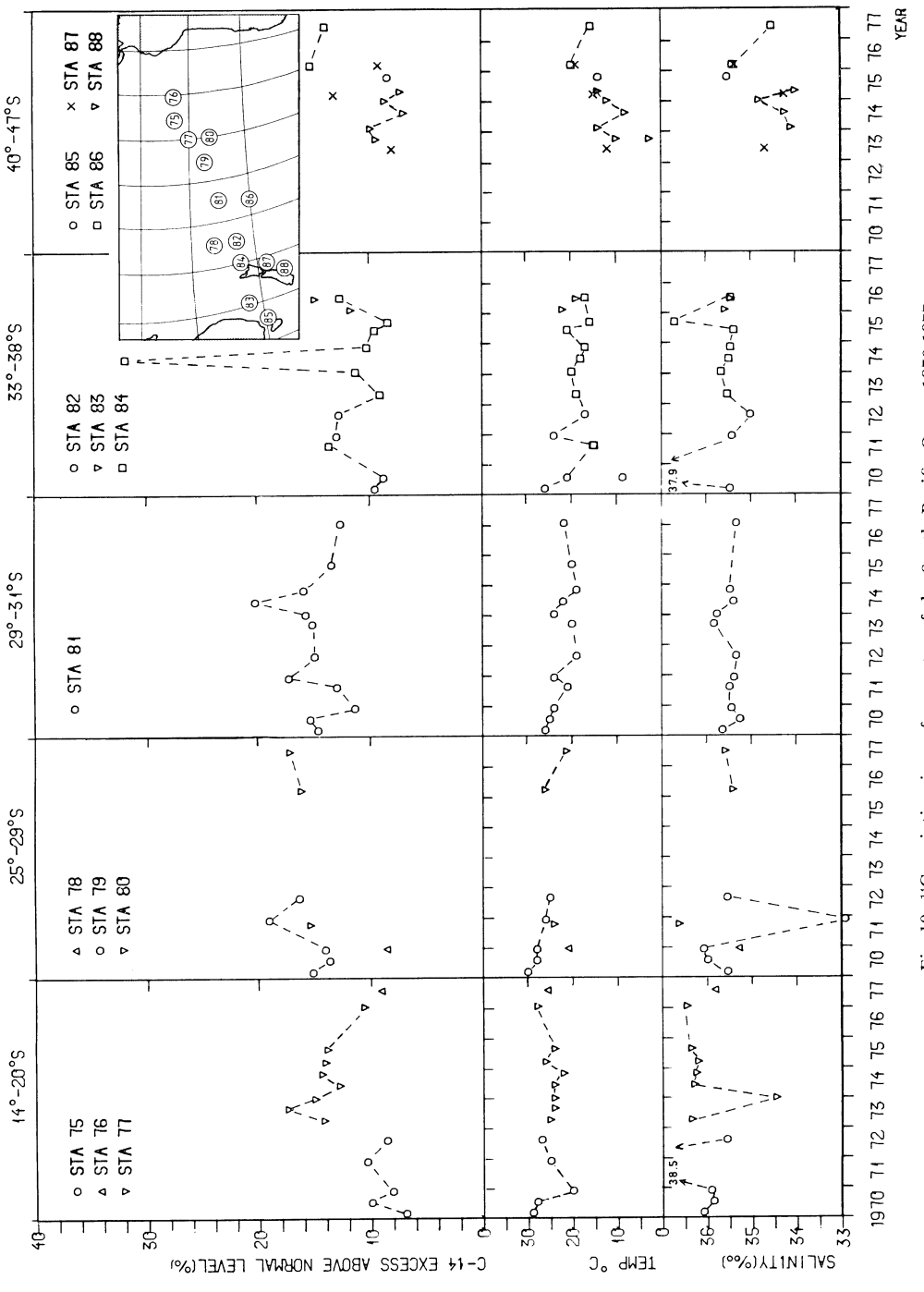

Fig 10. ^{14}C variation in surface water of the South Pacific Ocean 1970-1977

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TABLE 1. Carbon 14 in the Surface of the North Atlantic Ocean

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 1						
SV-8	179	660602	74°14′N, 20°11′E	4	34.95	0.1	134	1.0	75 ± 9
			Station 2						
SV-2	151	651121	74°40′N, 39°00′E	~4	35.19		126	1.2	68 ± 10
			Station 3, 71°–72°N, 07°–09°E						
SV-5	158	660109	71°48′N, 08°43′E	~4	33.98		59	−0.4	7 ± 10
SV-7	162	660210	71°50′N, 07°20′E	~4	35.06		113	0.5	56 ± 10
SV-32*	210	670114	72°08′N, 08°38′E	~4	33.91		174	−2.4	121 ± 10
			Station 4, 72°–73°N, 15°–20°E						
SV-1	150	651115	72°32′N, 19°64′E	~4	34.81		132	−2.9	82 ± 11
SV-9	179	660613	72°14′N, 19°38′E	4	37.83	5.8	141	0.2	84 ± 9
SV-26	203	661124	72°38′N, 14°39′E	~4	34.15		98	1.0	41 ± 9
SV-31	209	670110	72°38′N, 14°40′E	~4			120	0.4	63 ± 10
			Station 5, 64°–66°N, 11°–13°W						
SV-3	154	651212	64°28′N, 11°00′W	~4			137	−0.4	81 ± 11
SV-11	181	660620	66°00′N, 12°30′W	~4	34.59		135	1.2	76 ± 7
			Station 6, 63°–64°N, 03°E–04°W						
SV-4	153	651209	63°02′N, 03°44′E	~4	36.00		12	−4.4	−34 ± 10
SV-6	160	660127	63°45′N, 01°00′W	~4	35.15		125	1.5	67 ± 9
SV-10	181	660621	63°25′N, 04°00′W	~4			107	2.6	44 ± 9
SV-33	212	670125	63°25′N, 04°00′W	~4	35.11		78	1.9	20 ± 10
			Station 7, 45°–46°N, 05°–08°W						
SV-21	195	660926	45°12′N, 07°56′W	9	35.62	20	137	1.9	76 ± 9
SV-30	209	670101	44°43′N, 08°15′W	9	33.07	14	144	1.0	84 ± 10
TO-1A	717	760927	46°00′N, 07°30′W	7.5	35.68	18.2	124	−0.5	69 ± 14

TO-1B	717	760927	46°00′N, 07°30′W	7.5	35.59	18.2	123	−9.3	88 ± 10
TO-7	739	770305	46°00′N, 07°25′W	7	35.52	11.8	110	−7.4	71 ± 8
TO-22	778	771128	46°00′N, 07°23′W	7	35.57	14.6	124	−6.1	82 ± 8
TO-25	781	771223	46°00′N, 07°25′W	7		13	126	−7.0	85 ± 8
TO-33	797	780416	46°00′N, 07°15′W	6.5	35.57	12	100	−7.9	62 ± 10
TR-103	844	790310	47°51′N, 05°12′W		35.22		145	−7.7	106 ± 6
TR-104	846	790323	46°07′N, 07°33′W	9.6	35.50	12.	134	−10.1	100 ± 7
TR-116	860	790625	46°00′N, 07°30′W	9.4	35.60	16.8	137	−5.0	91 ± 11
TB-173	932	801114	46°00′N, 07°30′W	9	36.47	14.2	139	−2.8	88 ± 10
TO-15	756	770629	46°00′N, 11°47′W	7.5	35.23	17.4	149	−7.5	108 ± 8
			Station 8, 45°–46°N, 02°–03°W						
TR-37	775	771101	45°35′N, 01°40′W	9	35.70	17.2	162	−7.1	120 ± 10
TR-127*	871	790914	46°00′N, 02°30′W	9.3	34.11	17.9	120	−7.5	81 ± 7
TR-141	885	791221	46°00′N, 02°20′W	9.7		10.7	147	−8.3	109 ± 6
TR-155	899	800326	46°00′N, 02°18′W	9.3		10.3	161	−4.9	115 ± 8
TR-163	914	800708	46°00′N, 02°19′W	9.3	34.19	16.4	156	−6.8	114 ± 6
TB-187	947	810228	46°00′N, 02°40′W	10	35.39	13.9	126	−5.1	81 ± 7
			Station 9						
SV-142	388	700611	34°50′N, 43°10′W	7		20	174	0.7	114 ± 8
			Station 10, 36°–37°N, 35°–38°W						
SV-102	333	690522	36°40′N, 35°30′W	8	36.45	18	277	2.0†	208 ± 10
SV-111	347	690824	37°10′N, 37°41′W	7.5	36.04	25	183	4.5	115 ± 8
SV-123	359	691120	37°04′N, 35°28′W	8.5	28.56	20	250	4.0	179 ± 8
			Station 11, 35°–38°N, 29°–32°W						
SV-17	183	660707	37°08′N, 30°51′W		36.47		243	2.6	174 ± 10
SV-25	199	661025	35°30′N, 29°10′W		34.15		152	1.6	139 ± 9
SV-43	229	670529	36°25′N, 32°00′W	8	36.31	20	202	2.8	135 ± 10
SV-52	244	670908	38°10′N, 33°00′W	7	36.46	24	164	2.0†	101 ± 8
SV-59	259	671217	35°09′N, 29°20′W	6		20	335	−1.4	272 ± 10
SV-70	273	680324	36°53′N, 30°45′W	6	36.51	18	141	1.2	81 ± 9
SV-76	283	680604	37°15′N, 31°03′W	8	36.37	21	159	3.0	95 ± 8
SV-95	317	690130	37°20′N, 28°40′W	8	36.89	16	266	2.0†	198 ± 11
SV-146	402	700915	37°25′N, 31°56′W	7.5	36.45	24	198	1.7	135 ± 8

TABLE 1. (continued)

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 12, 38°–39°N, 22°–23°W						
SV-84	300	681010	38°05′N, 22°53′W	8	36.45	23	192	3.3	126 ± 8
SV-127	376	700315	38°31′N, 22°18′W	8	35.96	14	183	3.5	117 ± 8
			Station 13, 32°–34°N, 13°–14°W						
SV-56	257	671207	32°30′N, 13°30′W	9		19	218	0.3	156 ± 11
SV-83	294	680824	34°00′N, 13°00′W	9	36.95	24	221	2.8	154 ± 6
			Station 14, 34°–36°N, 18°–24°E						
TR-126	870	790908	35°26′N, 18°00′E	9.9	38.54	17.9	149	−6.2	106 ± 7
TB-172	931	801109	34°00′N, 24°00′E	9.0		23.0	161	−1.7	107 ± 8
TB-196	977	810921	34°00′N, 24°10′E	9.6		25.1	150	−3.8	102 ± 5
TB-205	990	811226	33°50′N, 19°40′E	8.5	38.14	16.0	121	−9.1	86 ± 7
TB-216	1003	820403	35°13′N, 18°30′E	10.0	37.92	15.0	144	−2.7	93 ± 5
			Station 15, 25°–28°N, 49°–52°W						
SV-16	183	660704	27°35′N, 50°30′W				182	−0.1	123 ± 9
SV-35	215	670216	25°00′N, 50°00′W		37.45	25	247	0.3	184 ± 7
SV-42	229	670527	27°00′N, 51°00′W	8	36.97	24	240	3.1	170 ± 9
SV-51	244	670905	27°49′N, 52°01′W	7	37.14	27	223	2.0	157 ± 11
SV-61	258	671216	26°54′N, 47°43′W	6	31.23	24	226	−0.5	166 ± 11
SV-71	272	680321	27°20′N, 50°35′W	6.5	37.03	21	206	2.5	141 ± 10
SV-79	287	680630	27°20′N, 50°42′W	8	36.88	27	237	2.7	169 ± 8
SV-110	346	690822	27°40′N, 52°10′W	8.5	37.07	28	288	1.3	222 ± 7
SV-126*	375	700311	26°40′N, 49°08′W	8	36.92	22	259	1.6	193 ± 9
SV-145	401	700912	27°22′N, 50°58′W	7.5	37.11	28	267	1.9	200 ± 9
TO-6	733	770121	28°20′N, 49°53′W	7	36.96	23.8	207	−2.2	153 ± 8
TO-14	755	770624	28°24′N, 50°00′W	7.5	36.95	27.2	206	−5.3	158 ± 8
			Station 16, 27°–31°N, 39°–45°N						
SV-24	199	661024	31°27′N, 39°00′W		37.19		201	1.1	138 ± 9
SV-87	301	681006	27°05′N, 43°45′W	8	47.4	27	262	2.0†	194 ± 11
SV-94	317	690126	27°35′N, 45°05′W	8	46.0	23	264	2.0†	196 ±12
SV-101	332	690520	27°08′N, 43°02′W	8	37.19	23	290	2.0†	222 ± 12

Station 17, 28°–30°N, 15°–18°W

SV-14	183	660703	29°21′N, 15°43′W	9	36.12	28	100	−0.1	45 ± 11
SV-20	195	660925	29°40′N, 15°28′W	9		25	263	−7.2	219 ± 12
SV-47	233	670623	30°36′N, 14°30′W	8.5	36.81	21	175	1.8	112 ± 11
SV-55	245	670915	29°04′N, 15°03′W	7.5		23	251	−0.6	190 ± 10
SV-67	271	680316	29°00′N, 15°00′W	9	36.77	19	197	0.8	135 ± 9
SV-75	282	680601	30°30′N, 14°32′W	9	37.47	20	341	2.0†	174 ± 11
SV-90	313	690101	29°40′N, 14°40′W	9	37.84	25	153	2.0†	91 ± 11
SV-99	324	690325	28°47′N, 15°04′W	9	36.50	20	135	2.0†	74 ± 11
SV-107	336	690609	29°00′N, 15°00′W	8	33.88	20	225	2.0†	159 ± 12
SV-115	347	690828	29°00′N, 14°55′W	9	36.11	23	193	1.5	130 ± 8
SV-119	359	691128	29°09′N, 15°00′W	9	36.52	24	150	2.1	89 ± 8
SV-131	381	700425	29°00′N, 15°20′W	9	36.70	19	189	2.9	124 ± 10
SV-154	392	700711	29°00′N, 15°20′W	9	36.23	22	184	4.1	117 ± 10
SV-162	405	701005	29°05′N, 15°45′W	8	36.60	23	178	1.1	117 ± 10
SV-166	420	710117	29°00′N, 18°12′W	9	36.33	20	206	1.8	143 ± 7
SV-178	431	710409	29°00′N, 15°30′W	8	36.31	17	176	−0.1	118 ± 10
SV-182	442	710626	29°00′N, 14°57′W	9	36.64	20	184	4.6	116 ± 10
SV-206	454	710912	29°00′N, 16°00′W	9	36.28	23	157	2.4	94 ± 10
SV-210	488	720508	29°00′N, 15°10′W	9	35.65	18	161	2.1	99 ± 10
TR-1	723	761110	30°25′N, 14°15′W	10	36.82	22.4	168	−5.8	124 ± 10
TR-12	733	770119	30°00′N, 14°05′W	9.5	36.63	19.0	140	−9.2	104 ± 6
TR-13A	737	770217	30°00′N, 15°18′W	9.5	36.67	19.2	139	−8.3	101 ± 11
TR-13B	737	770217	30°00′N, 15°18′W	9.5	36.55	19.2	167	−3.7	118 ± 7
TR-24	742	770425	31°13′N, 14°18′W	9	36.55	18.0	151	−8.7	114 ± 7
TR-25A	746	770519	30°00′N, 15°00′W	8	36.61	19.1	172	−6.0	128 ± 7
TR-25B	746	770519	30°00′N, 15°00′W	8	36.62	19.1	186	−3.4	135 ± 10
TR-36	759	770724	30°00′N, 15°00′W	7.5	36.57	20.8	155	−7.6	114 ± 10
TR-38A	763	770819	30°40′N, 14°35′W	9.5	36.69	22.4	151	−6.5	108 ± 11
TR-38B	763	770819	30°40′N, 14°35′W	9.5	36.60	22.4	140	−0.4	85 ± 11
TR-49A	776	771120	30°36′N, 14°59′W	9.9	36.75	22.2	162	−4.3	114 ± 6
TR-49B	776	771120	30°36′N, 14°59′W	9.9		22.2	184	11.1	101 ± 10
TR-60	787	780204	30°30′N, 14°35′W	10	36.69	19.1	165	−5.6	120 ± 6
TR-61	791	780228	30°00′N, 15°20′W	9	36.72	19.1	163	−5.8	118 ± 8
TR-72	801	780510	30°00′N, 15°10′W	9	36.66	19.5	159	−5.5	114 ± 10
TR-73	804	780530	30°00′N, 14°47′W	9.5	36.64	19.9	132	−5.0	87 ± 11

TABLE 1. (continued)

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 17 (continued)						
TR-94	834	781225	30°00′N, 13°56′W	9.5	36.57	20.5	173	−6.3	130 ± 6
TR-105	846	790325	30°00′N, 14°30′W	9.6	36.52	19.0	165	−6.5‡	122 ± 10
TR-114	857	790605	30°00′N, 14°10′W	9.5		20.1	156	−6.6	114 ± 10
TR-117	860	790627	30°00′N, 15°25′W	9.4	36.61	21.3	183	−8.0	143 ± 8
TR-128	874	791001	30°00′N, 15°10′W	9.6	36.63	22.7	173	−4.6	125 ± 6
TR-140	884	791215	30°00′N, 13°58′W	9.7		19.9	165	−7.5	124 ± 5
TR-142	888	800108	30°00′N, 15°18′W	9.5	36.63	19.4	170	−7.2	128 ± 5
TR-154	898	800322	30°00′N, 13°55′W	9.5		17.9	172	−6.5	129 ± 7
TR-162	913	800704	30°00′N, 13°50′W	9.9	36.63	21.3	178	−5.8	132 ± 5
TB-164	921	800827	30°05′N, 15°14′W	9.8		23.1	179	−4.1	130 ± 5
TB-174	935	801202	30°00′N, 15°50′W	10.7	32.44	19.2	177	−4.1	128 ± 8
TB-186	947	810224	30°00′N, 13°50′W	10.1	36.04	17.1	91	−10.7	60 ± 8
TB-198	979	811011	29°50′N, 14°40′W	10.5	36.60	21.6			
TB-207	993	820114	30°05′N, 14°52′W	10	36.70	18.8	170	−1.3	115 ± 8
			Station 18, 24°–25°N, 17°W						
SV-29	208	661229	25°06′N, 17°00′W	9	35.58	20	230	−1.0	171 ± 9
SV-39	220	670323	24°42′N, 17°12′W	9	36.69	20	152	0.4	94 ± 8
			Station 19, 17°–18°N, 20°–22°W						
SV-13	182	660701	17°20′N, 21°50′W		36.24		75	0.2	21 ± 8
SV-19	195	660921	17°50′N, 21°05′W	9		28	121	1.3	62 ± 9
SV-46	233	670621	17°08′N, 21°56′W	8.5	35.88	23	72	1.4	15 ± 9
SV-54	245	670912	16°40′N, 21°55′W	7.5		27	168	0.0	110 ± 10
SV-57	257	671204	17°30′N, 21°20′W	9		25	183	0.0	124 ± 8
SV-66	271	680315	17°00′N, 21°55′W	9	36.08	21	140	−0.3	84 ± 8
SV-74	282	680529	17°30′N, 21°00′W	6	37.04	22	214	0.2	154 ± 8
SV-82	294	680820	17°00′N, 22°00′W	9	36.14	25	133	1.2	75 ± 8
SV-91	313	681229	17°00′N, 21°50′W	9		23	202	1.6¶	138 ± 9

SV-98	324	690323	17°16′N, 21°36′W	9	35.97	24	200	1.6¶	134 ± 11
SV-106	335	690607	17°30′N, 21°40′W	8	36.35	22.5	209	1.6¶	145 ± 11
SV-114	347	690826	18°23′N, 20°30′W	9	36.12	28	135	2.5	73 ± 8
SV-118	359	691125	17°13′N, 21°37′W	9	35.65	26	146	2.4	84 ± 8
SV-130	381	700423	17°15′N, 21°42′W	9	36.05	23	129	4.2	65 ± 8
SV-153	392	700709	17°00′N, 22°05′W	9	38.30	25	106	3.1	45 ± 9
SV-161	404	701003	17°10′N, 21°45′W	8	29.76	27	168	−0.2	111 ± 9
SV-165	419	710115	17°00′N, 22°08′W	9	36.85	22	143	2.1	82 ± 9
SV-177	431	710407	17°00′N, 22°05′W	8	36.12	20	125	1.1	67 ± 9
SV-181	442	710624	17°25′N, 21°20′W	9	35.45	20	146	2.6	84 ± 9
SV-197*	476	720216	17°04′N, 22°00′W	9	36.13	22	129	1.3	71 ± 7
SV-205*	453	710910	17°00′N, 21°50′W	9	35.26	20	148	4.0	82 ± 10
SV-209	487	720506	17°00′N, 22°00′W	8.5	35.99	21	81	3.1	22 ± 10
			Station 20, 15°–18°N, 17°–18°W						
TR-2	723	761111	17°05′N, 17°49′W	10	35.51	26.6	115	−5.0	71 ± 6
TR-11	733	770117	17°00′N, 18°04′W	9.5	35.73	19.0	50	−9.8	18 ± 6
TR-14A	737	770219	15°28′N, 17°49′W	9.5	35.60	22.5	77	−8.7	41 ± 10
TR-14B	737	770219	15°28′N, 17°49′W	9.5	35.48	22.5	76	−5.0	33 ± 10
TR-23	746	770423	17°00′N, 18°00′W	9	35.68	22.0	56	−8.7	21 ± 6
TR-26	750	770520	17°00′N, 18°04′W	8	35.78	21.0	68	−8.4	33 ± 10
TR-35A	751	770723	17°00′N, 18°00′W	7.5	35.94	25.8	73	−3.9	28 ± 8
TR-35B	751	770723	17°00′N, 18°00′W	7.5	35.95	25.8	86	−2.6	38 ± 10
TR-39A	763	770821	17°00′N, 17°57′W	9.5	36.69	29.5	106	−4.9	62 ± 5
TR-39B	763	770821	17°00′N, 17°57′W	9.5		29.5	71	0.1	18 ± 9
TR-50	777	771121	17°35′N, 17°42′W	9.9		26.2	75	−3.5	28 ± 10
TR-59	787	780202	17°06′N, 17°49′W	10		19.1	63	−6.7	24 ± 6
TR-62	791	780302	17°20′N, 17°50′W	9.5		21.0	70	−5.1	28 ± 10
TR-71	801	780508	17°00′N, 17°55′W	9		23.1	69	−4.8	26 ± 5
TR-74	804	780601	17°00′N, 17°50′W	19.5	35.86	19.9	64	−5.1	22 ± 10
TR-83	815	780819	17°00′N, 18°00′W	10	36.20	29.1	105	−5.7	62 ± 7
TR-86	820	780920	17°15′N, 17°20′W	9.5	35.92	29.4	111	−3.5	63 ± 11
TR-95	834	781227	17°00′N, 18°00′W	9.5	35.62	23.8	121	−9.4	86 ± 11
TR-106	847	790327	17°00′N, 17°55′W	9.6	36.02	22.6	101	−7.6	63 ± 7
TR-113	856	790603	17°00′N, 17°40′W	9.5		22.4	61	−5.1	18 ± 7
TR-118	860	790628	17°00′N, 17°45′W	9.4	35.95	24.3	80	−6.1	40 ± 11

TABLE 1. (continued)

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 20 (continued)						
TR-129	874	791002	17°00′N, 17°55′W	9.6	36.18	28.1	115	−5.5	71 ± 7
TR-139	884	791213	17°00′N, 17°38′W	9.7	35.64	23.9	111	−6.5	70 ± 6
TR-143	888	800109	17°00′N, 17°54′W	9.5	35.69	22.4	119	−7.2	79 ± 6
TR-153	898	800320	17°00′N, 17°42′W	9.5		18.9	53	−4.6	10 ± 7
TR-161	913	800702	17°00′N, 17°38′W	9.9	35.84	24.3	81	−5.0	38 ± 6
TB-165	921	800829	17°00′N, 17°50′W	9.8	36.05	26.9	111	−7.7	70 ± 6
TB-175	935	801204	17°00′N, 17°50′W	9.7	36.29	22.2	153	−3.9	105 ± 5
TB-185	946	810221	17°00′N, 17°49′W	10.1	35.56	19.4	109	−6.0	67 ± 6
TB-188	967	810714	17°00′N, 17°59′W	10	36.03	26.3	96	−2.1	47 ± 8
TB-208	993	820116	16°16′N, 17°51′W	10	35.75	21.1	118	−0.3	64 ± 4
			Station 21, 13°–14°N, 23°–24°W						
SV-28	208	670227	13°55′N, 23°18′W	9	36.18	25	181	0.8	120 ± 9
SV-38*	220	670321	13°15′N, 23°45′W	9	36.18	25	141	0.9	82 ± 8
			Station 22, 00°N/S, 8°–9°W						
TR-3	723	761113	00°05′N, 09°03′W	10	35.60	25.7	118	−7.2	79 ± 9
TR-10	732	770114	00°00′N/S, 09°34′W	9.5	35.89	27.0	111	−8.6	74 ± 7
TR-15	738	770221	00°00′N/S, 09°00′W	9.5	35.23	29.7	159	−9.2	122 ± 11
TR-22	746	770420	00°30′S, 10°00′W	9	35.84	28.8	153	−10.8	120 ± 11
TR-27	755	770522	00°00′N/S, 14°00′W	8	35.47	27.0	137	−7.2	97 ± 6
TR-34	759	770720	00°00′N/S, 10°00′W	7.5	35.81	24.0	103	−5.5	60 ± 7
TR-40	764	770824	00°00′N/S, 08°51′W	9.5	35.70	24.6	106	−7.2	67 ± 9
TR-51	777	771124	00°00′N/S, 09°11′W	9.9	35.11	28.8	154	−3.3	104 ± 8
TR-58	787	780130	00°00′N/S, 09°49′W	10	35.62	27.5	132	−4.5	86 ± 7
TR-63	791	780304	00°00′N/S, 09°28′W	9.5	35.64	28.1	134	−3.1	84 ± 7
TR-70	800	780505	00°00′N/S, 09°20′W	9	35.44	28.8	135	−4.8	89 ± 10
TR-75	804	780604	00°00′N/S, 09°15′W	9.5	35.27	25.7	134	−5.2	90 ± 10

TR-82	815	780816	00°00′N/S, 09°11′W	10	35.89	23.7	101	−6.4	60 ± 7
TR-87	820	780923	00°00′N/S, 09°12′W	9.5	36.44	25.4	112	−5.3	69 ± 6
TR-96	834	781229	00°00′N/S, 09°36′W	9.5	35.60	27.3	130	−5.3	85 ± 9
TR-107	847	790330	00°00′N/S, 09°14′W	9.6	35.14	29.7	145	−7.9	105 ± 7
TR-119	860	790701	00°00′N/S, 09°10′W	9.5	35.70	24.1	124	−5.8	81 ± 6
TR-130	874	791005	00°00′N/S, 09°25′W	9.6	35.72	26.0	158	−4.7	111 ± 8
TR-138	884	791211	00°00′N/S, 09°00′W	9.7	35.35	28.1	156	−5.5	111 ± 5
TR-144	888	800112	00°00′N/S, 09°20′W	9.5	35.60	28.0	140	−7.0	99 ± 8
TR-152	898	800317	00°00′N/S, 09°11′W	9.5		28.1	143	−6.6	101 ± 6
TR-160	912	800629	00°00′N/S, 08°52′W	9.9	35.91	22.2	112	−5.5	69 ± 5
TB-166	921	800831	00°00′N/S, 09°20′W	9.8	35.75	22.2	118	−5.5	75 ± 5
TB-176	935	801207	00°00′N/S, 09°20′W	9.3	35.30	26.2	161	−3.5	111 ± 9
TB-184	946	810216	00°00′N/S, 09°31′W	10.1	35.52	28.0	155	−1.6	102 ± 7
TB-189	967	810717	00°00′N/S, 09°16′W	9.9	35.70	21.6	119	−1.2	67 ± 9
TB-199	980	811015	00°00′N/S, 08°50′W	10.5	35.97	27.5	115	−0.9	62 ± 6
TB-209	994	820118	00°06′N, 09°17′W	10.0	34.77	27.0	164	−2.2	112 ± 5

*Leak in the drum.
†Mean value $\delta^{13}C$ = 2.0 ± 1.5‰.
‡Mean value $\delta^{13}C$ = −6.5 ± 1.5‰.
¶Mean value $\delta^{13}C$ = 1.6 ± 1.4‰.

TABLE 2. Carbon 14 in the Surface of the South Atlantic Ocean

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 23, 03°–07°S, 32°–34°W						
SV-12	182	660627	05°25′S, 33°05′W		35.91		93	1.0	36 ± 9
SV-18*	194	660917	07°12′S, 33°25′W	9	35.98	28	196	0.3	136 ± 10
SV-27	207	661224	02°10′S, 31°58′W	9	35.99	28	191	4.4	112 ± 10
SV-36	219	670317	06°56′S, 33°43′W	9	36.05	29	168	1.6	106 ± 8
SV-45	232	670617	04°52′S, 32°49′W	8.5	34.42	28	129	1.1	70 ± 10
SV-53*	244	670908	04°47′S, 32°50′W	7.5	36.06	27	174	−0.3	116 ± 10
SV-65	270	680309	05°10′S, 33°03′W	9	36.37	29	161	1.2	101 ± 11
SV-73	281	680525	05°00′S, 33°10′W	9	36.29	29	184	2.4	120 ± 8
SV-81	293	680816	06°00′S, 33°00′W	9	35.43	27	174	1.8	112 ± 6
SV-89	312	681225	06°50′S, 33°44′W	9	36.71	28	165	2.0†	102 ± 10
SV-97	323	690319	05°00′S, 33°05′W	9	36.08	30	209	2.0†	144 ± 10
SV-105	335	690603	05°00′S, 33°00′W	8	35.77	28.5	239	2.0†	172 ± 10
SV-113	346	690822	04°52′S, 33°00′W	9	36.09	27	206	2.3	141 ± 8
SV-117	359	691122	05°05′S, 33°10′W	9	36.30	27	167	2.4	104 ± 8
SV-129	381	700419	05°00′S, 32°55′W	9	36.02	29	131	3.2	68 ± 9
SV-152	392	700705	05°00′S, 32°56′W	9	36.47	28	166	4.4	98 ± 9
SV-160	404	700929	05°00′S, 32°55′W	8	36.02	24	156	1.1	97 ± 9
SV-164	419	710111	05°00′S, 33°00′W	9	36.02	28	162	2.9	98 ± 10
SV-176	430	710403	05°00′S, 33°10′W	8	35.67	29	178	1.6	116 ± 10
SV-180	441	710620	03°07′S, 32°12′W	9	36.16	29	173	3.2	108 ± 8
SV-204	453	710906	05°00′S, 32°50′W	9	35.04	26	171	2.8	107 ± 8
SV-196	475	720212	05°06′S, 32°56′W	9	35.00	28	153	1.8	89 ± 8
SV-208	487	720511	05°00′S, 33°00′W	8.5	36.04	29	144	1.8	83 ± 10
			Station 24						
SV-58	256	671130	04°50′S, 21°20′W	9		27	122	0.7	64 ± 8

			Station 25, 14°–15°S, 01°–02°E						
TR-4	722	761116	15°11′S, 02°08′E	10	36.11	19.7	101	−5.2	58 ± 7
TR-9	732	770112	14°50′S, 01°47′E	9.5	36.37	23.0	99	−9.5	65 ± 7
TR-16	738	770223	13°30′S, 02°00′E	9.5	36.54	26.4	127	−8.4	89 ± 7
TR-21	746	770418	15°00′S, 01°30′E	9	36.57	25.0	118	−4.4	73 ± 11
TR-28	751	770525	15°00′S, 01°00′E	8	36.38	21.2	108	−5.8	66 ± 10
TR-33	759	770718	15°00′S, 02°00′E	7.5	36.41	22.0	125	−5.6	82 ± 8
TR-41	764	770826	14°53′S, 01°57′E	9.5	36.20	20.6	98	−8.0	60 ± 7
TR-52	778	771128	14°58′S, 01°58′E	9.9	36.43	21.5	139	−4.1	91 ± 10
TR-57	786	780128	15°05′S, 02°15′E	10	36.43	24.5	97	−5.0	53 ± 8
TR-64	792	780307	15°00′S, 01°41′E	9.5	36.44	26.1	92	−3.4	45 ± 10
TR-69	800	780503	15°00′S, 01°17′E	9	36.58	25.0	115	−4.7	70 ± 9
TR-76	805	780607	15°00′S, 02°10′E	9.5	36.51	23.6	127	−6.6	85 ± 10
TR-81	814	780813	15°00′S, 02°18′E	10	36.45	21.5	112	−6.4	71 ± 10
TR-88	821	780925	15°05′S, 02°10′E	9.5	36.45	19.4	114	−6.5‡	74 ± 7
TR-97	836	790101	15°00′S, 01°40′E	9.5	36.20	23.2	114	−5.3	71 ± 7
TR-108	847	790401	15°00′S, 02°20′E	9.5	36.48	25.0	95	−6.6	55 ± 11
TR-112	856	790529	15°00′S, 02°30′E	9.5		24.3	108	−6.5‡	67 ± 8
TR-120	861	790703	15°00′S, 01°54′E	9.4	36.54	23.4	116	−7.7	78 ± 5
TR-131	875	791008	15°00′S, 01°55′E	9.6	36.06	19.6	91	−4.0	45 ± 6
TR-137	884	791208	15°00′S, 02°00′E	9.8	35.98	20.8	113	−6.1	71 ± 5
TR-145	889	800114	15°00′S, 02°08′E	9.5	36.28	22.8	118	−6.8	77 ± 5
TR-151	897	800314	15°00′S, 02°30′E	9.5		24.8	94	−6.4	54 ± 5
TR-159	912	800627	15°00′S, 02°35′E	9.9	36.50	22.2	103	−7.9	65 ± 5
TB-167	922	800903	15°00′S, 02°00′E	9.8	35.91	18.2	109	−6.7	68 ± 6
TB-177	936	801209	15°00′S, 02°00′E	10.3	36.05	19.4	125	−3.1	76 ± 6
TB-183	946	810216	15°00′S, 02°00′E	10.2	36.36	23.4	102	−0.8	49 ± 8
TB-190	967	810719	15°00′S, 09°01′E	9.9	35.73	19.0	108	−0.9	56 ± 9
TB-200	980	811018	14°45′S, 02°09′E	10.5	36.25	18.5	83	+0.1	29 ± 7
TB-210	994	820121	15°00′S, 02°00′E	10	35.65	23.0	154	+0.1	97 ± 6
			Station 26, 25°–27°S, 10°–12°E						
TR-8	732	770110	25°55′S, 11°03′E	9.5	35.19	20.6	74	−9.5	40 ± 11
TR-20	745	770417	26°30′S, 11°00′E	9	35.41	22.0	118	−9.3	83 ± 8
TR-29	751	770527	26°00′S, 10°33′E	8	35.58	19.0	135	−5.2	90 ± 8
TR-32	758	770716	26°00′S, 10°00′E	8	35.45	17.0	160	−5.7	115 ± 11
TR-56	786	780126	26°25′S, 11°45′E	10		22.7	121	−3.8	74 ± 7

TABLE 2. (continued)

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 27, 30°–32°S, 14°–17°E						
TR-5	724	761119	29°57′S, 14°25′E	10	35.48	17.7	145	−7.5	105 ± 7
TR-17	738	770226	29°57′S, 14°25′E	9.5	35.47	21.2	133	−8.1	94 ± 11
TR-42	765	770829	32°17′S, 16°29′E	9.5	35.44	16.0	123	−7.3	83 ± 10
TR-53	778	771129	29°39′S, 14°05′E	9.9	35.44	19.2	127	−4.5	81 ± 10
TR-65	792	780310	30°00′S, 14°05′E	9.5	35.35	21.1	95	−4.2	59 ± 8
TR-68	800	780501	30°00′S, 15°00′E	9	35.30	17.3	117	−4.9	72 ± 7
TR-77	805	780609	30°00′S, 14°35′E	9.5	35.41	19.0	132	−6.2	89 ± 6
TR-80	814	780811	30°00′S, 14°42′E	10	35.43	16.3	126	−7.2	86 ± 11
TR-89	821	780927	30°00′S, 14°30′E	9.5	35.27	15.6	133	−5.8	89 ± 9
TR-98	835	790104	30°00′S, 14°55′E	9.5	35.26	19.4	96	−9.2	61 ± 9
TR-109	848	790404	30°00′S, 14°55′E	9.5	35.11	18.5	90	−7.7	53 ± 7
TR-111	855	790527	30°00′S, 14°35′E	9.5	35.12	17.2	110	−6.8	68 ± 8
TR-114	857	790605	30°00′S, 14°10′E	9.5		20.1	156	−6.6	114 ± 10
TR-121	861	790706	30°02′S, 14°37′E	9.4	35.30	16.1	120	−7.2	80 ± 8
TR-132	875	791010	30°00′S, 14°35′E	9.6	35.37	16.8	141	−6.1	98 ± 6
TR-136	883	791206	30°00′S, 14°45′E	9.8	35.43	18.3	138	−6.4	95 ± 6
TR-146	889	800117	30°00′S, 14°33′E	9.5	35.57	22.4	147	−6.7	105 ± 6
TR-150	897	800312	30°00′S, 14°50′E	9.5		19.8	131	−6.9	90 ± 6
TR-158	912	800625	30°00′S, 14°60′E	10	35.43	17.4	160	−3.0	109 ± 7
TB-168	922	800905	30°00′S, 14°10′E	9.8	35.31	14.2	126	−7.0	86 ± 5
TB-178	936	801212	30°00′S, 14°21′E	10.3	35.38	18.0	120	−5.5	76 ± 5
TB-182	945	810214	30°00′S, 14°13′E	10.2	35.18	19.5	110	−0.7	56 ± 8
TB-191	968	810721	30°00′S, 14°15′E	9.9	35.45	15.6	124	−2.1	73 ± 15
TB-201	981	811021	31°00′S, 14°45′E	10.5		16.0	118	−4.4	72 ± 6
TB-211	994	820124	30°02′S, 14°52′E	10.0	35.29	20.0	124	−2.0	73 ± 5

				Station 28, 31°–35°S, 50°–53°W					
SV-37	219	670312	32°45′S, 51°16′W	9	33.23	24	225	2.1¶	159 ± 9
SV-44	231	670610	32°10′S, 51°00′W	8.5	32.29	18	219	3.0	151 ± 10
SV-48	243	670902	31°45′S, 50°32′W	7.5	33.59	19	205	1.9	140 ± 7
SV-64	270	680303	34°32′S, 52°42′W	9	32.27	23	304	3.5	230 ± 8
SV-72	280	680518	32°48′S, 51°25′W	9	33.50	17	352	2.0	280 ± 8
SV-80	292	680807	33°10′S, 51°40′W	9	31.26	14	309	4.5	233 ± 8
SV-88	311	681217	32°35′S, 51°00′W	9	36.30	25	115	2.1¶	55 ± 10
SV-96	323	690313	31°17′S, 50°14′W	9	33.19	28	347	2.1¶	274 ± 11
SV-104	334	690527	31°50′S, 50°55′W	9	33.39	20.5	279	2.1¶	210 ± 12
SV-112	345	690813	32°08′S, 51°38′W	9	29.55	17	309	0.7	309 ± 8
SV-116	358	691115	31°45′S, 50°52′W	9	32.08	22	265	2.4	265 ± 8
SV-128	380	700412	31°53′S, 51°15′W	9	35.19	23	179	3.2	113 ± 10
SV-151	391	700628	31°30′S, 50°50′W	9	30.71	18	278	0.2	214 ± 9
SV-159	402	700916	31°40′S, 50°30′W	8	34.40	16	208	0.9	145 ± 9
SV-163	416	701222	31°50′S, 50°30′W	6.5	34.68	18	193	1.6	130 ± 9
SV-175	429	710323	32°05′S, 51°02′W	8	33.52	26	252	2.2	184 ± 10
SV-179	439	710603	33°28′S, 52°33′W	9	31.04	14	284	2.4	215 ± 10
SV-195	474	720202	31°50′S, 50°45′W	7.5	35.21	18	203	1.8	140 ± 10
SV-203	451	710827	31°55′S, 50°28′W	9		16	238	2.5	172 ± 5
SV-207	485	720421	32°00′S, 51°00′W	7	32.85	22	269	1.8	202 ± 9

*Leak in the drum.
†Mean value $\delta^{13}C = 2.0 \pm 1.5‰$.
‡Mean value $\delta^{13}C = -6.5 \pm 1.5‰$.
¶Mean value $\delta^{13}C = 2.1 \pm 1.1‰$.

TABLE 3. Carbon 14 in the Surface of the Indian Ocean

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 31, 7°S, 67°–69°E						
TO-31	794	780324	07°00′S, 69°00′E	7	34.67	28.0	143	−5.2	98 ± 7
TR-125	869	790829	06°54′S, 68°53′E	9.8	35.28	27.4	140	−6.9	99 ± 8
TR-195	975	810911	07°00′S, 67°30′E	10	34.80	27.0	177	−3.7	128 ± 8
			Station 32, 6°–7°S, 77°–78°E						
TO-8	743	770328	06°35′S, 77°00′E	7	34.18	29.8	171	−4.9	124 ± 7
TO-16	763	770820	06°35′S, 77°00′E	7	35.00	28.3	139	−6.7	97 ± 5
TO-26	785	780118	07°00′S, 77°00′E	7	34.19	29.0	154	−5.2	108 ± 10
TR-93	828	781118	07°00′S, 76°40′E	9.5	34.76	29.3	138	−5.4	94 ± 6
TR-102	842	790220	07°00′S, 78°00′E	9.5	34.21	30.5	137	−7.2	97 ± 7
TB-171	930	801028	07°00′S, 77°43′E	10.3	33.97	28.1	137	−0.3	82 ± 7
TB-204	989	811215	07°10′S, 77°06′E	8.5	34.86	28.0	142	−2.9	92 ± 5
TB-215	1002	820323	06°51′S, 78°02′E	10.0	34.48	28.6	162	−1.0	107 ± 5
			Station 33						
TO-21	774	771103	12°29′S, 77°00′E	7	35.04	27.8	142	−5.2	97 ± 6
			Station 34, 15°–18°S, 84°–89°E						
SV-286	709	760805	15°00′S, 88°42′E	7	34.56	26	208	−6.3	163 ± 12
TO-20	774	771102	18°00′S, 85°55′E	7	34.99	25.7	161	−4.6	114 ± 7
TO-30	794	780320	18°40′S, 86°48′E	7	35.02	27.5	172	−5.6	127 ± 11
TR-92	828	781116	18°05′S, 89°20′E	9.5	34.42	26.5	144	−5.7	100 ± 11
TR-124	868	790826	18°00′S, 89°20′E	9.8	34.80	23.1	159	−8.0	119 ± 10
TB-194	975	810909	18°00′S, 84°00′E	10	34.68	21.0	154	−4.6	107 ± 7
			Station 35, 18°S, 91°–94°E						
TO-2A	720	761023	18°10′S, 91°00′E	8	35.02	23.0	183	−0.9	126 ± 12
TO-2B	720	761023	18°10′S, 91°00′E	8	34.99	23.0	158	−7.7	118 ± 9
TO-9	743	770331	18°00′S, 91°00′E	7	35.12	26.4	192	−4.8	144 ± 7

TO-17	764	770823	18°00′S, 91°00′E	7	35.91	24.3	175	−5.1	128 ± 9
TO-27	785	780120	18°00′S, 91°50′E	7	36.43	27.5	162	−3.1	111 ± 8
TR-101	841	790217	18°00′S, 93°47′E	9.5	34.75	27.0	180	−6.3	136 ± 7
TB-170	929	801025	18°00′S, 93°46′E	10.3	34.42	25.2	155	−5.8	111 ± 5
TB-203	988	811213	18°00′S, 94°07′E	8.5	34.47	23.4	160	−1.0	105 ± 6
			Station 36						
TR-48	771	771016	31°24′S, 41°32′E	9.5	35.50	22.0	156	−6.8	114 ± 7
			Station 37, 30°–32°S, 60°–66°E						
TR-7	731	770103	31°43′S, 65°30′E	9.5	35.76	23.5	162	−9.1	125 ± 8
TR-19	745	770411	31°36′S, 60°30′E	9	35.46	24.6	177	−8.8	139 ± 9
TR-31	757	770709	32°00′S, 65°00′E	8	35.41	21.0	186	−5.7	140 ± 11
TR-47	771	771013	30°00′S, 66°12′E	9.5	35.74	20.3	167	−6.9	125 ± 6
TR-55	785	780119	31°29′S, 65°00′E	10	35.67	23.0	163	−3.5	113 ± 7
TR-67	799	780424	31°49′S, 65°00′E	9	35.72	21.5	182	−4.5	134 ± 7
TR-79	813	780804	30°03′S, 65°00′E	10	35.58	19.8	190	−5.5	143 ± 10
TR-115	855	790521	31°36′S, 65°00′E	9.5	35.40	21.0	195	−6.6	151 ± 10
TR-135	882	791129	31°28′S, 65°00′E	9.8	35.74	20.9	199	−6.9	165 ± 5
TR-149	896	800306	31°42′S, 65°00′E	9.5	35.59	23.9	189	−6.7	145 ± 5
TR-157	911	800618	31°21′S, 65°00′E	10.1	35.58	20.1	193	−6.7	150 ± 4
TB-181	944	810208	31°25′S, 65°00′E	10.1	35.78	23.4	199	−0.3	140 ± 8
			Station 38						
TR-46	771	771011	30°00′S, 85°00′E	9.5	35.95	19.0	174	−7.6	133 ± 10
			Station 39, 28°–30°S, 106°–112°E						
SV-285	708	760801	30°00′S, 108°22′E	7		19.0	217	−5.2	169 ± 9
TO-3A	721	761025	30°00′S, 107°20′E	8	35.44	20.6	211	−2.5	156 ± 11
TO-3B	721	761025	30°00′S, 107°20′E	8	35.44	20.6	173	−9.1	135 ± 11
TO-10	743	770403	30°00′S, 107°21′E	7	35.75	22.3	190	−5.7	144 ± 14
TO-18	764	770826	30°00′S, 108°40′E	7	35.70	19.7	181	−5.2	135 ± 7
TO-19	773	771030	30°00′S, 106°30′E	7	35.82	19.5	128	−6.0	85 ± 5
TO-28	786	780123	30°00′S, 108°17′E	7	35.92	20.5	180	−5.2	133 ± 8
TO-29	793	780318	30°00′S, 106°20′E	7	35.97	23.0	203	−6.5‡	158 ± 7
TR-91	828	781113	30°18′S, 111°10′E	9.5	35.11	22.3	180	−5.3	133 ± 9
TR-100	841	790215	30°00′S, 112°30′E	9.5	35.65	24.0	180	−8.0	140 ± 9
TR-123	868	790823	28°04′S, 108°00′E	9.8	35.62	20.3	169	−8.8	129 ± 8

TABLE 3. (continued)

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 40, 34°–36°S, 63°–65°E						
TR-43	765	770903	36°18′S, 63°18′E	9.5	35.41	14.8	126	−7.4	87 ± 10
TR-78	805	780615	34°15′S, 65°00′E	9.5	35.53	17.9	164	−5.4	119 ± 6
			Station 41, 32°–34°S, 107°–108°E						
TR-134	881	791124	31°59′S, 108°00′E	9.8	35.91	18.9	198	−5.9	152 ± 6
TR-148	890	800127	34°30′S, 108°00′E	9.5	35.91	19.9	202	−7.3	159 ± 6
TR-156	910	800613	31°55′S, 108°00′E	10.2	35.93	18.2	183	−7.9	143 ± 5
TB-180	938	801227	33°55′S, 107°18′E	10.2	35.22	20.0	151	−4.8	105 ± 6
TB-193	970	810803	33°33′S, 108°00′E	10.3	35.62	15.0	180	−5.0	133 ± 6
			Station 42, 40°S, 31°–36°E						
TR-30	752	770530	40°00′S, 36°00′E	8	35.52	18.8	181	−6.5	138 ± 7
TR-99 I	835	790107	40°00′S, 31°30′E	9.5	35.39	16.9	136	−6.3	94 ± 7
			Station 43, 37°–41°S, 65°–68°E						
TR-6	725	761125	40°08′S, 65°03′E	10	35.36	15.7	140	−9.4	104 ± 6
TR-18	739	770304	40°04′S, 66°40′E	9.5	35.32	17.3	165	−8.2	126 ± 8
TR-54	779	771206	40°22′S, 68°00′E	9	35.36	15.6	117	−5.3	73 ± 10
TR-66	793	780316	37°02′S, 65°00′E	9.5	35.38	19.5	169	−3.3	119 ± 7
TR-90	822	781003	36°51′S, 65°00′E	9.5	35.37	15.8	143	−6.3	100 ± 8
TR-110	849	790410	41°15′S, 65°00′E	9.5	34.18	13.0	105	−7.2	65 ± 11
TR-133	876	791016	40°00′S, 65°00′E	9.5	35.18	13.9	149	−6.6	107 ± 6
TR-147	890	800123	40°06′S, 65°00′E	9.5	35.43	16.1	170	−5.8	125 ± 5
TB-179	936	801213	37°59′S, 65°00′E	10.3	35.39	17.1	153	−4.4	106 ± 5
TB-192	969	810728	38°46′S, 65°00′E	10	35.34	13.4	152	−5.0	106 ± 7
TB-202	982	811027	38°58′S, 64°40′E	10.5		14.0	149	−1.5	96 ± 8
TB-212	995	820131	37°25′S, 65°05′E	7.5	35.16	17.0	156	− 4.3	110 ± 6
			Station 44, 37°–39°S, 105°–108°E						
TR-44	766	770908	37°40′S, 105°00′E	9.5	35.31	13.6	174	−7.3	133 ± 10
TR-45	766	770908	37°45′S, 107°33′E	9.5	35.39	14.0	169	−7.9	130 ± 6
TB-169	924	800916	39°27′S, 107°30′E	9.8	35.18	10.8	149	−8.2	111 ± 6
TB-213	993	820204	38°15′S, 107°48′E	10	35.15	18.0	139	−3.6	90 ± 4
			Station 45						
TR-99 II	836	790110	45°00′S, 65°00′E	9.5	34.89	14.1	129	−5.6	85 ± 10

‡Mean value $\delta^{13}C = -6.5 \pm 1.5‰$.

TABLE 4. Carbon 14 in the Surface of the North Pacific Ocean

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 51						
SV-132	380	700413	44°22′N, 170°00′W		33.65		92	2.9	32 ± 8
			Station 52, 44°–46°N, 124°–125°W						
SV-22	195	661001	45°00′N, 124°00′W		34.44		183	2.9	126 ± 9
SV-40	226	670505	46°20′N, 124°50′W	8	30.54	11	339	1.9	283 ± 9
SV-49	241	670817	45°06′N, 124°36′W	7	30.73	20	212	1.7	157 ± 7
SV-62	253	671110	45°06′N, 124°48′W		32.94	13	306	−0.1	25 ± 12
SV-68	274	680222	45°40′N, 124°55′W	6.5	31.02	9	230	0.8	177 ± 9
SV-77	284	680611	44°50′N, 123°45′W	8	31.04	12	186	2.7	122 ± 6
SV-85	297	680914	45°40′N, 124°43′W	7		16	255	0.5	191 ± 6
SV-92	311	681217	46°20′N, 124°50′W	5.5	32.72	10	342	1.2†	272 ± 10
SV-103*	330	690501	44°50′N, 124°51′W	7.5	33.56	19	286	1.2†	220 ± 14
SV-124	372	700221	45°02′N, 124°24′W	6.3	32.05	11	270	1.1	205 ± 8
SV-140	385	700521	46°12′N, 124°49′W	7	26.50	12	265	1.1	200 ± 8
			Station 53						
SV-133	380	700415	41°52′N, 150°00′W	5		9	165	0.8	105 ± 8
			Station 54, 39°–42°N, 124°W						
SV-108	343	690802	42°02′N, 124°	7	31.12	15.8	218	−1.8	162 ± 8
SV-120	356	691028	38°36′N, 123°36′W	5.5		14	121	1.8	62 ± 11
SV-143	399	700823	42°02′N, 124°41′W	7	33.57	12	96	1.6	39 ± 8
			Station 55, 40°–42°N, 160°E						
SV-158	408	701026	39°45′N, 160°00′E		36.62	22	164	1.1	105 ± 9
SV-235	547	730627	41°34′N, 160°00′E	7	33.72	14	137	1.5	78 ± 8
			Station 56, 37°–40°N, 179°–180°W						
SV-156	408	701028	40°11′N, 180°00′W		35.28	20	149	2.2	87 ± 8
SV-184	447	710729	39°31′N, 179°30′E		34.01	19	179	3.9	112 ± 11
SV-236	547	730629	40°02′N, 180°00′W	7	34.29	15	162	2.1	100 ± 10
SV-252	583	740305	37°17′N, 179°47′W	7.5	34.42	14	80	−0.4	27 ± 8
			Station 57						
SV-183	447	710727	39°35′N, 160°00′W		34.44	19	183	2.6	119 ± 10

TABLE 4. (continued)

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 58						
SV-185	447	710731	36°57′N, 149°49′E		34.14	25	267	4.6	194 ± 8
			Station 59, 34°N, 159°–160°E						
SV-223	522	730102	34°19′N, 160°26′E		36.61		204	5.5	132 ± 10
SV-227	528	730218	34°08′N, 160°00′E	6.5	34.60	15	174	−0.4	117 ± 8
SV-251	582	740303	34°07′N, 158°40′E	7.5	34.41	14	139	−0.1	83 ± 8
			Station 60, 33°–35°N, 178°–180°E/W						
SV-224*	522	730104	33°56′N, 179°40′E		34.68		210	1.1	148 ± 10
SV-228	529	730220	33°05′N, 180°00′E	6.5	34.58	16	173	1.8	112 ± 8
SV-256*	601	740709	34°11′N, 177°30′W	8	34.47	22	319	5.1	241 ± 19
			Station 61						
SV-271	648	750603	34°34′N, 174°21′W	6	34.37	18	230	21.7	121 ± 13
			Station 62, 32°–34°N, 150°–151°W						
SV-225	522	730106	32°39′N, 150°50′W		34.21		306	5.2	229 ± 11
SV-237	547	730701	34°56′N, 150°00′W	7	34.28	20	229	2.7	162 ± 10
SV-253	583	740308	33°44′N, 150°14′W	7.5	34.29	16	209	1.8	145 ± 10
SV-257	601	740711	34°04′N, 150°00′W	8	34.58	23	248	2.3	181 ± 9
SV-272	648	750606	33°41′N, 150°19′W	6	34.07	22			
			Station 63						
SV-134	380	700418	34°35′N, 130°00′W	5		14	319	4.0	244 ± 9
			Station 64						
SV-245	564	731024	29°46′N, 150°00′E	7	35.67	23	284	4.9	209 ± 8
			Station 65, 29°–32°N, 159°–160°E						
SV-171	427	710313	29°50′N, 160°00′E	7	34.93	19	183	1.7	121 ± 8
SV-199	473	720124	29°29′N, 159°42′E	7	34.78	20	216	1.9	152 ± 8
SV-214	482	720328	29°00′N, 159°00′E	7.5	34.86	20	207	4.9	136 ± 10
SV-243	563	731019	32°02′N, 160°00′E	7	34.46	25	234	1.5	170 ± 8

			Station 66, 27°–30°N, 180°E/W						
SV-172	428	710315	20°40′N, 180°00′E/W	7	34.93	19	197	2.2	133 ± 8
SV-200	473	720127	26°55′N, 179°42′W	7	35.20	21	237	2.1	171 ± 8
SV-244	563	731021	30°10′N, 180°00′E/W	7	35.77	25	266	4.9	192 ± 10
			Station 67						
SV-213	482	720326	25°00′N, 175°00′E	7.5	35.15	20	258	10.0	172 ± 9
			Station 68$_1$, 28°–30°N, 149°–150°W						
SV-157	408	701031	29°43′N, 150°00′W		37.33	24	271	1.7	204 ± 8
SV-173	428	710318	27°50′N, 149°21′W	7	35.26	27	265	1.4	199 ± 8
			Station 68$_2$, 25°–26°N, 150°–00′W						
SV-201	473	720129	25°50′N, 150°00′W	7	35.36	22	266	2.4	198 ± 8
SV-229	529	730223	25°20′N, 150°00′W	6.5	35.21	21	257	21	190 ± 7
			Station 69, 23°–26°N, 120°–121°W						
SV-226	523	730109	26°11′N, 120°38′W		34.37		222	3.0	155 ± 10
SV-238*	548	730705	23°57′N, 120°00′W	7	33.93	21	270	3.3	199 ± 8
SV-246	564	731027	23°30′N, 120°00′W	7	34.10	21	273	6.5	194 ± 10
SV-254	584	740312	24°46′N, 120°30′W	7.5	33.84	18	254	1.8	188 ± 7
SV-258	602	740715	26°07′N, 120°00′W	8	33.65	20	278	2.8	208 ± 8
SV-273	649	750610	26°02′N, 121°22′W	6	33.92	20	273	12.2	182 ± 9
			Station 70, 20°–22°N, 119°–120°W						
SV-135	381	700421	22°14′N, 120°00′W	5	34.37	20	216	4.8	145 ± 8
SV-155	409	700511	20°39′N, 120°00′W		38.46	24	246	2.2	179 ± 8
SV-174	429	710322	21°20′N, 120°00′W	7	34.28	20	289	2.4	220 ± 9
SV-186	448	710805	19°40′N, 120°00′W		34.45	24	291	1.5	224 ± 11
SV-202	474	720204	21°00′N, 119°10′W	7	34.36	22	244	2.8	176 ± 8
			Station 71						
SV-212	481	720321	18°00′N, 155°00′W	7.5	35.03	26	239	1.5	174 ± 10
			Station 72, 14°–17°N, 120°–123°W						
SV-211	480	720317	14°00′N, 123°00′W	7.5	34.73	24	162	2.1	100 ± 10
SV-230	530	730226	16°58′N, 120°00′W	6.5	33.77	24	180	2.5	117 ± 8

TABLE 4. (continued)

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 73, 14°–15°N, 93°–95°W						
SV-23	197	661013	14°20′N, 95°25′W		33.90		133	2.9	70 ± 9
SV-50	243	670827	14°13′N, 95°21′W	7	33.80	30	141	2.8	78 ± 7
SV-60	257	671207	14°00′N, 95°16′W	7	37.22	28	230	2.0	164 ± 11
SV-69	271	680311	14°10′N, 94°55′W	8	34.35	25	83	1.1	27 ± 7
SV-78	285	680621	14°12′N, 95°30′W	8	35.01	29	153	1.3	93 ± 7
SV-86	299	680926	14°10′N, 95°05′W	8	33.74	29	155	1.7	94 ± 9
SV-93	312	690116	13°50′N, 93°05′W	8	31.12	28	163	1.6‡	101 ± 10
SV-100	331	690510	14°33′N, 94°36′W	8	34.37	29	181	1.6‡	118 ± 10
SV-109	345	690813	14°24′N, 92°43′W	7.5	31.28	30	155	1.3	95 ± 8
SV-121*	357	691108	14°50′N, 95°10′W	7.5		30	106	0.1	51 ± 10
SV-125	374	700302	14°25′N, 95°20′W	8	34.04	25	194	0.3	135 ± 8
SV-141	387	700531	14°31′N, 94°32′W	7	34.17	29	192	1.6	129 ± 8
SV-144	400	700903	14°34′N, 95°12′W	7	33.17	29	149	2.6	87 ± 8

* Leak in the drum.
† Mean value $\delta^{13}C = 1.2 \pm 0.8‰$.
‡ Mean value $\delta^{13}C = 1.6 \pm 0.9‰$.

TABLE 5. Carbon 14 in the Surface of the South Pacific Ocean

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
				Station 74					
SV-190	456	711001	04°01′S, 99°09′W	6	35.26	23	130	2.2	70 ± 7
				Station 75, 14°–15°S, 110°W					
SV-136	373	700224	15°00′S, 110°00′W	2.5	36.09	29	134	3.8	69 ± 10
SV-147	392	700709	14°43′S, 110°00′W	4	35.87	28	160	1.3	100 ± 8
SV-167	411	701118	15°00′S, 110°00′W	4	35.92	20	141	1.7	81 ± 8
SV-191*	463	711116	14°19′S, 110°00′W	3	38.46	25	165	1.6	104 ± 7
SV-219	500	720730	13°53′S, 110°00′W	4	35.57	27	163	9.1	86 ± 10
				Station 76					
TO-13	759	770613	14°39′S, 100°00′W	7.5	35.83	25.7	134	−5.8	91 ± 8
				Station 77, 19°–20°S, 119°–120°W					
SV-231	535	730406	19°22′S, 120°00′W	7	36.34	25	206	2.2	142 ± 8
SV-239	555	730825	19°06′S, 119°25′W	7		24	239	2.0	174 ± 8
SV-247	572	731223	19°26′S, 120°00′W	7	34.46	24	217	3.1	150 ± 8
SV-259	595	740527	19°30′S, 120°00′W	7	36.29	24	228	17.2	128 ± 9
SV-263	615	741015	19°45′S, 120°00′W	7	36.24	22	225	8.9	144 ± 8
SV-267	635	750307	20°00′S, 120°00′W	7	36.20	26	262	25.5	141 ± 12
SV-275	658	750814	19°45′S, 120°00′W	7	36.35	24	210	4.8	139 ± 7
TO-5	731	770107	19°15′S, 120°00′W	7	36.45	27.8	161	−1.1	106 ± 13
				Station 78					
SV-170	413	701128	26°05′S, 170°00′W	4	35.30	21	146	1.7	86 ± 8
				Station 79, 25°–26°, 130°W					
SV-137	373	700228	26°15′S, 130°00′W	2.5	35.54	30	219	2.9	152 ± 8
SV-148	393	700713	13°55′S, 130°00′W	4	35.99	28	200	1.5	137 ± 8
SV-168	412	701122	24°50′S, 130°00′W	4	36.08	28	206	2.4	141 ± 8
SV-192*	463	711120	24°40′S, 130°00′W	3	32.92	26	261	3.2	191 ± 13
SV-220	501	720803	25°02′S, 130°00′W	4	35.55	25	235	4.3	164 ± 8

TABLE 5. (Continued)

Sample	Week	Date of Collection	Location	Depth m	Salin ‰	Temp °C	$\delta^{14}C$ ‰	$\delta^{13}C$ ‰	$\Delta^{14}C$ ‰
			Station 80, 26°–29°S, 120°W						
SV-189	455	710926	26°15′S, 120°00′W	6	36.61	24	220	2.4	154 ± 10
SV-282	687	760302	29°01′S, 120°00′W	7	35.41	26	227	2.1	162 ± 7
TO-12	753	770610	28°43′S, 120°00′W	7.5	35.58	21.2	219	−5.6	172 ± 7
			Station 81, 29°–31°S, 150°W						
SV-138	374	700302	31°12′S, 150°00′W	2.5	35.65	26	220	5.5	147 ± 8
SV-149	393	700717	31°00′S, 150°00′W	4	36.26	25	217	1.1	154 ± 8
SV-169	412	701126	31°00′S, 150°00′W	4	35.45	24	173	0.4	114 ± 8
SV-187	448	710802	29°50′S, 150°00′W	5.5	35.49	21	206	7.2	130 ± 11
SV-193	464	711122	28°40′S, 150°00′W	3	35.39	24	237	1.3	173 ± 8
SV-221	501	720807	31°25′S, 150°00′W	4	35.34	19	230	8.4	150 ± 8
SV-240	556	730829	29°12′S, 150°00′W	7	35.84	20	217	2.0	152 ± 12
SV-248	573	731228	29°30′S, 150°00′W	7	35.77	24	226	3.1	158 ± 10
SV-260	595	740531	29°20′S, 150°00′W	7	35.40	22	275	3.8	203 ± 13
SV-264*	615	741019	29°30′S, 150°00′W	7	35.48	19	250	12	160 ± 13
SV-276	659	750818	29°04′S, 150°00′W	7		20	212	7.5	135 ± 10
TO-4	730	770102	30°25′S, 150°00′W	7	35.34	21.8	173	−5.6	127 ± 10
			Station 82, 33°–36°S, 170°W						
SV-139	374	700306	35°20′S, 170°00′W	2.5	35.48	26	159	2.7	96 ± 8
SV-150	393	700719	34°00′S, 170°00′W	4	37.87	21	148	1.3	88 ± 8
SV-194	464	711125	33°09′S, 170°00′W	3	35.43	24	192	1.3	130 ± 8
SV-222	501	720810	35°56′S, 170°00′W	4	35.02	17	199	5.0	128 ± 8
			Station 83, 37°S, 160°E						
SV-279	680	760115	36°39′S, 160°00′E	7	35.58	22	186	5.1	117 ± 11
SV-283	699	760526	36°44′S, 160°00′E	7	35.45	19	194	−6.2	149 ± 10

			Station 84, 35°–38°S, 179°–180°E						
SV-188	448	710808	34°59′S, 179°32′E	5.5	38.52	15	200	1.5	137 ± 8
SV-233	536	730415	35°44′S, 180°00′E	7	35.53	19	191	19.0	91 ± 13
SV-249	574	740101	35°52′S, 180°00′E	7	35.67	20	173	1.2	113 ± 10
SV-261	596	740605	35°16′S, 180°00′E	7	35.50	18	449	~20	319 ± 20
SV-265	616	741024	35°42′S, 180°00′E	7	35.46	17	202	17.8	103 ± 10
SV-269	645	750516	36°40′S, 180°00′E	7	35.39	21	216	27.1	96 ± 14
SV-277	659	750824	35°51′S, 180°00′E	7	36.71	16	148	3.2	84 ± 7
SV-284	701	760613	38°22′S, 178°34′E	7	35.46	17	176	−3.8	127 ± 10
			Station 85						
SV-278	665	751005	41°27′S, 150°00′E	7	35.53	14	149	3.7	84 ± 9
			Station 86, 39°–41°S, 150°–154°W						
SV-281	686	760227	39°41′S, 150°00′W	7	35.41	20	215	1.1	153 ± 8
TO-11	752	770605	40°47′S, 154°00′W	7.5	34.55	15.7	192	−2.9	140 ± 7
			Station 87, 40°–43°S, 174°–180°E						
SV-234	542	730524	42°50′S, 174°25′E	6	34.69	12	157	9.5	80 ± 8
SV-242*	635	731013	41°36′S, 179°17′E	7	34.26	15	195	1.8	132 ± 8
SV-280	686	760225	39°59′S, 180°00′E	7	35.37	19	162	4.9	92 ± 10
			Station 88, 46°–47°S, 169°–171°E						
SV-241	559	730923	46°39′S, 169°27′E	7	37.26	10	150	−0.4	94 ± 10
SV-250	578	740202	46°40′S, 169°30′E	7	34.10	14	161	2.2	99 ± 8
SV-262	604	740891	46°23′S, 171°25′E	7	34.25	8	150	11.1	69 ± 10
SV-266	625	741214	46°41′S, 169°40′E	7	34.82	12	150	3.2	86 ± 9
SV-270	641	750418	46°43′S, 168°57′E	7	34.01	14	149	9.1	72 ± 8

* Leak in the drum.