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Contents

NOAA/CMDL Atmospheric Methane Data for the Period 1983-1990 from Shipboard Flask Sampling

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ABSTRACT. This memorandum presents atmospheric methane data obtained through the shipboard sampling component of the NOAA/CMDL global cooperative flask sampling program. A significant part of this program has involved flask sampling from a commercial container ship, the *Southland Star*, on regular crossings of the Pacific Ocean between the U.S. west coast and New Zealand. Shipboard flask sampling has also been carried out on a variety of oceanographic research expeditions. Tabulations are provided for individual flask measurements and annual mean methane mixing ratios for 14 sites spaced every five degrees of latitude across the Pacific Ocean between 30°N and 35°S. The methane data from the *Southland Star* are also shown as time series plots. The locations of flask sampling on the oceanographic research expeditions are shown in a series of maps. The flask methane data from these expeditions are shown as a series of plots of methane versus latitude. A brief history of the development of the sampling program is included. Flask sampling methods, and analytical and calibration procedures are documented.

1. Introduction

Atmospheric methane (CH_4) has been measured systematically through much of the 1980's by several laboratories (e.g., *Brunke et al.*, 1990; *Khalil and Rasmussen*, 1990; *Blake and Rowland*, 1988; *Steele et al.*, 1987; *Fraser et al.*, 1986). Through this work, many aspects of the behavior of methane in the atmosphere have been elucidated, such as the long-term growth, the seasonality, and the latitudinal gradient.

The most comprehensive set of measurements of atmospheric methane has been provided since 1983 through the cooperative flask sampling network operated by the Carbon Cycle Group now in the Climate Monitoring and Diagnostics Laboratory (CMDL) of the U.S. National Oceanic and Atmospheric Administration (NOAA). [From 1983-1990, these activities were carried out under the NOAA program known as Geophysical Monitoring for Climatic Change (GMCC).] The CH_4 data from the NOAA/CMDL cooperative flask network have been described in detail (*Steele et al.*, 1987; *Lang et al.*, 1990*a,b*), and made available as a numeric data package by the Carbon Dioxide Information Analysis Center at Oak Ridge National Laboratory (*Steele and Lang*, 1991).

In this flask sampling network (which now comprises about 35 fixed sites); flask air samples are typically collected about once per week and returned to NOAA/CMDL in Boulder, Colorado, where they are analyzed for methane, carbon dioxide (CO_2) (see *Conway et al.*, 1988), and in some cases carbon monoxide (CO, see *Novelli et al.*, 1991). Although the geographic coverage provided through this network has been, and remains, quite extensive, it is clear that it was inadequate for answering important questions about the global or regional budgets of methane (*Fung et al.*,1991), carbon dioxide (*Tans et al.*,1990), or carbon monoxide. Partly through this recognition, flask air samples have been collected occasionally at other locations, either on ships (e.g., *Conway and Steele*, 1988) or from aircraft (*Conway et al.*, 1985; *Conway and Steele*, 1989; and *Conway et al.*, 1992).

The shipboard flask sampling has been possible through the use of oceanographic research vessels and the merchant vessel, *Southland Star*, that sails regularly between the U.S. west coast and New Zealand. In this report we document the methane results for 1983-1990 obtained from this shipboard flask sampling program, provide tabulations and plots of the data, and give relevant information about sampling and analytical methodologies.

2. Sampling From the *Southland Star*

Flask sampling from the *Southland Star* began in December 1986, and has continued regularly since that time. It has been a successful and scientifically valuable operation. The flask samples are analyzed for methane (*Steele et al.*, 1992) and carbon dioxide. Carbon monoxide is not measured in these air samples because CO is unstable in the flasks that were used to collect the air samples. We briefly describe here the genesis and development of the program.

By 1985 it was clear to members of the Carbon Cycle Group at CMDL that the geographical coverage for measurements of both carbon dioxide and methane provided by the fixed sites of the cooperative flask sampling network was too sparse in tropical latitudes, especially the southern tropics. The occasional oceanographic research cruises that collected flask air samples in these regions could not provide regular weekly or monthly sampling. Some effort was expended in trying to find additional fixed sampling sites in tropical latitudes, but high cost and logistic difficulties militated against all the sites considered.

The breakthrough in our thinking came in late 1985 when we became aware of a Japanese flask sampling program that used a commercial container ship, the *Hyogo Maru*, sailing on monthly voyages between Japan and the east coast of Australia. This program was developed to measure both seasonal and meridional variations in atmospheric carbon dioxide (*Tanaka et al.*, 1987).

The weekly trade publication *Pacific Shipper* was used as a source for finding a shipping company operating between the west coast of the U.S. and either Australia or New Zealand suitable for our needs. Letters were written to several companies in February 1986, and two positive responses were received. Both of these companies were visited in July 1986. On the basis of these visits, Blue Star Line, Ltd. (San Francisco), and its vessel, the *Southland Star*, were selected. A significant factor in making this choice was that Blue Star Line, Ltd. was already cooperating with scientists at the Scripps Institution of Oceanography, La Jolla, in a project to measure sea surface temperatures between Fiji and New Zealand from the *Southland Star*.

The flasks chosen for this shipboard sampling program, were 3-L, evacuated, glass flasks with a single, glass piston, O-ring sealed valve. The valve, made by Louwers-Hapert, Netherlands, had a Viton O-ring, and a "soft-stop" when fully closed, making it difficult for the operator to break the flask by overtightening the valve. Evacuated flasks were chosen because of their simplicity of use in field situations, thus eliminating the need for pumps or intake lines. The plan was for the ship's officers to collect the samples (in pairs) from the bridge wings at every 5° of latitude. The normal tour of duty for an officer is four months, making it imperative that the sampling procedures be simple and robust, so that they could be learned quickly and then carried out competently, interrupting the navigation duties for only brief periods of time.

The logistics of this operation were relatively simple. A suitable number of flasks for a round-trip crossing of the Pacific were sent to Terminal Island, Los Angeles, where they were loaded onto the *Southland Star*. When the ship returned to Los Angeles, the filled flasks were sent to CMDL in Boulder, where the air samples were analyzed for carbon dioxide and methane. This flask sampling program was designated "Operation Pacific Air" to give it clear name recognition with the officers and management of Blue Star Line, Ltd. To further improve the operation, a training video portraying detailed aspects of the flask sampling procedures was prepared and provided to the officers of the *Southland Star* in July 1988.

Each voyage across the Pacific Ocean by the *Southland Star* took approximately three weeks. Typically the *Southland Star* sailed southward from Los Angeles, passing reasonably close to Christmas Island and sometimes calling at American Samoa and Fiji, en route to New Zealand. On this southward crossing the first pair of flask samples was collected at a latitude of 30°N, and then at every 5° of latitude until 35°S (see Figure 1). Air samples were not collected south of 35°S even though the ship typically sails partway down the east coast of New Zealand. This was to avoid collecting air samples that were contaminated by recent contact of the atmosphere with New Zealand.

On the northward voyage the ship sometimes called at Hawaii before reaching Seattle, Washington. During this crossing the first pair of flask samples was collected at 35°S, and then at every 5° of latitude until 45°N (Figure 1). From Seattle the ship sailed south along the coast to Los Angeles. Again we chose not to collect samples on this section to avoid

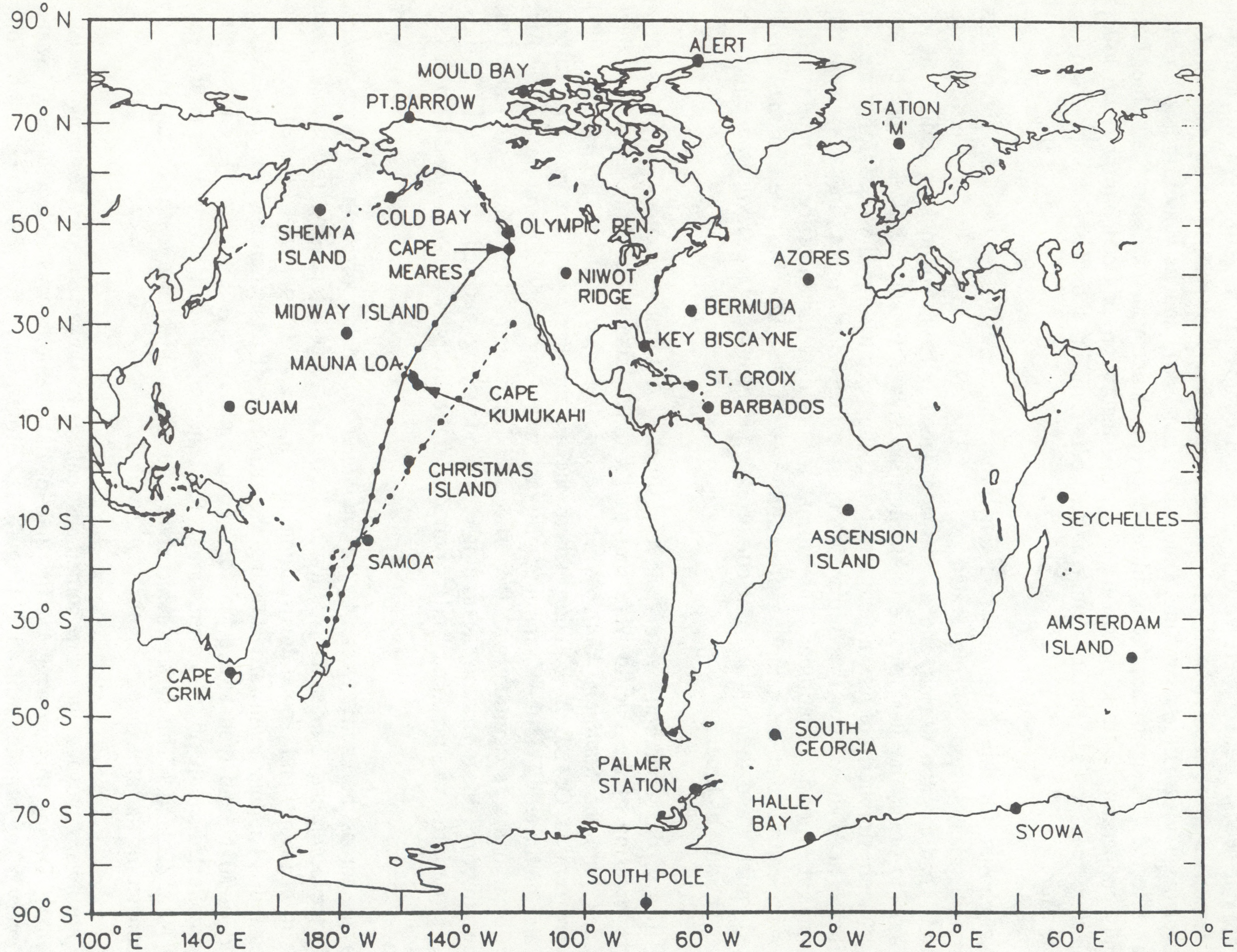

Figure 1. Map showing the locations (large dots) of the NOAA/CMDL cooperative flask sampling sites. The southbound track of the *Southland Star* is represented by the dotted line and the northbound track is represented by the solid line. The small dots along these cruise tracks represent the approximate sampling locations.

obtaining air samples influenced by recent contact with land. As a result of this strategy, the number of flask samples collected at the latitudes 45°N, 40°N, and 35°N was about half the number collected at each of the other latitudes.

The three-letter code used for all air samples collected on the *Southland Star* is PAC (Table 1). Data were grouped according to the latitude at which flask samples were collected, creating 17 subdivisions or "sites." Sites in the northern hemisphere were denoted by the letter N followed by two digits for the latitude (e.g., N25 identifies flask samples collected at 25°N latitude). Similarly, sites in the southern hemisphere were denoted by the letter S with two digits for the latitude. Samples collected at the equator were placed in a category with the three-digit code "000." We did not designate longitude because the longitudinal variations in methane mixing ratio in the mid-Pacific are negligible in comparison with the latitudinal variations.

Data from individual samples collected on the *Southland Star* at the 17 sites are given in Appendix A. From these tabulations it can be seen that in nearly all cases the actual latitude where an air sample was collected is very close to the latitude that defines the site. In cases where this condition was not met, the sample was assigned to the nearest latitude site. A latitude site is defined as the center latitude (e.g., 5°N, 10°N, or 15°N) $\pm$ 2.5°. For example, if a sample was collected at 22°N latitude, it was assigned to the N20 site; if it was collected at 23°N latitude, it was assigned to the N25 site. In rare instances, the sample position coordinates were not recorded on the sample sheet. Sometimes we were able to calculate the unrecorded sample latitude. However, if we could not calculate the latitude unambiguously then these samples were excluded from the data listing.

The listings in Appendix A include a code for the flask type and the collection method. All samples from the *Southland Star* were collected in the evacuated 3-L glass flasks (type 8) mentioned previously. The key to the codes for all flask types is given in Table 2. The same collection method (T) was used for all samples on the *Southland Star*. The key to codes for all sample collection methods is given in Table 3. The procedure to fill evacuated flasks was described by *Steele et al.* (1987). Briefly, it involves the sample-taker facing into the wind while holding the flask forward and slightly above head level, using a short piece of wooden dowel to repeatedly displace the air in the short section of tubing beyond the flask valve, holding his/her breath, opening the valve and waiting a few seconds for it to fill to ambient pressure (during which there is usually an audible hissing sound), and then closing the valve. The flasks in each pair were usually filled in quick succession.

In Appendix B we present calculated annual mean methane mixing ratios for 14 of the 17 sites sampled from the *Southland Star*. The methane mixing ratios are given in parts per billion (10^9) by volume in dry air (ppb). Time series plots of the methane mixing ratios for the 17 sites sampled from the *Southland Star* are shown in Appendix C.

Table 1 -- Details of Sampling From the *Southland Star* and the Research Expeditions

Code	Ship Name	Experiment or Program	Beginning Flask Coverage	Ending Flask Coverage
PAC (N45-S35)	*Southland Star* Blue Star Line, Ltd.	Ships of Opportunity Program (Operation Pacific Air)	14 DEC 86	25 DEC 90
AKC	*Akademik Korolev*	Soviet-American Gas and Aerosol (SAGA I) Experiment	25 OCT 83	14 NOV 83
DIS	*Discoverer*	1. Carbon Dioxide and Acid Rain	06 MAR 83	21 MAY 83
		2. Carbon Dioxide and Acid Rain	28 FEB 84	13 APR 84
DSC	*Discoverer*	1. Marine Sinks of Atmospheric Carbon Dioxide	07 FEB 85	04 MAR 85
		2. Equatorial Pacific Ocean Climate Studies (EPOCS)	20 APR 85	14 MAY 85
		3. Carbon Dioxide and Acid Rain	27 MAY 85	18 JUN 85
		4. Marine Sinks of Atmospheric Carbon Dioxide	29 JUN 85	22 JUL 85
		5. Outer Continental Shelf Environmental Assessment Project (OCSEAP)	23 AUG 85	08 SEP 85
ESG	*Mexico Naval Oceanographic Research Ship H-02*	Air Chemistry Studies Over the Gulf of Mexico	21 JUL 86	08 AUG 86
KOR	*Akademik Korolev*	Soviet-American Gas and Aerosol (SAGA II) Experiment	19 MAY 87	24 JUL 87
LLE	*Knorr*	Long Lines Expedition	08 OCT 83	06 FEB 84
OCE	*Oceanographer*	1. Equatorial Pacific Ocean Climate Studies (EPOCS)	16 APR 86	20 JUN 86
		2. Marine Sinks of Atmospheric Carbon Dioxide	01 JUL 86	22 JUL 86
PML	*USCGC Polar Star*	Beaufort Sea Mesoscale Circulation Study	04 OCT 86	18 OCT 86
RRS	*John Bisco*	British Antarctic Survey	01 JAN 85	27 MAR 85
SUR	*Surveyor*	1. Exclusive Economic Zone (EEZ)	09 SEP 86	22 NOV 86
		2. Antarctic Marine Living Resources Program (AMLR)	12 JAN 89	31 JAN 89

Table 2 -- Description of Flask Types Used for Sampling

Code Used for Flask Type*	Flask Material	Flask Size+	Flask Shape	Number of Stopcocks	Stopcock Type
1	Pyrex glass	0.5 L	Cylindrical	2	Ground-glass, solid glass plug, 3-mm bore lubricated with Apiezon N grease
4	Pyrex glass	3 L	Cylindrical	1	High-vacuum, glass piston, 10-mm bore, black Vitron O-ring sealed (from J. Young Scientific Glassware)
5	Pyrex glass	3 L	Cylindrical	1	High-vacuum, glass piston, 10-mm bore, black butyl O-ring sealed (from J. Young Scientific Glassware)
8	Pyrex glass	3 L	Cylindrical	1	High-vacuum, glass piston, 9-mm bore, black Viton O-ring sealed (from Louwers-Hapert, Netherlands)
9	Internally Electro-polished stainless steel	1-4 L	Cylindrical and Spherical	1-2	Nupro stainless steel and bellows valve, H series**

*Code is used for tabulations given in Appendix A.
+Flask sizes are approximate.
**These flask types were used only on the *Akademik Korolev* 1987 cruise (KOR). Specific details about these flasks are given in *Butler et al.* (1988).

Note: In Table 2 of *Lang et al.* (1990*a*), flask type 5 should have been identified as type 4, consistent with the codes shown here.

Table 3 -- Description of Collection Methods Used for Sampling

Code Used for Collection Method*	Description of Collection Method
P	A portable, battery-powered suitcase sampler is used. Two flasks are normally connected in series, flushed with air, and then pressurized to 1.25-1.5 times ambient atmospheric pressure (see *Komhyr et al.*, 1985).
T	Evacuated 3-L glass flasks are filled by opening the single O-ring stopcock (see *Steele et al.*, 1987, for more details).
N+	Flasks are pre-filled with 3 atm of dry, natural air. Before final filling, each flask is flushed and pressurized ten times to 3 atm. The flasks are flushed and filled using a battery-powered, Scientific Instrument Specialists (SIS), Moscow, Idaho, model N05SVI pump. The flow rate is 1 L min^{-1} at 1 atm. The air intake line is approximately 4 m of 2.2-mm-i.d. stainless steel tubing, which extends over the ship's bow. (*Butler et al.*, 1988).

*Code is used for tabulations given in Appendix A.
+The flasks collected on the KOR used a pump to flush and fill the flask (see *Butler et al.*, 1988, for details). This flask filling procedure is different from the "N" flasks found in *Lang et al.* (1990*a,b*).

3. Sampling from Oceanographic Research Expeditions

During the early years of the NOAA/CMDL methane measurement program, the number of fixed sites in the cooperative flask sampling network was only about half the 1990 total, and systematic sampling from the *Southland Star* had not begun. Our knowledge of the distribution of atmospheric methane was still limited, and consequently we saw value in carrying out some exploratory flask sampling at locations not normally sampled through the network of fixed sites. Through links with other NOAA research programs, particularly with the Pacific Marine Environmental Laboratory (PMEL) in Seattle, Washington, and a variety of other oceanographic research programs, this exploratory sampling was most readily carried out from research vessels. In many instances NOAA/CMDL staff took part in these research cruises, collecting flask air samples as part of their duties. When NOAA/CMDL staff did not participate in a cruise, we reached an agreement with the personnel of one of the other research projects to collect the flask air samples. The flask samples collected on these research expeditions were analyzed for methane and carbon dioxide. All trace gas analyses of these flask samples were carried out at CMDL in Boulder, Colorado.

Pertinent details of the oceanographic expeditions in which we obtained flask air samples are given in Table 1. Air samples collected on the oceanographic research expeditions were assigned three-letter codes to make them compatible with existing data files from the fixed site network (Table 1). The three-letter code is not a site as such, but simply a way of organizing the data. After the entry for the *Southland Star*, the entries in Table 1 are organized alphabetically by the code. The grouping of the data into the three-letter codes was not totally systematic. If the same research vessel (e.g., the *Surveyor* or *Oceanographer*) was used for collection of flask samples on more than one occasion, all the flask data were included under a single code (e.g., SUR or OCE). Two exceptions were (1) for two cruises of the (former) Soviet research ship, the *Akademik Korolev*, where the first was assigned the code AKC, and the second the code KOR, and (2) for the cruises of the *Discoverer*, where the cruises in 1983 and 1984 were assigned the code DIS and the cruises during 1985 were assigned the code DSC. It should be noted that the beginning and ending dates given in the last column of Table 1 apply only to the dates when flask samples were collected, and should not be assumed to indicate the beginning or ending dates of the projects or expeditions.

Individual flask data for all these research expeditions are given in Appendix A. Even though the latitude and longitude for each air sample are included in the tabulations of Appendix A, maps are included to visually indicate the locations where the air samples were collected, and these are shown in Appendix D. In Appendix E we show plots of methane mixing ratio versus the latitude where the samples were collected. A variety of flask types were used on these oceanographic expeditions, but experience soon led us to favor the 3-L evacuated flasks with a single O-ring valve because of their ease of use in sometimes difficult sampling conditions. The type of flask used in each case is given by a code number in the tabulations of Appendix A, and the key to this code number can be found in Table 2. The flask collection method used in each case is given by a code letter in Appendix A, and the key to this code letter is given in Table 3.

4. Analytical and Calibration Procedures

The flask samples obtained from these shipboard programs were analyzed for methane using the same basic techniques and on the same gas chromatographic systems that were used for the samples from the fixed network sites. Most of these techniques and analytical systems have been described in detail elsewhere (*Steele et al.*, 1987; *Lang et al.*, 1990*a,b*). Table 4 is a summary of the systems and their period of use. The codes used for these different

Table 4 -- Description of Gas Chromatographic Systems Used for Methane Analysis

Code Used for GC System*	Period of Use	Basic Configuration of GC System
C1	27 APR 83-13 NOV 83	Carle 211-M, series S GC; Spectra-Physics SP4100 integrator; Carle Model 2026 8-port stream selection valve.
C2	07 DEC 83-05 AUG 85	Carle 211-M, series S GC; Hewlett-Packard (HP) 3390A and 3392A integrators; Carle model 2026 8-port stream selection valve; Hewlett-Packard 85-B computer (after October 1984).
C3	12 AUG 85-12 JAN 86	Hach-Carle series 400, model 04270-A GC; Hewlett-Packard 3392A integrator; Hach-Carle model 2026 8-port stream selection valve; Hewlett-Packard 85-B computer.
C4	24 JAN 86-22 NOV 90	Hach-Carle Series 400 GC, basic model 04270-A, without a methanizer, but configured to backflush CO_2 from the silica gel column; HP3393A integrator and HP310 workstation; Valco 4- and 8-port stream selection valves setup on a custom carousel. See *Lang et al.* (1990*b*) for the evolution of the C4 system.
C7	23 NOV 90-24 JAN 91	Hach-Carle Series 400 GC, model 04270-A; HP 3393A integrator; Valco 4- and 8-port stream selection valves mounted on a carousel for automated sampling. The sample loop of Carle GC is connected in series with the sample loop of a second GC (RGA3 with a mercuric oxide detector) used for analysis of carbon monoxide and hydrogen; this dual GC system (including the carousel) is controlled controlled by a HP model 332 UNIX workstation.

*Code is used for tabulations given in Appendix A.

systems are also given in Table 4, and are identical to the codes used previously (*Lang et al.*, 1990*a,b*). These codes are also given in the tabulations of Appendix A to identify the particular system used for the analysis of every flask sample. As can be seen from Table 4, there is no overlap in the periods of use of any of these analytical systems. This apparent lack of overlap should not be interpreted to mean that new systems were not tested before being introduced for routine analysis of flask samples. Extensive testing was performed to ensure a high degree of consistency between the systems before introduction of any new procedures.

A new, improved methane flask analysis system was employed on November 23, 1990. This new gas chromatographic system is referred to as C7 in Table 4. Note that in Table 4 no C5 or C6 is mentioned. This is because we adopted a procedure of numbering sequentially all the Carle gas chromatographs as they were acquired. Not all of the chromatographs were used for analysis of flask samples. The C5 chromatograph was originally deployed to the Mauna Loa Observatory for in situ measurements of atmospheric methane and the C6 chromatograph was used for development and training.

The principal new feature of the C7 system was that it consisted of two independent chromatographs, each with its own sample loop. The two sample loops were joined in series. One gas chromatograph was a Carle series 400, model 04270-A, fitted with a flame ionization detector for measuring methane. The other was a Trace Analytical Reduction Gas Analyzer, model RGA3, with a heated mercuric oxide detector, for measuring carbon monoxide and hydrogen. Flask samples were mounted on a carousel for automated analysis (see *Lang et al.*, 1990*b*). The output signal from each detector was fed to a separate integrator (Hewlett-Packard, model 3393A). Overall control and real-time processing of data were accomplished with a Hewlett-Packard model 332 UNIX workstation, but valve switching in both chromatographs and in the carousel was controlled by the Carle chromatograph microprocessor. The flow rate of air sample through the series-connected sample loops was measured with a Tylan mass flow meter and integrated by the computer to regulate the total volume of air sample used to flush and fill the sample loops (see *Lang et al.*, 1990*b*). The entire system was protected against power outages by an uninterruptible power supply (Best Micro-Ferrups model MD2KVA).

The air sample was passed from the carousel, through a drying tube held at -80°C, through the sample loop of the Trace Analytical RGA3, through a three-way valve, through the sample loop of the Carle chromatograph, and finally through the mass flowmeter to a rotamer flowmeter where it vents into the lab. After adequate flushing of the sample loops, the carousel valve closed, and then the three-way valve switched so that the sample loop of the RGA3 was open to the atmosphere and could equilibrate to ambient atmospheric pressure. The sample loop of the Carle chromatograph was open to the atmosphere through the flowmeter, and was similarly able to equilibrate to ambient atmospheric pressure. After this equilibration period (several seconds), the samples were injected into the RGA3 and Carle chromatographs. By having the three-way valve between the two sample loops and in the appropriate position at the time of the sample injections, we eliminated any possibility of a pressure transient caused by the injection of the first sample influencing the sample in the other sample loop.

One of the major incentives in the development of this C7 system was to improve productivity by linking two gas chromatographs. The flasks have to be mounted on the carousel and the relevant data entered into the computer only once. Previously, the same flasks were analyzed for methane on one gas chromatograph, and then analyzed separately for carbon monoxide and hydrogen on another gas chromatograph. This C7 system was capable of analyzing 20-22 air samples in a 10-h day.

We did not measure carbon dioxide with the C7 system. However, the column configuration of the Carle gas chromatograph, a silica gel column and a molecular sieve 5A column connected in series, is standard for carbon dioxide analysis. For that application, the air sample is injected onto the silica gel column which allows the methane (and other species such as carbon monoxide and hydrogen) to pass quickly through to the molecular sieve column. Methane is separated on the molecular sieve column before passing to the flame ionization detector. The carbon dioxide in the air sample is retained on the silica gel column while the methane is being separated and detected. After the elution of the methane peak from the molecular sieve column, the sampling valve (10-port, two-position valve) is switched to its load position. This reverses the order of the series-connected columns; the outlet of the silica gel column now flows to the detector. Carbon dioxide may then be reduced to methane over a heated nickel catalyst and detected at the FID. However, we chose not to employ this option.

As before (*Lang et al.*, 1990*a,b*), we typically analyzed one flask from each pair for methane, and at least two aliquots from that flask when possible. The difference in methane mixing ratio between the first and second aliquot is included in the tabulations of Appendix A, when available. Statistics on these first-minus-second methane mixing ratios are shown in Table 5 for each of the 17 sites sampled from the *Southland Star*, and for the research expeditions. The total number of flasks from all these shipboard sampling programs for which at least two aliquots were analyzed for methane was 1209. The mean difference for first-minus-second aliquot was -0.26 ± 5.0 ppb (uncertainty is 1σ). This difference is comparable to that found for several thousand flask samples from the fixed network sites, and reported in *Lang et al.* (1990*a,b*). The present results indicate an overall precision level of approximately 0.3% for these methane mixing ratios. As we have noted previously (*Lang et al.*, 1990*b*), this average precision level of 0.3% applies to a single determination of a methane mixing ratio. Since it is normal practice for two aliquots to be analyzed from each flask, and the results from both aliqouts are averaged, the estimated uncertainty for the averaged mixing ratio is approximately 0.2%.

In Table 6 we summarize the time elapsed between flask sample collection and analysis. These elapsed times are comparable to those found in the fixed network (see *Lang et al.*, 1990*a,b*). The storage time does not influence the methane mixing ratios of air samples stored in the flasks (*Steele et al.*, 1987).

Table 5 -- Summary Statistics for the Precision of Methane Mixing Ratios

Site Code	Number of Flasks With at Least Two Aliquots	Mean Value of First - Second Aliquot Mixing Ratio (ppb)	Sample Standard Deviation of Mean (ppb)
N45	21	-1.6	4.5
N40	23	-0.6	6.8
N35	27	-1.2	4.6
N30	55	-1.0	5.2
N25	55	-0.9	5.0
N20	54	-0.2	5.9
N15	57	-1.1	5.0
N10	58	-0.9	5.1
N05	57	-0.2	5.6
000	53	-0.8	4.8
S05	60	0.2	5.0
S10	55	1.1	5.0
S15	56	0.4	5.2
S20	55	0.1	4.6
S25	52	0.0	4.6
S30	48	-1.1	6.0
S35	44	-0.7	3.9
AKC	29	1.3	4.5
DIS	74	0.2	5.9
DSC	84	0.2	2.6
ESG	7	-1.8	4.5
KOR	47	0.2	4.7
LLE	38	-0.6	3.3
OCE	40	-1.0	4.1
PML	11	-3.6	6.6
RRS	10	-0.5	5.0
SUR	39	1.5	5.9

The tables in Appendix A include only those samples that were both properly collected and analyzed. The procedures used to identify unacceptable flask samples were described previously (*Lang et al.*, 1990*a,b*), and we followed those procedures here. The statistics on the incidence of unacceptable flask samples are given in Table 7. From all the shipboard sampling programs covered in this memorandum, methane analysis was attempted on 1230 flasks. Only 10 of these (or 0.81%) were unacceptable. This percentage of unacceptable flask samples is considerably lower than the average of approximately 14% found for the

Table 6 -- Summary Statistics for the Time Between Flask Sampling and Flask Analysis

Site Code	Mean Time (Days)	Median Time (Days)	Minimum and Maximum Time (Days)
N45	33	22	8 - 84
N40	36	28	12 - 82
N35	34	29	9 - 83
N30	52	51	10 - 158
N25	52	51	11 - 157
N20	53	50	16 - 157
N15	50	47	6 - 155
N10	51	49	7 - 154
N05	51	47	8 - 153
000	51	48	9 - 152
S05	50	47	9 - 152
S10	51	45	10 - 151
S15	51	44	11 - 148
S20	47	43	11 - 96
S25	47	44	13 - 95
S30	47	44	23 - 95
S35	46	45	14 - 91
AKC	56	55	45 - 68
DIS	39	29	13 - 96
DSC	44	42	19 - 72
ESG	74	70	68 - 85
KOR	113	112	69 - 135
LLE	138	166	71 - 188
OCE	59	48	25 - 96
PML	59	59	53 - 67
RRS	70	35	27 - 113
SUR	48	49	4 - 96

fixed network sites (*Lang et al.*, 1990*a,b*), but comparable to the best of the fixed network sites.

Over the period of this study four cylinders of methane calibration gas were used, and details of these are given in Table 8. All of these calibration gases are compressed natural air. These are the same calibration gases that have been used for analysis of flask air samples from the fixed network sites, and the first three calibration gases have been described previously (*Lang et al.*, 1990*a,b*). The fourth calibration gas, contained in cylinder AAL-17269, was put into service on November 8, 1989. The cylinder was aluminum

Table 7 -- Flask Sampling Statistics

Site Code	Total Number of Flasks Samples*	Number of Unacceptable Flask Samples	Percent of Unacceptable Flask Samples
N45	21	0	0
N40	23	0	0
N35	27	0	0
N30	55	0	0
N25	56	1	2
N20	54	0	0
N15	58	1	2
N10	58	0	0
N05	58	1	2
000	54	1	2
S05	61	0	0
S10	56	1	2
S15	57	1	2
S20	57	0	0
S25	52	0	0
S30	48	0	0
S35	44	0	0
AKC	29	0	0
DIS	74	0	0
DSC	86	0	0
ESG	12	2	17
KOR	47	0	0
LLE	39	0	0
OCE	40	0	0
PML	12	0	0
RRS	12	2	17
SUR	40	0	0

* For which a methane analysis was attempted.

(manufactured by Luxfer, Riverside, California), size 150, and fitted with a brass, packless, tapered thread valve. The internal surface of the cylinder had been passivated with the ACULIFE IV treatment, a proprietary process of Scott Specialty Gases (Plumsteadville, Pennsylvania). This cylinder was filled to a pressure of 2250 psig (15.5 Mpa) with dry, natural air at site C1 near Niwot Ridge, Colorado, on November 12, 1987, using a RIX

Table 8 -- Calibration Standards Used for Methane Flask Analysis

Cylinder Number	CH_4 Mixing Ratio (ppb)	Starting Analysis Date	Ending Analysis Date
O-245	1653.0	27 APR 83	10 JUN 85
O-259	1676.0	11 JUN 85	24 MAR 87
CC1406	1701.7	25 MAR 87	07 NOV 89
AAL-17269	1714.55	08 NOV 89	24 JAN 91

(Emeryville, California) compressor, model SA-3. The air was dried by passing it through two 20 inch long by 1 1/8" o.d. stainless steel tubes connected in series and filled with Aquasorb (active ingredient, phosphorus pentoxide). The drying tubes were placed between the high-pressure outlet of the compressor and the cylinder inlet. The water content of air in this cylinder was determined to be less than one part per million with a Meeco Aquamatic. The air in cylinder AAL-17269 was intensively calibrated for methane over a period of about 2 years against a suite of other methane calibrations gases, particularly the first three shown in Table 8. In this way we determined that the methane mixing ratio of the air in AAL-17269 was not drifting relative to any of the other methane calibration gases. In addition we were able to extend the methane calibration scale to this new calibration standard very precisely before its introduction to routine use.

The periods of use of the four calibration gases do not overlap. Because we include the analysis date for each flask in Appendix A, the particular calibration gas used in the analysis of any flask can be readily deduced by examination of the dates of usage in Table 8.

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Appendix A
Tabulations of Methane Mixing Ratios and Details of Individual Flask Samples From All Shipboard Sampling

In this appendix we tabulate specific information about each flask sample. These details are given separately for each three-letter code. The tables are arranged with data from the *Southland Star* coming first, followed by data from 10 oceanographic research expeditions. Data from the *Southland Star* have been divided into 17 sites according to latitude (Section 2). We begin with data from the northernmost site (N45), continuing in sequence southward and finishing with the southernmost site of S35. Entries for the 10 research expeditions are then arranged alphabetically by the three-letter code (see Table 1). The column headings used in these tabulations are essentially identical to those used for the tabulations in two previous technical memorandums (*Lang et al.*, 1990*a,b* Appendix A), except that here we include two additional columns. These are for the latitude (column 3) and longitude (column 4) where each sample was collected. In some cases the longitude was not recorded on the sample sheet; in such cases a default value of 999.99 was entered, but only when the latitude was known. If the latitude was not recorded on the sample sheet or unambiguously calculated, the sample could not be included in these tabulations.

For each site the data are listed chronologically by sample date (column 1) and sample time (column 2). All sample dates and times are given in Greenwich Mean Time (GMT). We denote the sample date as "day month year," with the month given by the first three letters of the month's name. For the year we specify only the last two digits of that year. The sample time is listed to the nearest minute using the 24-h clock convention. When a sample time was not provided by the sample taker a default value of 9999 was entered. The filling of the flask was not instantaneous, and the sampling period is usually several minutes. For these tabulations, the sample time listed represents the beginning of the sampling period.

The latitude where each sample was collected is given in decimal degrees followed by either an N (north) or an S (south). Similarly, the longitude is given in decimal degrees followed by either an E (east) or W (west).

Column 5 lists the arithmetic mean methane mixing ratio determined for all aliquots measured for the flask sample. The number of aliquots used in determining the mean for each sample is listed in column 7. The sixth column, is the difference (in ppb) between the first and second aliquots; it is an indication of the analytical precision. This difference is always calculated as first minus second aliquot.

The flask identification numbers are in column 8. They are included to aid in merging this data set with carbon dioxide data determined from the same flasks. Column 9 contains code numbers that specify the type of flask used to collect the flask sample. These code numbers are described in Table 2.

The method used to collect the flask sample is listed as a code letter in column 10. A full description of these collections methods is given in Table 3.

Several different chromatographs were used over the course of this work. Column 11 contains a code to distinguish which chromatograph was used to analyze the flask sample. A description of the codes are given in Table 4.

The analysis date (column 12) is the date the flask sample was analyzed. We use the same convention as for the sample date except that the analysis date is based on local time in Boulder, Colorado, rather than GMT.

Column 13 ("Flag") is used to identify samples that we believe do not represent "background" conditions. These "nonbackground" samples are identified with a plus (+) symbol in this column. Very few shipboard samples are considered to be nonbackground.

Data that are judged to be unacceptable are not included in these tabulations. Any flask that was not collected according to specified guidelines is considered to be unacceptable. In most cases, the sample takers provided us with information on the sample sheet that led us to exclude the flask samples. Another reason for unacceptable flask samples is a failure of the analysis system. Although this is rare, occasionally one aliquot of a flask sample was excluded for analytical reasons.

Southland Star (N 45)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
05 JUN 87	0450	45.00N	129.75W	1734.7	1.2	2	3146-86	8	T	C4	16 JUN 87	
07 JUN 87	2000	44.98N	124.82W	1729.7	-5.3	2	3078-86	8	T	C4	16 JUN 87	
20 JUL 87	0049	45.08N	129.55W	1692.6	-6.5	3	3150-86	8	T	C4	24 SEP 87	
29 AUG 87	1304	44.59N	129.33W	1678.9	4.2	2	3134-86	8	T	C4	18 NOV 87	
13 OCT 87	1756	45.03N	129.33W	1763.1	-.1	2	3094-86	8	T	C4	24 NOV 87	
07 JAN 88	2305	45.07N	128.93W	1724.1	-4.5	2	3028-86	8	T	C4	18 JAN 88	
10 JAN 88	0555	44.88N	124.82W	1742.1	-3.3	2	3144-86	8	T	C4	18 JAN 88	
17 FEB 88	0120	44.93N	129.78W	1748.6	-3.0	2	3030-86	8	T	C4	03 MAR 88	
05 APR 88	1614	45.00N	129.65W	1726.7	4.4	2	3026-85	8	T	C4	26 APR 88	
20 MAY 88	1207	45.00N	129.52W	1738.9	7.7	2	3066-86	8	T	C4	16 JUN 88	
19 MAY 89	0251	45.02N	129.47W	1765.2	-3.0	2	3068-70	8	T	C4	21 JUN 89	
06 JUL 89	1244	45.05N	129.40W	1738.0	-1.9	2	3194-70	8	T	C4	26 JUL 89	
27 AUG 89	0720	45.00N	129.38W	1699.9	-7.0	2	3180-70	8	T	C4	20 NOV 89	
20 JAN 90	2106	45.00N	129.62W	1751.6	1.0	2	3222-70	8	T	C4	21 FEB 90	
08 MAR 90	1209	45.00N	126.50W	1768.9	-3.4	2	3042-70	8	T	C4	30 MAR 90	
11 MAR 90	1049	45.00N	124.83W	1780.8	-.8	2	3184-70	8	T	C4	30 MAR 90	
13 JUN 90	0650	45.00N	129.65W	1749.4	-2.0	2	3100-70	8	T	C4	20 AUG 90	
02 AUG 90	1000	45.00N	129.50W	1715.2	-6.4	2	3148-70	8	T	C4	17 AUG 90	
19 SEP 90	0303	45.00N	130.37W	1767.8	-.4	2	3230-70	8	T	C4	30 OCT 90	
05 NOV 90	2127	45.00N	129.54W	1770.3	1.3	2	3200-70	8	T	C7	18 DEC 90	
25 DEC 90	9999	45.00N	129.46W	1760.3	-4.7	2	3088-70	8	T	C7	22 JAN 91	

Southland Star (N 40)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
04 JUN 87	0506	40.00N	136.17W	1710.0	9.6	2	3094-86	8	T	C4	17 JUN 87	
18 JUL 87	2355	40.03N	136.20W	1684.1	-1.2	2	3132-86	8	T	C4	24 SEP 87	
28 AUG 87	1425	40.02N	135.00W	1673.0	3.8	2	3126-86	8	T	C4	28 SEP 87	
12 OCT 87	1840	40.00N	136.27W	1720.5	1.0	2	3020-86	8	T	C4	23 NOV 87	
06 JAN 88	2247	40.03N	136.20W	1741.3	.3	2	3090-86	8	T	C4	18 JAN 88	
16 FEB 88	0140	40.05N	136.17W	1745.6	-.5	2	3040-85	8	T	C4	03 MAR 88	
04 APR 88	1700	40.00N	136.15W	1733.1	.5	2	3124-86	8	T	C4	26 APR 88	
19 MAY 88	1248	40.00N	136.22W	1700.8	-9.0	2	3186-86	8	T	C4	16 JUN 88	
27 JUN 88	1740	40.00N	136.85W	1725.5	-6.0	2	3091-86	8	T	C4	28 JUL 88	
15 AUG 88	2020	40.00N	136.00W	1710.6	-4.2	2	3012-86	8	T	C4	13 SEP 88	
03 JAN 89	0525	40.37N	135.87W	1730.0	1.0	2	3120-86	8	T	C4	31 JAN 89	
04 APR 89	0313	40.02N	139.15W	1733.7	-14.1	3	3132-70	8	T	C4	26 APR 89	
17 MAY 89	2150	40.00N	136.48W	1755.4	-6.8	2	3076-70	8	T	C4	21 JUN 89	
05 JUL 89	1551	41.07N	134.68W	1731.5	-4.2	2	3196-70	8	T	C4	26 JUL 89	
26 AUG 89	0730	40.00N	136.22W	1708.4	5.1	2	3120-70	8	T	C4	17 NOV 89	
19 JAN 90	2040	40.00N	136.10W	1774.2	6.8	2	3070-70	8	T	C4	21 FEB 90	
07 MAR 90	1540	40.00N	128.78W	1778.1	13.9	3	3230-70	8	T	C4	03 APR 90	
24 APR 90	1400	40.00N	139.30W	1735.3	5.6	2	3124-70	8	T	C4	15 MAY 90	
12 JUN 90	0210	40.00N	136.33W	1749.0	.5	2	3096-70	8	T	C4	21 AUG 90	
17 SEP 90	2212	40.00N	137.87W	1742.3	-.9	2	3132-70	8	T	C4	31 OCT 90	
04 OCT 90	2145	40.00N	136.23W	1751.6	1.8	2	3093-70	8	T	C7	14 DEC 90	
04 OCT 90	2145	40.00N	136.23W	1754.5	-15.2	2	3094-70	8	T	C7	10 DEC 90	
24 DEC 90	9999	40.00N	136.20W	1762.8	-1.2	2	3050-70	8	T	C7	22 JAN 91	

Southland Star (N 35)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
21 JAN 87	9999	35.00N	128.85W	1709.0	-2.8	2	3042-86	8	T	C4	14 MAR 87	
07 MAR 87	1804	35.00N	138.75W	1722.7	-1.0	2	3134-86	8	T	C4	16 MAR 87	
23 APR 87	9999	35.00N	128.63W	1733.3	-2.2	2	3050-86	8	T	C4	04 MAY 87	
03 JUN 87	0627	35.00N	142.67W	1728.8	-.4	2	3122-86	8	T	C4	17 JUN 87	
18 JUL 87	0038	35.08N	142.23W	1710.5	-3.6	2	3038-86	8	T	C4	25 SEP 87	
27 AUG 87	1644	35.02N	142.15W	1669.0	-6.7	2	3002-86	8	T	C4	28 SEP 87	
11 OCT 87	2030	35.00N	142.35W	1713.0	-1.9	2	3046-86	8	T	C4	23 NOV 87	
15 FEB 88	0414	35.38N	141.87W	1706.5	-2.0	2	3030-85	8	T	C4	03 MAR 88	
03 APR 88	1800	35.00N	142.35W	1697.3	2.3	2	3176-86	8	T	C4	25 APR 88	
18 MAY 88	1500	35.03N	142.13W	1697.9	2.5	2	3050-86	8	T	C4	16 JUN 88	
26 JUN 88	1915	35.00N	142.80W	1729.3	-1.8	2	3072-86	8	T	C4	28 JUL 88	
14 AUG 88	2048	35.00N	142.23W	1673.6	-2.0	2	3112-86	8	T	C4	13 SEP 88	
02 JAN 89	0533	35.25N	142.07W	1722.2	6.8	2	3152-86	8	T	C4	31 JAN 89	
16 FEB 89	1738	35.95N	141.10W	1721.7	-10.9	3	3102-86	8	T	C4	14 MAR 89	
03 APR 89	0402	35.00N	142.42W	1737.8	4.2	2	3134-70	8	T	C4	25 APR 89	
16 MAY 89	2300	35.00N	142.50W	1737.2	3.0	2	3178-70	8	T	C4	21 JUN 89	
04 JUL 89	0902	35.00N	142.28W	1741.7	-8.3	2	3226-70	8	T	C4	26 JUL 89	
25 AUG 89	0810	35.00N	142.48W	1732.8	-1.9	2	3176-70	8	T	C4	17 NOV 89	
18 JAN 90	1955	35.00N	142.28W	1732.1	3.8	2	3232-70	8	T	C4	21 FEB 90	
06 MAR 90	2030	35.00N	130.90W	1762.3	-9.5	2	3114-70	8	T	C4	03 APR 90	
23 APR 90	1520	35.00N	145.47W	1733.6	1.8	2	3102-70	8	T	C4	15 MAY 90	
10 JUN 90	2200	35.00N	142.60W	1752.4	-6.8	2	3086-70	8	T	C4	20 AUG 90	
31 JUL 90	0242	35.00N	142.42W	1693.2	1.1	2	3222-70	8	T	C4	20 AUG 90	
16 SEP 90	9999	35.00N	144.68W	1744.2	6.9	2	3122-70	8	T	C4	30 OCT 90	
03 NOV 90	1900	35.00N	142.50W	1759.4	-4.6	2	3173-70	8	T	C7	14 DEC 90	
03 NOV 90	1900	35.00N	142.50W	1759.3	2.8	2	3174-70	8	T	C7	10 DEC 90	
23 DEC 90	1810	35.00N	142.36W	1771.0	-.6	2	3228-70	8	T	C7	24 JAN 91	

Southland Star (N 30)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
14 DEC 86	1915	30.00N	122.85W	1703.3	-3.6	2	3028-86	8	T	C4	11 FEB 87	
19 JAN 87	2116	30.00N	139.65W	1709.3	5.6	2	3046-86	8	T	C4	14 MAR 87	
25 JAN 87	1800	30.00N	123.07W	1711.2	.9	2	3016-86	8	T	C4	14 MAR 87	
06 MAR 87	0749	30.00N	139.65W	1714.2	-5.6	2	3140-86	8	T	C4	16 MAR 87	
11 MAR 87	1920	30.00N	123.00W	1712.2	7.0	2	3022-86	8	T	C4	05 MAY 87	
21 APR 87	0750	30.00N	139.48W	1734.9	4.2	2	3052-86	8	T	C4	04 MAY 87	
27 APR 87	1358	30.00N	122.52W	1729.1	-1.8	2	3088-86	8	T	C4	17 JUN 87	
02 JUN 87	0855	30.00N	147.97W	1701.8	-8.4	2	3098-86	8	T	C4	17 JUN 87	
11 JUN 87	2105	30.02N	122.83W	1723.1	-2.3	2	3058-86	8	T	C4	28 SEP 87	
17 JUL 87	0145	30.08N	147.92W	1692.5	-4.2	2	3060-86	8	T	C4	25 SEP 87	
26 JUL 87	0730	29.98N	122.98W	1701.1	-4.7	2	3024-86	8	T	C4	25 SEP 87	
26 AUG 87	1930	30.00N	147.88W	1691.6	.8	2	3066-86	8	T	C4	29 SEP 87	
05 SEP 87	1720	30.00N	123.03W	1715.4	4.4	2	3140-86	8	T	C4	18 NOV 87	
10 OCT 87	2155	30.10N	148.12W	1703.9	-5.8	2	3108-86	8	T	C4	23 NOV 87	
03 DEC 87	2336	30.00N	123.02W	1731.8	4.5	2	3100-86	8	T	C4	18 JAN 88	
05 JAN 88	0005	30.00N	147.80W	1749.9	-7.3	2	3048-86	8	T	C4	18 JAN 88	
14 JAN 88	0718	30.07N	122.25W	1752.2	-8.5	2	3024-86	8	T	C4	09 MAR 88	
14 FEB 88	0252	30.08N	148.10W	1726.2	-.7	2	3042-86	8	T	C4	02 MAR 88	
02 APR 88	1930	30.03N	148.05W	1707.1	3.0	2	3046-86	8	T	C4	25 APR 88	
13 APR 88	1840	29.98N	123.00W	1734.8	-3.0	2	3130-86	8	T	C4	16 JUN 88	
17 MAY 88	1701	29.98N	148.18W	1712.1	6.5	2	3178-86	8	T	C4	16 JUN 88	
26 MAY 88	1920	30.00N	122.33W	1747.9	-5.0	2	3055-86	8	T	C4	26 JUL 88	
25 JUN 88	2045	30.00N	148.37W	1735.3	-4.5	2	3014-86	8	T	C4	28 JUL 88	
10 JUL 88	1725	30.00N	122.32W	1718.6	1.4	2	3064-86	8	T	C4	13 SEP 88	
10 JUL 88	1725	30.00N	122.32W	1722.8	-2.8	2	3114-86	8	T	C4	13 SEP 88	
13 AUG 88	2117	30.00N	148.18W	1670.2	1.1	2	3046-86	8	T	C4	13 SEP 88	
24 AUG 88	1945	29.98N	122.83W	1721.4	-9.3	2	3150-86	8	T	C4	30 JAN 89	
01 JAN 89	0544	30.00N	148.02W	1742.5	-2.3	2	3130-86	8	T	C4	30 JAN 89	
15 FEB 89	1740	30.55N	147.30W	1739.3	-24.0	3	3116-86	8	T	C4	14 MAR 89	
02 APR 89	0534	30.07N	148.08W	1739.6	-5.9	2	3140-70	8	T	C4	25 APR 89	
13 APR 89	2312	29.47N	123.97W	1729.3	3.6	2	3186-70	8	T	C4	21 JUN 89	
16 MAY 89	0010	30.00N	148.12W	1733.9	.6	2	3184-70	8	T	C4	21 JUN 89	
29 MAY 89	1214	29.07N	124.67W	1748.4	-.6	2	3116-70	8	T	C4	26 JUL 89	
03 JUL 89	0956	30.00N	148.12W	1722.1	-2.7	2	3010-70	8	T	C4	26 JUL 89	
14 JUL 89	1825	30.00N	122.38W	1725.7	8.3	2	3158-70	8	T	C4	13 SEP 89	
24 AUG 89	0920	30.00N	148.20W	1698.4	-1.6	2	3054-70	8	T	C4	17 NOV 89	
03 SEP 89	2030	30.00N	123.28W	1737.3	4.2	2	3018-70	8	T	C4	20 NOV 89	
11 OCT 89	0228	30.53N	129.15W	1727.6	3.5	2	3072-70	8	T	C4	17 NOV 89	
25 OCT 89	0900	30.00N	123.47W	1747.6	4.0	2	3124-70	8	T	C4	03 JAN 90	
03 DEC 89	0810	30.00N	130.63W	1743.7	-4.0	2	3004-70	8	T	C4	04 JAN 90	
14 DEC 89	1230	30.00N	122.95W	1739.3	.1	2	3214-70	8	T	C4	20 FEB 90	

Southland Star (N 30)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
17 JAN 90	2032	30.00N	148.17W	1743.6	3.3	2	3096-70	8	T	C4	20 FEB 90	
28 JAN 90	1835	30.00N	122.92W	1779.6	1.4	2	3138-70	8	T	C4	30 MAR 90	
17 MAR 90	0315	30.00N	123.12W	1738.1	-3.0	2	3120-70	8	T	C4	16 MAY 90	
22 APR 90	1830	30.00N	150.50W	1747.2	-2.0	2	3132-70	8	T	C4	16 MAY 90	
03 MAY 90	2000	30.00N	123.70W	1747.6	-1.9	2	3020-70	8	T	C4	20 AUG 90	
09 JUN 90	1814	30.00N	148.23W	1739.1	-.3	2	3228-70	8	T	C4	20 AUG 90	
22 JUN 90	9999	30.00N	123.42W	1718.8	1.8	2	3184-70	8	T	C4	21 AUG 90	
30 JUL 90	0030	30.00N	148.20W	1720.6	-.5	2	3118-70	8	T	C4	20 AUG 90	
15 SEP 90	2100	30.00N	149.75W	1744.5	4.3	2	3028-70	8	T	C4	30 OCT 90	
27 SEP 90	0808	30.00N	122.84W	1742.2	-2.2	2	3023-70	8	T	C7	17 DEC 90	
27 SEP 90	0808	30.00N	122.84W	1739.8	-.3	2	3024-70	8	T	C7	11 DEC 90	
02 NOV 90	9999	30.00N	148.25W	1739.3	4.2	3	3080-70	8	T	C7	18 DEC 90	
13 NOV 90	1034	30.00N	122.85W	1749.5	1.7	2	3042-70	8	T	C7	23 JAN 91	
22 DEC 90	1850	30.00N	147.16W	1764.4	-3.9	2	3002-70	8	T	C7	24 JAN 91	

Southland Star (N 25)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
15 DEC 86	1820	25.00N	128.00W	1696.3	-2.8	2	3032-86	8	T	C4	11 FEB 87	
18 JAN 87	2205	25.00N	150.23W	1698.7	-6.3	2	3006-86	8	T	C4	14 MAR 87	
26 JAN 87	1818	25.00N	128.75W	1713.4	3.1	2	3012-86	8	T	C4	16 MAR 87	
04 MAR 87	2200	25.07N	149.83E	1709.7	-1.0	2	3104-86	8	T	C4	15 MAR 87	
12 MAR 87	1915	25.00N	999.99	1696.1	4.0	2	3066-86	8	T	C4	05 MAY 87	
28 APR 87	1147	25.00N	127.67W	1697.6	-3.4	2	3130-86	8	T	C4	17 JUN 87	
01 JUN 87	1030	25.00N	153.53W	1704.7	1.1	2	3086-86	8	T	C4	17 JUN 87	
12 JUN 87	2000	24.98N	128.67W	1716.2	1.3	2	3104-86	8	T	C4	25 SEP 87	
16 JUL 87	0327	25.00N	153.38W	1696.6	-3.7	2	3048-86	8	T	C4	28 SEP 87	
27 JUL 87	0641	24.98N	128.82W	1708.3	1.1	2	3124-86	8	T	C4	25 SEP 87	
25 AUG 87	2100	25.13N	153.52W	1679.8	-1.7	2	3032-86	8	T	C4	29 SEP 87	
06 SEP 87	1820	24.97N	129.02W	1680.6	13.1	3	3172-86	8	T	C4	23 NOV 87	
10 OCT 87	0002	25.15N	153.60W	1722.7	1.2	2	3156-86	8	T	C4	23 NOV 87	
04 DEC 87	2319	24.97N	128.85W	1711.9	-1.9	2	3124-86	8	T	C4	18 JAN 88	
03 JAN 88	2018	25.02N	153.57W	1732.0	-5.6	2	3136-86	8	T	C4	18 JAN 88	
15 JAN 88	0515	25.00N	127.42W	1751.1	-5.8	2	3058-86	8	T	C4	09 MAR 88	
13 FEB 88	0312	25.08N	153.60W	1698.7	-5.9	2	3020-86	8	T	C4	02 MAR 88	
26 FEB 88	2054	24.97N	128.93W	1737.2	-2.0	2	3028-85	8	T	C4	25 APR 88	
01 APR 88	1925	25.00N	153.70W	1732.5	-3.5	2	3134-86	8	T	C4	26 APR 88	
14 APR 88	1820	25.00N	128.67W	1723.8	-2.5	2	3100-86	8	T	C4	16 JUN 88	
16 MAY 88	1920	25.00N	153.73W	1730.7	9.6	2	3120-86	8	T	C4	20 JUN 88	
27 MAY 88	1610	25.00N	127.42W	1734.2	-9.8	2	3010-86	8	T	C4	28 JUL 88	
24 JUN 88	2045	25.00N	153.78W	1688.4	8.8	2	3142-86	8	T	C4	28 JUL 88	
11 JUL 88	1600	25.00N	127.50W	1710.8	1.7	2	3032-86	8	T	C4	01 SEP 88	
11 JUL 88	1600	25.00N	127.50W	1706.0	-10.8	3	3082-86	8	T	C4	01 SEP 88	
12 AUG 88	2115	25.00N	153.70W	1702.1	-4.3	2	3158-86	8	T	C4	13 SEP 88	
25 AUG 88	1902	25.02N	128.43W	1724.0	2.4	2	3166-86	8	T	C4	30 JAN 89	
31 DEC 88	0600	25.00N	153.55W	1727.1	-2.8	2	3008-86	8	T	C4	30 JAN 89	
14 FEB 89	1846	25.37N	153.10W	1688.6	-12.1	3	3140-86	8	T	C4	14 MAR 89	
01 APR 89	0550	25.05N	153.05W	1723.3	-11.5	3	3144-70	8	T	C4	25 APR 89	
14 APR 89	1543	25.00N	130.02W	1730.9	-3.3	2	3100-70	8	T	C4	21 JUN 89	
15 MAY 89	0016	25.00N	153.67W	1727.6	1.3	2	3120-70	8	T	C4	20 JUN 89	
30 MAY 89	0639	25.08N	129.77W	1749.6	-2.7	2	3105-70	8	T	C4	27 JUL 89	
02 JUL 89	1110	25.00N	153.70W	1725.9	4.0	2	3046-70	8	T	C4	26 JUL 89	
15 JUL 89	1530	25.00N	127.43W	1709.4	-2.7	2	3038-70	8	T	C4	13 SEP 89	
23 AUG 89	1015	25.00N	153.77W	1691.7	2.6	2	3206-70	8	T	C4	17 NOV 89	
04 SEP 89	2300	25.00N	130.10W	1743.9	-3.4	2	3090-70	8	T	C4	20 NOV 89	
09 OCT 89	1800	25.00N	146.40W	1722.4	-.3	2	3050-70	8	T	C4	20 NOV 89	
26 OCT 89	1125	25.00N	130.20W	1745.3	2.6	2	3032-70	8	T	C4	03 JAN 90	
01 DEC 89	0317	25.00N	146.50W	1730.4	-4.4	2	3190-70	8	T	C4	04 JAN 90	
15 DEC 89	1130	25.00N	128.82W	1726.7	1.6	2	3100-70	8	T	C4	20 FEB 90	

Southland Star (N 25)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
16 JAN 90	2110	25.00N	153.60W	1713.6	4.0	2	3067-70	8	T	C4	21 FEB 90	
05 MAR 90	0625	25.00N	134.77W	1715.4	.3	2	3094-70	8	T	C4	02 APR 90	
18 MAR 90	0240	25.00N	128.98W	1742.3	-1.1	2	3162-70	8	T	C4	16 MAY 90	
21 APR 90	2000	25.00N	154.70W	1735.2	.1	2	3028-70	8	T	C4	16 MAY 90	
04 MAY 90	2200	25.00N	130.03W	1742.2	-9.3	2	3190-70	8	T	C4	20 AUG 90	
08 JUN 90	1410	25.00N	153.85W	1726.8	0.0	2	3066-70	8	T	C4	21 AUG 90	
23 JUN 90	1750	25.00N	130.27W	1718.7	-2.5	2	3182-70	8	T	C4	21 AUG 90	
29 JUL 90	0145	25.00N	154.00W	1703.5	7.8	2	3224-70	8	T	C4	21 AUG 90	
14 SEP 90	2350	25.00N	153.33W	1732.5	6.1	2	3018-70	8	T	C4	30 OCT 90	
28 SEP 90	0504	25.00N	125.80W	1739.0	-3.6	2	3125-70	8	T	C7	17 DEC 90	
28 SEP 90	0504	25.00N	125.80W	1735.4	.8	2	3126-70	8	T	C7	11 DEC 90	
01 NOV 90	1815	25.00N	153.70W	1750.8	.5	2	3202-70	8	T	C7	18 DEC 90	
14 NOV 90	1348	25.00N	128.71W	1731.1	.5	2	3168-70	8	T	C7	23 JAN 91	
21 DEC 90	1830	25.00N	153.73W	1729.5	1.8	2	3086-70	8	T	C7	22 JAN 91	

Southland Star (N 20)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
16 DEC 86	1622	19.98N	134.22W	1698.2	.9	2	3026-86	8	T	C4	21 JAN 87	
16 JAN 87	1428	20.00N	158.48W	1726.2	4.2	2	3002-86	8	T	C4	14 MAR 87	
27 JAN 87	1830	20.00N	134.22W	1702.4	.1	2	3058-86	8	T	C4	15 MAR 87	
13 MAR 87	1830	20.00N	134.25W	1701.1	-2.4	2	3044-86	8	T	C4	05 MAY 87	
18 APR 87	1732	20.08N	158.48W	1718.0	-12.5	4	3114-86	8	T	C4	04 MAY 87	
29 APR 87	0900	20.02N	132.62W	1686.7	-10.8	3	3016-86	8	T	C4	18 JUN 87	
30 MAY 87	1434	20.00N	158.45W	1695.9	-3.0	2	3080-86	8	T	C4	17 JUN 87	
13 JUN 87	9999	20.00N	134.28W	1707.8	-4.8	2	3072-86	8	T	C4	29 SEP 87	
14 JUL 87	0242	20.00N	158.45W	1676.7	8.6	2	3036-86	8	T	C4	28 SEP 87	
28 JUL 87	0500	19.95N	134.35W	1696.9	-9.7	3	3122-86	8	T	C4	28 SEP 87	
24 AUG 87	1018	20.48N	158.35W	1656.4	.2	2	3100-86	8	T	C4	25 SEP 87	
07 SEP 87	1801	20.00N	134.38W	1664.6	1.2	2	3168-86	8	T	C4	23 NOV 87	
07 OCT 87	2105	20.07N	158.57W	1668.8	-.6	2	3154-86	8	T	C4	23 NOV 87	
05 DEC 87	2200	19.97N	134.33W	1707.8	-7.1	2	3152-86	8	T	C4	18 JAN 88	
02 JAN 88	1205	20.08N	158.17W	1732.6	12.5	3	3132-86	8	T	C4	18 JAN 88	
16 JAN 88	0300	19.90N	132.25W	1716.2	.1	2	3068-86	8	T	C4	02 MAR 88	
11 FEB 88	9999	20.00N	158.45W	1703.5	-3.8	2	3116-86	8	T	C4	03 MAR 88	
27 FEB 88	1900	20.03N	134.23W	1738.9	3.7	2	3032-85	8	T	C4	25 APR 88	
31 MAR 88	0708	19.95N	158.50W	1696.0	-3.9	2	3060-86	8	T	C4	26 APR 88	
15 APR 88	1810	20.00N	134.25W	1737.5	3.4	2	3162-86	8	T	C4	16 JUN 88	
15 MAY 88	0940	20.00N	158.47W	1705.2	12.3	3	3168-86	8	T	C4	20 JUN 88	
28 MAY 88	1325	20.02N	132.43W	1716.9	-7.3	2	3180-86	8	T	C4	26 JUL 88	
23 JUN 88	1327	20.00N	158.48W	1688.3	13.8	3	3004-86	8	T	C4	26 JUL 88	
12 JUL 88	1414	20.08N	132.38W	1701.1	-5.2	2	3050-86	8	T	C4	12 SEP 88	
11 AUG 88	0945	20.00N	158.47W	1681.0	1.2	2	3016-86	8	T	C4	14 SEP 88	
26 AUG 88	1950	20.07N	134.22W	1702.4	-1.2	2	3042-86	8	T	C4	31 JAN 89	
29 DEC 88	0655	20.00N	158.63W	1700.8	-7.8	2	3128-86	8	T	C4	31 JAN 89	
28 FEB 89	0146	19.37N	137.18W	1699.8	-6.4	2	3006-70	8	T	C4	25 APR 89	
15 APR 89	1940	20.00N	136.12W	1695.9	-5.0	2	3078-70	8	T	C4	21 JUN 89	
13 MAY 89	1008	20.17N	158.42W	1720.9	-3.9	2	3118-70	8	T	C4	20 JUN 89	
31 MAY 89	0610	20.00N	136.35W	1742.2	-3.3	2	3098-70	8	T	C4	26 JUL 89	
30 JUN 89	1025	20.00N	158.47W	1716.2	11.5	3	3202-70	8	T	C4	27 JUL 89	
16 JUL 89	1140	19.97N	130.63W	1704.9	-.6	2	3232-70	8	T	C4	13 SEP 89	
21 AUG 89	1130	19.98N	158.53W	1652.5	5.1	2	3222-70	8	T	C4	13 SEP 89	
06 SEP 89	0000	20.00N	136.37W	1727.0	9.9	2	3142-70	8	T	C4	20 NOV 89	
07 OCT 89	1159	20.00N	158.75W	1699.3	5.5	2	3084-70	8	T	C4	20 NOV 89	
27 OCT 89	1614	20.00N	136.47W	1710.9	7.8	2	3210-70	8	T	C4	03 JAN 90	
16 DEC 89	1110	20.00N	134.57W	1711.3	4.4	2	3044-70	8	T	C4	20 FEB 90	
30 JAN 90	1746	20.00N	134.33W	1762.1	1.0	2	3014-70	8	T	C4	30 MAR 90	
04 MAR 90	1227	20.00N	136.63W	1707.0	-.1	2	3098-70	8	T	C4	02 APR 90	
19 MAR 90	0116	20.00N	134.35W	1726.0	-4.4	2	3076-70	8	T	C4	16 MAY 90	

Southland Star (N 20)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH_4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
20 APR 90	1130	20.00N	158.33W	1736.5	-.4	2	3036-70	8	T	C4	16 MAY 90	
06 MAY 90	0030	20.00N	136.07W	1736.5	-1.7	2	3030-70	8	T	C4	20 AUG 90	
06 JUN 90	1015	20.00N	158.50W	1728.7	-6.2	2	3232-70	8	T	C4	21 AUG 90	
24 JUN 90	2330	20.00N	136.53W	1710.3	-2.0	2	3104-70	8	T	C4	21 AUG 90	
27 JUL 90	1200	20.00N	158.25W	1698.6	1.2	2	3092-70	8	T	C4	21 AUG 90	
11 AUG 90	1432	20.00N	134.62W	1682.9	.7	2	3034-70	8	T	C4	29 OCT 90	
13 SEP 90	0032	20.00N	158.58W	1727.0	-6.4	2	3046-70	8	T	C4	30 OCT 90	
28 SEP 90	2320	20.00N	125.98W	1696.9	1.0	2	3101-70	8	T	C7	17 DEC 90	
28 SEP 90	2320	20.00N	125.98W	1697.3	-.6	2	3102-70	8	T	C7	11 DEC 90	
30 OCT 90	1910	20.00N	158.61W	1731.0	-3.6	2	3191-70	8	T	C7	14 DEC 90	
30 OCT 90	1910	20.00N	158.61W	1732.7	3.9	2	3192-70	8	T	C7	10 DEC 90	
15 NOV 90	1730	20.00N	134.25W	1735.8	3.5	2	3216-70	8	T	C7	23 JAN 91	
19 DEC 90	2223	20.00N	157.60W	1757.4	-2.6	2	3224-70	8	T	C7	22 JAN 91	

Southland Star (N 15)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
17 DEC 86	1931	15.00N	139.73W	1687.4	-2.0	2	3036-86	8	T	C4	21 JAN 87	
18 DEC 86	2033	15.00N	145.30W	1685.9	3.0	2	3030-86	8	T	C4	21 JAN 87	
15 JAN 87	1758	15.00N	160.77W	1702.7	-3.3	2	3060-86	8	T	C4	21 JAN 87	
28 JAN 87	1851	15.00N	139.18W	1687.9	-5.7	2	3064-86	8	T	C4	15 MAR 87	
14 MAR 87	1830	15.00N	139.67W	1705.7	1.2	2	3018-86	8	T	C4	05 MAY 87	
17 APR 87	1850	15.00N	160.93W	1715.5	4.6	2	3110-86	8	T	C4	04 MAY 87	
30 APR 87	0600	15.00N	137.32W	1678.7	-1.8	2	3090-86	8	T	C4	18 JUN 87	
29 MAY 87	1152	15.02N	160.80W	1682.8	-1.8	2	3046-86	8	T	C4	17 JUN 87	
14 JUN 87	1754	15.00N	139.70W	1677.2	-4.3	2	3070-86	8	T	C4	29 SEP 87	
13 JUL 87	0618	15.00N	160.75W	1673.3	-1.5	2	3062-86	8	T	C4	24 SEP 87	
29 JUL 87	0440	14.72N	140.07W	1690.6	-.2	2	3116-86	8	T	C4	28 SEP 87	
23 AUG 87	1215	15.00N	161.53W	1649.4	.5	2	3008-86	8	T	C4	25 SEP 87	
08 SEP 87	1830	15.00N	139.83W	1663.3	-.7	2	3188-86	8	T	C4	18 NOV 87	
07 OCT 87	0051	15.00N	161.73W	1685.1	1.7	2	3166-86	8	T	C4	24 NOV 87	
06 DEC 87	2040	15.00N	139.85W	1694.4	5.5	2	3088-86	8	T	C4	18 JAN 88	
01 JAN 88	1256	14.98N	160.80W	1698.2	-2.4	2	3074-86	8	T	C4	18 JAN 88	
11 FEB 88	0049	15.03N	160.77W	1699.9	3.7	2	3114-86	8	T	C4	03 MAR 88	
28 FEB 88	1737	15.02N	139.68W	1729.0	-4.4	2	3048-86	8	T	C4	26 APR 88	
30 MAR 88	0950	15.00N	160.75W	1681.0	2.7	2	3164-86	8	T	C4	26 APR 88	
16 APR 88	1838	15.00N	139.92W	1711.4	-5.7	2	3106-86	8	T	C4	16 JUN 88	
14 MAY 88	1509	15.02N	160.75W	1689.1	-10.2	3	3154-86	8	T	C4	16 JUN 88	
29 MAY 88	1110	15.00N	137.17W	1701.2	-3.3	2	3166-86	8	T	C4	26 JUL 88	
22 JUN 88	1850	15.00N	160.90W	1693.2	-.1	2	3058-86	8	T	C4	26 JUL 88	
13 JUL 88	1340	15.05N	137.03W	1680.8	-.5	2	3100-86	8	T	C4	01 SEP 88	
13 JUL 88	1400	14.93N	137.08W	1673.0	10.5	3	3108-86	8	T	C4	01 SEP 88	
10 AUG 88	1156	15.00N	160.75W	1682.1	3.3	2	3104-86	8	T	C4	13 SEP 88	
27 AUG 88	2015	15.03N	139.60W	1689.9	-15.6	3	3110-86	8	T	C4	30 JAN 89	
28 DEC 88	0637	15.00N	161.60W	1702.4	1.9	2	3098-86	8	T	C4	31 JAN 89	
28 FEB 89	2335	14.95N	142.30W	1717.4	-11.9	3	3010-70	8	T	C4	25 APR 89	
30 MAR 89	0050	15.00N	160.83W	1698.6	-8.3	3	3162-70	8	T	C4	26 APR 89	
16 APR 89	2000	15.00N	142.32W	1682.9	6.9	2	3110-70	8	T	C4	21 JUN 89	
12 MAY 89	1230	15.00N	160.78W	1712.5	.4	2	3180-70	8	T	C4	20 JUN 89	
01 JUN 89	0726	15.00N	142.52W	1721.0	-1.4	2	3082-70	8	T	C4	26 JUL 89	
29 JUN 89	0802	15.00N	160.85W	1683.7	7.6	2	3124-70	8	T	C4	26 JUL 89	
17 JUL 89	0930	15.00N	133.60W	1713.0	-3.3	2	3138-70	8	T	C4	13 SEP 89	
20 AUG 89	1035	14.62N	161.18W	1671.9	4.7	2	3070-70	8	T	C4	13 SEP 89	
07 SEP 89	0305	14.73N	142.97W	1706.8	-4.5	2	3162-70	8	T	C4	20 NOV 89	
06 OCT 89	1600	15.00N	161.77W	1701.5	-2.4	2	3168-70	8	T	C4	20 NOV 89	
28 OCT 89	2100	15.00N	142.55W	1710.6	-10.5	3	3196-70	8	T	C4	03 JAN 90	
27 NOV 89	0328	15.00N	160.90W	1704.5	6.0	2	3022-70	8	T	C4	04 JAN 90	
17 DEC 89	1015	15.00N	139.83W	1666.5	-2.5	2	3116-70	8	T	C4	20 FEB 90	

Southland Star (N 15)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
14 JAN 90	1336	15.00N	160.83W	1733.4	-1.1	2	3048-70	8	T	C4	20 FEB 90	
31 JAN 90	1729	15.00N	139.78W	1687.2	.3	2	3182-70	8	T	C4	30 MAR 90	
03 MAR 90	1900	15.00N	138.20W	1703.1	-6.0	2	3150-70	8	T	C4	02 APR 90	
20 MAR 90	0228	15.00N	139.72W	1713.3	1.2	2	3144-70	8	T	C4	16 MAY 90	
19 APR 90	1412	15.00N	160.78W	1731.7	6.0	2	3210-70	8	T	C4	16 MAY 90	
07 MAY 90	0630	15.00N	142.23W	1720.7	-4.7	2	3070-70	8	T	C4	20 AUG 90	
05 JUN 90	1430	15.00N	160.92W	1730.8	-4.2	2	3174-70	8	T	C4	21 AUG 90	
26 JUN 90	0400	15.00N	142.63W	1714.3	-2.6	2	3002-70	8	T	C4	21 AUG 90	
12 AUG 90	1745	15.00N	139.70W	1687.5	6.4	2	3004-70	8	T	C4	29 OCT 90	
12 SEP 90	0445	15.00N	161.58W	1733.4	2.9	2	3124-70	8	T	C4	29 OCT 90	
30 SEP 90	0350	15.00N	132.73W	1708.3	1.1	2	3035-70	8	T	C7	17 DEC 90	
30 SEP 90	0350	15.00N	132.73W	1740.8	.9	2	3036-70	8	T	C7	11 DEC 90	
29 OCT 90	2240	15.00N	161.73W	1729.0	-5.3	2	3039-70	8	T	C7	14 DEC 90	
29 OCT 90	2240	15.00N	161.73W	1729.1	-3.6	2	3040-70	8	T	C7	10 DEC 90	
16 NOV 90	2050	15.00N	139.80W	1744.0	-3.3	2	3056-70	8	T	C7	23 JAN 91	
19 DEC 90	0509	15.00N	156.78W	1744.7	-4.7	2	3038-70	8	T	C7	22 JAN 91	

Southland Star (N 10)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
14 JAN 87	2140	10.00N	163.04W	1696.6	3.1	2	3068-86	8	T	C4	21 JAN 87	
29 JAN 87	1935	10.00N	145.23W	1674.3	7.8	2	3112-86	8	T	C4	14 MAR 87	
01 MAR 87	1215	10.03N	163.00W	1681.0	-3.2	2	3146-86	8	T	C4	15 MAR 87	
15 MAR 87	1820	10.00N	145.03W	1692.4	9.3	2	3074-86	8	T	C4	04 MAY 87	
16 APR 87	2200	9.98N	163.00W	1668.9	2.6	2	3036-86	8	T	C4	04 MAY 87	
01 MAY 87	1902	10.00N	141.80W	1667.0	-4.5	2	3092-86	8	T	C4	16 JUN 87	
28 MAY 87	1052	10.00N	163.02W	1701.1	-.8	2	3142-86	8	T	C4	17 JUN 87	
15 JUN 87	1745	10.00N	145.17W	1667.4	-3.4	2	3052-86	8	T	C4	28 SEP 87	
12 JUL 87	1038	10.00N	163.05W	1652.0	.1	2	3026-86	8	T	C4	25 SEP 87	
30 JUL 87	0215	10.00N	145.17W	1662.7	2.7	2	3136-86	8	T	C4	25 SEP 87	
22 AUG 87	1727	10.02N	164.52W	1648.2	-7.7	2	3098-86	8	T	C4	30 SEP 87	
09 SEP 87	1900	10.00N	145.27W	1654.2	-2.5	2	3186-86	8	T	C4	23 NOV 87	
06 OCT 87	0518	10.02N	164.55W	1679.6	4.0	2	3016-86	8	T	C4	24 NOV 87	
07 DEC 87	1855	10.00N	145.23W	1661.2	-3.9	2	3130-86	8	T	C4	18 JAN 88	
31 DEC 87	1820	10.33N	162.92W	1688.7	-4.9	2	3006-86	8	T	C4	18 JAN 88	
17 JAN 88	2154	9.90N	141.50W	1694.7	-2.5	2	3052-86	8	T	C4	09 MAR 88	
10 FEB 88	0637	10.05N	163.00W	1696.0	.7	2	3054-86	8	T	C4	09 MAR 88	
29 FEB 88	1542	10.13N	144.90W	1713.0	2.0	2	3112-86	8	T	C4	25 APR 88	
29 MAR 88	1138	10.02N	163.05W	1675.6	.5	2	3006-86	8	T	C4	26 APR 88	
17 APR 88	1835	10.00N	145.25W	1701.6	-7.6	2	3132-86	8	T	C4	16 JUN 88	
13 MAY 88	2000	10.00N	163.05W	1685.1	-4.0	2	3170-86	8	T	C4	20 JUN 88	
30 MAY 88	0830	10.00N	141.85W	1692.0	-6.6	2	3026-86	8	T	C4	28 JUL 88	
22 JUN 88	0120	10.00N	163.08W	1674.8	-4.5	2	3148-86	8	T	C4	28 JUL 88	
14 JUL 88	1247	10.00N	141.72W	1645.9	2.0	2	3066-86	8	T	C4	14 SEP 88	
14 JUL 88	1247	10.00N	141.72W	1648.6	-4.6	2	3106-86	8	T	C4	14 SEP 88	
09 AUG 88	1430	9.98N	163.00W	1664.2	-20.7	3	3018-86	8	T	C4	14 SEP 88	
28 AUG 88	2020	10.00N	144.67W	1644.9	-9.0	2	3176-86	8	T	C4	30 JAN 89	
27 DEC 88	0805	10.00N	164.50W	1701.8	-.8	2	3090-86	8	T	C4	30 JAN 89	
11 FEB 89	2111	10.00N	163.10W	1681.6	3.0	2	3168-86	8	T	C4	14 MAR 89	
02 MAR 89	0050	10.97N	148.42W	1706.4	1.6	2	3152-70	8	T	C4	25 APR 89	
29 MAR 89	0539	10.03N	163.00W	1681.3	-11.5	2	3156-70	8	T	C4	26 APR 89	
17 APR 89	2120	9.50N	148.67W	1680.4	0.0	2	3002-70	8	T	C4	21 JUN 89	
11 MAY 89	1815	10.02N	162.97W	1689.6	-2.5	2	3084-70	8	T	C4	20 JUN 89	
02 JUN 89	0753	10.00N	148.52W	1696.2	-2.5	2	3028-70	8	T	C4	26 JUL 89	
28 JUN 89	1118	10.05N	163.17W	1673.6	-2.9	2	3126-70	8	T	C4	26 JUL 89	
18 JUL 89	0809	10.00N	139.03W	1666.5	-3.2	2	3230-70	8	T	C4	14 SEP 89	
19 AUG 89	1336	10.00N	162.90W	1677.8	-4.2	2	3024-70	8	T	C4	13 SEP 89	
08 SEP 89	0330	10.05N	148.58W	1658.7	4.2	2	3192-70	8	T	C4	17 NOV 89	
05 OCT 89	2130	10.00N	164.02W	1655.0	5.8	2	3034-70	8	T	C4	20 NOV 89	
30 OCT 89	0100	10.00N	148.60W	1697.4	1.1	2	3122-70	8	T	C4	29 DEC 89	
27 NOV 89	2330	10.00N	162.97W	1701.2	.5	2	3194-70	8	T	C4	04 JAN 90	

Southland Star (N 10)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
18 DEC 89	0850	10.00N	145.10W	1671.7	3.5	2	3062-70	8	T	C4	20 FEB 90	
13 JAN 90	1815	10.00N	163.00W	1726.2	-2.6	2	3064-70	8	T	C4	20 FEB 90	
01 FEB 90	1745	10.00N	145.12W	1685.7	-3.5	2	3156-70	8	T	C4	30 MAR 90	
03 MAR 90	0100	10.00N	140.08W	1708.7	-4.5	2	3142-70	8	T	C4	02 APR 90	
21 MAR 90	0515	10.00N	145.18W	1709.8	2.2	2	3060-70	8	T	C4	16 MAY 90	
18 APR 90	1644	10.00N	163.02W	1694.0	7.0	2	3108-70	8	T	C4	16 MAY 90	
08 MAY 90	1330	10.00N	148.40W	1713.9	8.3	2	3186-70	8	T	C4	20 AUG 90	
04 JUN 90	1630	10.00N	163.25W	1697.7	4.5	2	3158-70	8	T	C4	20 AUG 90	
27 JUN 90	1000	10.00N	148.83W	1694.1	-1.8	2	3026-70	8	T	C4	21 AUG 90	
13 AUG 90	1741	10.00N	154.08W	1675.5	.8	2	3135-70	8	T	C4	29 OCT 90	
10 SEP 90	0718	10.00N	164.45W	1794.9	-6.8	2	3208-70	8	T	C4	29 OCT 90	+
01 OCT 90	0945	10.00N	138.88W	1665.3	2.5	2	3031-70	8	T	C7	18 DEC 90	
01 OCT 90	0945	10.00N	138.88W	1664.2	-1.9	2	3032-70	8	T	C7	11 DEC 90	
28 OCT 90	2220	10.00N	164.58W	1687.8	2.8	2	3007-70	8	T	C7	17 DEC 90	
28 OCT 90	2220	10.00N	164.58W	1692.0	-2.2	2	3008-70	8	T	C7	11 DEC 90	
17 NOV 90	2308	10.00N	144.38W	1697.9	2.8	2	3186-70	8	T	C7	22 JAN 91	
18 DEC 90	1205	10.00N	155.90W	1739.2	2.8	2	3130-70	8	T	C7	22 JAN 91	

Southland Star (N 05)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH_4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
19 DEC 86	2144	4.92N	150.23W	1639.5	.9	2	3044-86	8	T	C4	21 JAN 87	
14 JAN 87	0115	5.00N	165.33W	1681.7	1.8	2	3066-86	8	T	C4	22 JAN 87	
30 JAN 87	2054	4.80N	150.42W	1674.3	2.6	2	3086-86	8	T	C4	14 MAR 87	
28 FEB 87	1643	5.00N	165.28W	1664.8	-2.1	2	3152-86	8	T	C4	15 MAR 87	
16 MAR 87	1805	5.00N	150.08W	1654.7	3.5	2	3024-86	8	T	C4	04 MAY 87	
02 MAY 87	0000	5.00N	145.53W	1652.0	6.0	2	3152-86	8	T	C4	16 JUN 87	
27 MAY 87	0610	5.00N	165.30W	1651.8	-5.9	2	3138-86	8	T	C4	17 JUN 87	
16 JUN 87	1715	5.00N	150.42W	1647.2	-1.9	3	3076-86	8	T	C4	28 SEP 87	
11 JUL 87	1520	5.05N	165.15W	1637.6	-2.3	2	3064-86	8	T	C4	25 SEP 87	
31 JUL 87	0040	5.03N	149.98W	1630.9	0.0	2	3010-86	8	T	C4	25 SEP 87	
22 AUG 87	0007	5.25N	167.28W	1636.5	3.8	2	3004-86	8	T	C4	30 SEP 87	
10 SEP 87	1930	4.98N	150.22W	1636.8	-3.8	2	3180-86	8	T	C4	18 NOV 87	
08 DEC 87	2000	5.80N	150.05W	1636.7	5.9	2	3080-86	8	T	C4	18 JAN 88	
31 DEC 87	0000	5.18N	165.10W	1656.0	13.4	3	3022-86	8	T	C4	18 JAN 88	
18 JAN 88	2044	5.03N	145.88W	1666.5	-5.1	2	3062-86	8	T	C4	09 MAR 88	
09 FEB 88	1202	5.02N	165.22W	1684.4	3.5	2	3032-86	8	T	C4	09 MAR 88	
01 MAR 88	1550	5.03N	150.23W	1703.7	-1.9	2	3036-86	8	T	C4	25 APR 88	
28 MAR 88	1240	5.00N	165.33W	1690.8	-5.6	2	3122-86	8	T	C4	22 APR 88	
18 APR 88	1915	5.00N	150.57W	1680.5	15.4	3	3126-86	8	T	C4	16 JUN 88	
13 MAY 88	0209	5.02N	105.22W	1631.4	-10.5	2	3084-86	8	T	C4	15 JUN 88	
31 MAY 88	0445	5.00N	145.95W	1639.9	-8.9	2	3188-86	8	T	C4	28 JUL 88	
21 JUN 88	0815	5.00N	165.32W	1643.7	-1.0	2	3176-86	8	T	C4	28 JUL 88	
15 JUL 88	1200	5.02N	145.95W	1644.7	-6.4	2	3084-86	8	T	C4	01 SEP 88	
15 JUL 88	1200	5.02N	145.95W	1641.1	1.3	2	3094-86	8	T	C4	01 SEP 88	
08 AUG 88	1821	5.18N	165.28W	1642.6	-3.5	2	3118-86	8	T	C4	15 SEP 88	
29 AUG 88	9999	5.00N	999.99	1644.8	2.6	2	3022-86	8	T	C4	30 JAN 89	
26 DEC 88	0942	5.00N	167.33W	1677.4	5.3	2	3068-86	8	T	C4	30 JAN 89	
17 JAN 89	0500	5.25N	153.72W	1663.2	-8.3	2	3104-70	8	T	C4	26 APR 89	
11 FEB 89	0605	5.60N	164.95W	1669.7	9.4	2	3170-86	8	T	C4	14 MAR 89	
03 MAR 89	0139	4.93N	154.25W	1700.5	11.5	3	3142-70	8	T	C4	25 APR 89	
28 MAR 89	1008	5.00N	165.37W	1682.4	-8.9	2	3080-70	8	T	C4	25 APR 89	
18 APR 89	2000	5.00N	154.22W	1682.7	6.8	2	3012-70	8	T	C4	21 JUN 89	
10 MAY 89	1854	5.02N	165.23W	1673.9	1.8	2	3092-70	8	T	C4	21 JUN 89	
03 JUN 89	1230	5.00N	154.42W	1660.7	.7	2	3122-70	8	T	C4	26 JUL 89	
27 JUN 89	1819	5.15N	165.07W	1653.7	-3.5	2	3048-70	8	T	C4	26 JUL 89	
19 JUL 89	0729	5.00N	144.25W	1670.2	.2	2	3214-70	8	T	C4	14 SEP 89	
18 AUG 89	2040	5.25N	165.15W	1665.0	.3	2	3001-70	8	T	C4	13 SEP 89	
09 SEP 89	0532	5.00N	154.03W	1657.9	10.2	3	3166-70	8	T	C4	17 NOV 89	
04 OCT 89	2035	5.00N	167.50W	1652.2	-1.9	2	3074-70	8	T	C4	17 NOV 89	
31 OCT 89	0605	5.00N	154.22W	1668.2	1.3	2	3212-70	8	T	C4	03 JAN 90	
19 DEC 89	0735	5.00N	150.22W	1662.7	-7.4	2	3199-70	8	T	C4	20 FEB 90	

Southland Star (N 05)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
12 JAN 90	2245	5.00N	165.27W	1678.6	-1.9	2	3006-70	8	T	C4	20 FEB 90	
02 FEB 90	1825	5.00N	150.22W	1668.4	-4.3	2	3008-70	8	T	C4	30 MAR 90	
02 MAR 90	0710	5.00N	141.85W	1706.8	.8	2	3206-70	8	T	C4	02 APR 90	
22 MAR 90	0600	5.00N	150.25W	1712.3	-4.4	2	3212-70	8	T	C4	16 MAY 90	
17 APR 90	2145	5.00N	165.33W	1692.6	-1.2	2	3016-70	8	T	C4	16 MAY 90	
09 MAY 90	2009	5.00N	154.23W	1706.4	-9.2	2	3088-70	8	T	C4	20 AUG 90	
03 JUN 90	2138	5.00N	165.40W	1685.9	3.8	2	3062-70	8	T	C4	17 AUG 90	
28 JUN 90	1425	5.00N	154.22W	1670.5	-1.4	2	3126-70	8	T	C4	21 AUG 90	
14 AUG 90	1742	5.00N	150.29W	1674.1	-1.5	2	3136-70	8	T	C4	29 OCT 90	
10 SEP 90	1100	5.00N	167.38W	1668.0	-8.1	2	3108-70	8	T	C4	29 OCT 90	
02 OCT 90	1804	5.00N	145.40W	1665.0	.9	2	3137-70	8	T	C7	18 DEC 90	
02 OCT 90	1804	5.00N	145.40W	1663.7	-.5	2	3138-70	8	T	C7	11 DEC 90	
28 OCT 90	0030	5.00N	167.43W	1667.2	-2.3	2	3097-70	8	T	C7	17 DEC 90	
28 OCT 90	0030	5.00N	167.43W	1664.9	-1.2	2	3098-70	8	T	C7	11 DEC 90	
19 NOV 90	0340	5.00N	149.90W	1674.1	-.1	2	3116-70	8	T	C7	22 JAN 91	
17 DEC 90	1825	5.00N	154.86W	1673.6	1.9	2	3114-70	8	T	C7	23 JAN 91	

Southland Star (000)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
20 DEC 86	2215	0.00	155.38W	1632.7	2.2	2	3014-86	8	T	C4	21 JAN 87	
13 JAN 87	0523	0.00	999.99	1661.5	.9	2	3062-86	8	T	C4	22 JAN 87	
31 JAN 87	9999	0.00	155.57W	1627.2	3.2	2	3082-86	8	T	C4	14 MAR 87	
27 FEB 87	2000	0.00	167.53W	1657.6	-1.5	2	3130-86	8	T	C4	16 MAR 87	
17 MAR 87	9999	0.00	155.37W	1633.5	8.6	2	3032-86	8	T	C4	04 MAY 87	
15 APR 87	0513	0.00	167.47W	1651.6	5.4	2	3014-86	8	T	C4	04 MAY 87	
02 MAY 87	2004	0.00	150.37W	1653.5	-6.7	2	3002-86	8	T	C4	17 JUN 87	
26 MAY 87	0952	0.00	167.37W	1631.7	.3	2	3118-86	8	T	C4	18 JUN 87	
17 JUN 87	1740	0.20S	155.72W	1636.0	-6.9	2	3018-86	8	T	C4	29 SEP 87	
10 JUL 87	2037	0.00	167.42W	1621.0	.3	2	3081-86	8	T	C4	28 SEP 87	
01 AUG 87	0108	0.00	155.50W	1619.0	-4.1	2	3144-86	8	T	C4	25 SEP 87	
21 AUG 87	0500	0.00	170.28W	1640.3	-8.0	2	3112-86	8	T	C4	28 SEP 87	
11 SEP 87	1935	0.00	155.67W	1633.3	3.4	2	3178-86	8	T	C4	18 NOV 87	
04 OCT 87	1317	0.12N	170.33W	1633.9	.7	2	3118-86	8	T	C4	23 NOV 87	
09 DEC 87	2000	0.00	155.57W	1634.6	-4.7	2	3002-86	8	T	C4	18 JAN 88	
19 JAN 88	1856	0.00	150.38W	1635.9	1.5	2	3086-86	8	T	C4	09 MAR 88	
08 FEB 88	1730	0.03S	167.55W	1668.5	-1.1	2	3014-86	8	T	C4	03 MAR 88	
02 MAR 88	0434	0.00	155.57W	1681.1	-3.7	2	3074-86	8	T	C4	25 APR 88	
27 MAR 88	1508	0.00	167.43W	1643.9	-4.2	2	3018-86	8	T	C4	22 APR 88	
19 APR 88	1835	0.00	155.52W	1656.2	.3	2	3160-86	8	T	C4	16 JUN 88	
01 JUN 88	0200	0.00	150.28W	1638.5	-.2	2	3060-86	8	T	C4	28 JUL 88	
20 JUN 88	1500	0.08S	167.72W	1649.5	-11.3	3	3144-86	8	T	C4	26 JUL 88	
07 AUG 88	2155	0.00	167.48W	1639.0	-6.1	2	3164-86	8	T	C4	14 SEP 88	
30 AUG 88	2218	0.00	155.38W	1640.3	-6.2	2	3156-86	8	T	C4	30 JAN 89	
25 DEC 88	1040	0.00	170.32W	1674.7	-3.4	2	3060-86	8	T	C4	30 JAN 89	
18 JAN 89	1004	0.00	159.75W	1668.7	-10.5	3	3108-70	8	T	C4	25 APR 89	
04 MAR 89	0130	0.00	160.05W	1701.9	-7.8	2	3050-70	8	T	C4	25 APR 89	
27 MAR 89	1554	0.00	167.43W	1682.7	-3.9	2	3022-70	8	T	C4	25 APR 89	
19 APR 89	1938	0.02N	159.90W	1684.0	3.3	2	3017-70	8	T	C4	21 JUN 89	
10 MAY 89	0100	0.00	167.37W	1657.5	-4.1	2	3174-70	8	T	C4	21 JUN 89	
04 JUN 89	1230	0.00	160.02W	1660.4	3.9	2	3216-70	8	T	C4	26 JUL 89	
27 JUN 89	0030	0.12N	167.52W	1642.4	3.1	2	3040-70	8	T	C4	26 JUL 89	
20 JUL 89	0646	0.00	149.77W	1672.0	-8.6	2	3068-70	8	T	C4	13 SEP 89	
18 AUG 89	0200	0.00	167.67W	1661.2	5.9	2	3118-70	8	T	C4	13 SEP 89	
10 SEP 89	0844	0.00	160.23W	1658.2	-.6	2	3160-70	8	T	C4	17 NOV 89	
04 OCT 89	0000	0.00	170.22W	1646.1	-1.9	2	3112-70	8	T	C4	17 NOV 89	
01 NOV 89	0925	0.00	160.13W	1669.0	.4	2	3026-70	8	T	C4	04 JAN 90	
20 DEC 89	0610	0.00	155.47W	1657.6	2.3	2	3088-70	8	T	C4	20 FEB 90	
12 JAN 90	0200	0.00	167.62W	1671.8	3.5	2	3082-70	8	T	C4	20 FEB 90	
03 FEB 90	1855	0.00	155.57W	1681.4	10.4	3	3204-70	8	T	C4	02 APR 90	
01 MAR 90	1330	0.00	143.45W	1682.2	-2.9	2	3160-70	8	T	C4	02 APR 90	

Southland Star (000)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
23 MAR 90	0930	0.00	156.00W	1693.7	-.2	2	3226-70	8	T	C4	16 MAY 90	
17 APR 90	0015	0.00	167.50W	1672.6	3.9	2	3152-70	8	T	C4	15 MAY 90	
11 MAY 90	0200	0.00	160.00W	1656.1	1.3	2	3140-70	8	T	C4	21 AUG 90	
03 JUN 90	0020	0.00	167.73W	1670.0	4.3	2	3048-70	8	T	C4	17 AUG 90	
29 JUN 90	1953	0.00	160.17W	1660.6	-1.1	2	3052-70	8	T	C4	21 AUG 90	
24 JUL 90	1808	0.00	163.65W	1663.5	7.1	2	3050-70	8	T	C4	20 AUG 90	
15 AUG 90	1721	0.00	155.49W	1663.7	5.9	2	3226-70	8	T	C4	29 OCT 90	
09 SEP 90	1556	0.00	170.25W	1668.0	-6.1	2	3144-70	8	T	C4	29 OCT 90	
04 OCT 90	0150	0.00	151.80W	1665.6	-2.2	2	3052-70	8	T	C7	18 DEC 90	
27 OCT 90	0050	0.00	170.40W	1659.3	-2.1	2	3095-70	8	T	C7	14 DEC 90	
27 OCT 90	0050	0.00	170.40W	1658.2	-1.3	2	3096-70	8	T	C7	10 DEC 90	
17 DEC 90	0055	0.00	154.10W	1670.4	-.8	2	3172-70	8	T	C7	23 JAN 91	

Southland Star (S 05)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH_4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
21 DEC 86	2215	5.00S	160.47W	1625.4	-2.6	2	3024-86	8	T	C4	21 JAN 87	
12 JAN 87	0919	5.00S	167.62W	1629.2	-8.7	2	3074-86	8	T	C4	21 JAN 87	
01 FEB 87	2354	5.00S	160.72W	1623.9	-6.7	2	3078-86	8	T	C4	14 MAR 87	
27 FEB 87	0230	4.98S	169.55W	1665.2	1.5	2	3120-86	8	T	C4	16 MAR 87	
18 MAR 87	1713	5.00S	160.55W	1626.4	-4.4	2	3028-86	8	T	C4	04 MAY 87	
14 APR 87	1020	5.00S	169.70W	1622.5	6.0	2	3128-86	8	T	C4	04 MAY 87	
03 MAY 87	1715	5.05S	154.77W	1639.5	-2.7	2	3108-86	8	T	C4	17 JUN 87	
25 MAY 87	1300	5.00S	169.75W	1630.1	-3.3	2	3126-86	8	T	C4	18 JUN 87	
18 JUN 87	1745	5.00S	160.65W	1626.9	-4.2	2	3054-86	8	T	C4	29 SEP 87	
10 JUL 87	0210	4.93S	169.17W	1616.5	-4.8	2	3042-86	8	T	C4	29 SEP 87	
02 AUG 87	0102	5.03S	160.80W	1624.7	-8.6	2	3148-86	8	T	C4	28 SEP 87	
20 AUG 87	1018	5.00S	172.80W	1636.4	-4.5	2	3092-86	8	T	C4	28 SEP 87	
12 SEP 87	1853	5.00S	160.88W	1625.0	1.5	2	3032-85	8	T	C4	24 NOV 87	
03 OCT 87	1730	4.97S	172.78W	1630.6	.2	2	3056-86	8	T	C4	23 NOV 87	
10 DEC 87	1905	5.00S	160.62W	1651.5	-7.2	2	3038-86	8	T	C4	18 JAN 88	
29 DEC 87	0834	4.92S	169.83W	1646.6	5.6	2	3112-86	8	T	C4	18 JAN 88	
20 JAN 88	1630	5.23S	155.03W	1636.8	-.9	2	3096-86	8	T	C4	03 MAR 88	
20 JAN 88	1750	5.53S	155.28W	1635.8	-1.0	2	3076-86	8	T	C4	03 MAR 88	
07 FEB 88	2310	4.98S	169.68W	1670.4	4.8	2	3004-86	8	T	C4	03 MAR 88	
03 MAR 88	1225	5.00S	160.72W	1665.4	3.5	2	3088-86	8	T	C4	25 APR 88	
26 MAR 88	1639	4.95S	169.65W	1640.7	-7.5	2	3034-86	8	T	C4	26 APR 88	
20 APR 88	1645	5.00S	160.68W	1658.4	-3.2	3	3158-86	8	T	C4	15 JUN 88	
01 JUN 88	2350	5.07S	154.92W	1628.9	5.6	2	3022-86	8	T	C4	28 JUL 88	
19 JUN 88	2245	5.00S	169.75W	1642.8	3.5	2	3030-86	8	T	C4	26 JUL 88	
17 JUL 88	1400	5.02S	154.80W	1652.6	7.0	2	3132-86	8	T	C4	14 SEP 88	
17 JUL 88	1400	5.02S	154.80W	1647.5	9.6	2	3172-86	8	T	C4	14 SEP 88	
07 AUG 88	0010	5.00S	169.72W	1640.2	5.0	2	3048-86	8	T	C4	15 SEP 88	
31 AUG 88	2342	5.03S	160.73W	1645.5	6.5	2	3134-86	8	T	C4	31 JAN 89	
24 DEC 88	1900	3.65S	172.18W	1670.8	-1.5	2	3188-86	8	T	C4	30 JAN 89	
19 JAN 89	1904	6.03S	166.80W	1650.8	-12.7	3	3090-70	8	T	C4	26 APR 89	
09 FEB 89	1920	4.22S	169.38W	1654.0	2.3	2	3098-70	8	T	C4	14 MAR 89	
05 MAR 89	0230	5.27S	166.02W	1692.0	11.8	3	3136-70	8	T	C4	25 APR 89	
25 MAR 89	1559	5.00S	169.77W	1679.5	-6.5	2	3052-70	8	T	C4	25 APR 89	
20 APR 89	1901	5.00S	165.58W	1659.7	6.6	2	3014-70	8	T	C4	21 JUN 89	
09 MAY 89	0653	5.00S	169.72W	1655.1		1	3042-70	8	T	C4	20 JUN 89	
05 JUN 89	1400	5.00S	165.72W	1650.6	-1.3	2	3204-70	8	T	C4	26 JUL 89	
26 JUN 89	0617	5.00S	169.68W	1641.9	7.4	2	3016-70	8	T	C4	27 JUL 89	
21 JUL 89	0400	5.00S	154.73W	1659.3	2.6	2	3078-70	8	T	C4	13 SEP 89	
17 AUG 89	0913	5.00S	169.73W	1646.6	-2.1	2	3014-70	8	T	C4	13 SEP 89	
11 SEP 89	1215	5.00S	165.72W	1660.2	-.7	2	3150-70	8	T	C4	17 NOV 89	
03 OCT 89	0320	4.67S	172.78W	1643.1	-5.9	2	3128-70	8	T	C4	20 NOV 89	

Southland Star (S 05)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
02 NOV 89	1105	5.00S	165.52W	1659.7	1.2	2	3130-70	8	T	C4	04 JAN 90	
25 NOV 89	0210	5.00S	169.67W	1662.4	-.1	2	3133-70	8	T	C4	04 JAN 90	
21 DEC 89	0459	5.00S	160.62W	1661.7	4.2	2	3188-70	8	T	C4	21 FEB 90	
11 JAN 90	0620	5.00S	169.75W	1671.7	6.4	2	3158-70	8	T	C4	20 FEB 90	
04 FEB 90	2205	5.00S	160.77W	1678.7	5.0	2	3052-70	8	T	C4	02 APR 90	
28 FEB 90	1905	5.00S	145.10W	1669.6	7.4	2	3091-70	8	T	C4	03 APR 90	
24 MAR 90	0837	5.00S	160.90W	1698.3	2.2	2	3180-70	8	T	C4	16 MAY 90	
16 APR 90	0130	5.00S	169.60W	1672.1	-.7	2	3072-70	8	T	C4	15 MAY 90	
12 MAY 90	0505	5.18S	165.98W	1645.3	-2.7	2	3106-70	8	T	C4	21 AUG 90	
02 JUN 90	0300	5.00S	169.73W	1664.3	-.3	2	3044-70	8	T	C4	17 AUG 90	
01 JUL 90	0000	5.00S	165.80W	1663.1	-3.2	2	3138-70	8	T	C4	21 AUG 90	
24 JUL 90	0057	5.00S	165.38W	1652.0	-4.5	2	3170-70	8	T	C4	20 AUG 90	
16 AUG 90	1714	5.00S	160.65W	1655.4	-1.9	2	3146-70	8	T	C4	29 OCT 90	
08 SEP 90	2005	5.00S	172.88W	1659.5	5.6	2	3111-70	8	T	C4	31 OCT 90	
08 SEP 90	2005	5.00S	172.88W	1668.4	1.0	2	3112-70	8	T	C4	29 OCT 90	
05 OCT 90	9999	5.00S	158.55W	1661.3	1.0	2	3128-70	8	T	C7	18 DEC 90	
26 OCT 90	0232	5.00S	172.93W	1658.9	.3	2	3105-70	8	T	C7	14 DEC 90	
26 OCT 90	0232	5.00S	172.93W	1656.8	-.5	2	3106-70	8	T	C7	10 DEC 90	
21 NOV 90	1000	5.00S	160.41W	1667.1	-1.3	2	3170-70	8	T	C7	24 JAN 91	
16 DEC 90	0620	5.00S	153.25W	1668.5	-.1	2	3140-70	8	T	C7	23 JAN 91	

Southland Star (S 10)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH_4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
22 DEC 86	2255	10.00S	165.90W	1633.1	2.6	2	3076-86	8	T	C4	21 JAN 87	
11 JAN 87	1452	10.00S	171.85W	1621.0	-4.0	2	3070-86	8	T	C4	21 JAN 87	
02 FEB 87	0720	10.00S	160.63W	1698.0	-5.4	2	3088-86	8	T	C4	15 MAR 87	
03 FEB 87	0342	10.00S	166.02W	1637.5	.5	2	3108-86	8	T	C4	16 MAR 87	
26 FEB 87	0701	10.00S	171.80W	1614.0	-1.8	2	3148-86	8	T	C4	15 MAR 87	
19 MAR 87	1641	10.00S	165.77W	1627.5	-4.9	2	3026-86	8	T	C4	05 MAY 87	
13 APR 87	1425	10.02S	171.90W	1606.4	4.3	2	3124-86	8	T	C4	04 MAY 87	
04 MAY 87	1705	10.00S	160.05W	1611.5	-.9	2	3006-86	8	T	C4	16 JUN 87	
24 MAY 87	1552	10.00S	171.87W	1606.2	-3.8	2	3140-86	8	T	C4	17 JUN 87	
19 JUN 87	1728	10.00S	166.00W	1619.9	1.2	2	3044-86	8	T	C4	30 SEP 87	
09 JUL 87	0735	10.00S	172.12W	1617.8	3.7	3	3120-86	8	T	C4	29 SEP 87	
03 AUG 87	0002	10.03S	165.97W	1619.7	1.4	2	3016-86	8	T	C4	29 SEP 87	
19 AUG 87	1550	9.98S	175.08W	1621.8	-.6	2	3030-86	8	T	C4	29 SEP 87	
13 SEP 87	1830	10.03S	165.93W	1626.5	2.8	2	3158-86	8	T	C4	24 NOV 87	
02 OCT 87	2304	9.87S	174.98W	1623.2	1.4	2	3040-86	8	T	C4	23 NOV 87	
11 DEC 87	2048	10.00S	165.98W	1625.5	.9	2	3036-86	8	T	C4	18 JAN 88	
21 JAN 88	1630	10.33S	160.53W	1630.8	1.2	2	3044-86	8	T	C4	03 MAR 88	
07 FEB 88	0600	9.90S	171.77W	1641.6	3.3	2	3098-86	8	T	C4	02 MAR 88	
25 MAR 88	1845	10.00S	171.83W	1620.2	8.5	2	3002-86	8	T	C4	26 APR 88	
21 APR 88	1855	10.00S	165.88W	1636.5	8.1	2	3174-86	8	T	C4	20 JUN 88	
02 JUN 88	2305	9.98S	160.12W	1628.1	5.6	2	3136-86	8	T	C4	28 JUL 88	
19 JUN 88	0540	9.98S	171.87W	1624.5	-4.8	2	3150-86	8	T	C4	26 JUL 88	
18 JUL 88	1710	10.10S	160.18W	1649.1	-1.3	2	3178-86	8	T	C4	01 SEP 88	
06 AUG 88	0500	9.83S	171.83W	1641.1	-2.7	2	3160-86	8	T	C4	13 SEP 88	
01 SEP 88	0220	10.00S	165.75W	1662.8	-.6	2	3144-86	8	T	C4	30 JAN 89	
20 JAN 89	1130	9.25S	170.42W	1660.6	-6.5	2	3088-70	8	T	C4	26 APR 89	
08 FEB 89	2235	10.92S	171.85W	1662.2	7.9	2	3100-70	8	T	C4	14 MAR 89	
06 MAR 89	0246	10.27S	171.58W	1629.7	8.7	2	3146-70	8	T	C4	26 APR 89	
24 MAR 89	1843	10.00S	171.92W	1650.3	2.6	2	3056-70	8	T	C4	25 APR 89	
21 APR 89	1928	10.03S	171.35W	1639.1	2.7	2	3074-70	8	T	C4	20 JUN 89	
08 MAY 89	1340	10.00S	171.83W	1655.2	-5.1	2	3020-70	8	T	C4	20 JUN 89	
06 JUN 89	1840	10.10S	171.70W	1640.9	8.1	2	3210-70	8	T	C4	27 JUL 89	
25 JUN 89	1157	10.00S	171.93W	1640.0	7.2	2	3108-70	8	T	C4	27 JUL 89	
22 JUL 89	0237	10.00S	160.12W	1661.4	1.0	2	3200-70	8	T	C4	14 SEP 89	
16 AUG 89	1524	10.00S	171.90W	1650.1	-8.0	2	3178-70	8	T	C4	13 SEP 89	
12 SEP 89	1735	10.05S	171.42W	1648.9	1.3	2	3140-70	8	T	C4	21 NOV 89	
02 OCT 89	0530	9.95S	175.22W	1646.6	2.3	2	3154-70	8	T	C4	20 NOV 89	
03 NOV 89	1727	10.00S	171.45W	1649.8	.8	2	3036-70	8	T	C4	03 JAN 90	
24 NOV 89	0748	10.00S	171.90W	1651.6	22.4	3	3060-70	8	T	C4	03 JAN 90	
22 DEC 89	0448	10.00S	165.92W	1657.8	-2.6	2	3218-70	8	T	C4	21 FEB 90	
10 JAN 90	1130	10.00S	171.87W	1647.8	-1.0	2	3109-70	8	T	C4	20 FEB 90	

Southland Star (S 10)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
06 FEB 90	0137	10.00S	165.85W	1678.6	1.3	2	3202-70	8	T	C4	02 APR 90	
28 FEB 90	0100	10.00S	146.67W	1643.0	-1.5	2	3148-70	8	T	C4	03 APR 90	
25 MAR 90	1020	10.00S	165.77W	1689.8	-1.6	2	3126-70	8	T	C4	16 MAY 90	
15 APR 90	0630	10.00S	171.92W	1638.2	2.9	2	3024-70	8	T	C4	16 MAY 90	
13 MAY 90	0530	10.00S	171.33W	1635.0	-2.2	2	3006-70	8	T	C4	20 AUG 90	
01 JUN 90	0609	10.00S	171.90W	1659.2	-4.0	2	3082-70	8	T	C4	17 AUG 90	
02 JUL 90	0612	10.00S	171.67W	1651.3	-4.6	2	3142-70	8	T	C4	17 AUG 90	
17 AUG 90	1638	10.00S	165.90W	1653.4	-.4	2	3152-70	8	T	C4	30 OCT 90	
08 SEP 90	0146	10.00S	175.23W	1655.1	3.0	2	3073-70	8	T	C4	31 OCT 90	
06 OCT 90	1536	10.00S	165.05W	1651.9	.2	2	3179-70	8	T	C7	18 DEC 90	
06 OCT 90	1536	10.00S	165.05W	1655.1	5.3	2	3180-70	8	T	C7	11 DEC 90	
25 OCT 90	0530	10.00S	175.25W	1653.5	-1.3	2	3150-70	8	T	C7	18 DEC 90	
22 NOV 90	1330	10.00S	165.56W	1658.2	2.9	2	3204-70	8	T	C7	23 JAN 91	
15 DEC 90	0924	10.00S	151.25W	1667.0	2.9	2	3232-70	8	T	C7	22 JAN 91	

Southland Star (S 15)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
25 DEC 86	1245	15.00S	173.20W	1620.2	-2.9	2	3072-86	8	T	C4	21 JAN 87	
10 JAN 87	9999	15.00S	174.18W	1610.7	10.9	3	3054-86	8	T	C4	21 JAN 87	
05 FEB 87	0613	15.03S	172.05W	1618.5	2.5	2	3080-86	8	T	C4	16 MAR 87	
25 FEB 87	1206	15.03S	174.18W	1608.7	4.6	2	3144-86	8	T	C4	15 MAR 87	
12 APR 87	1720	15.00S	174.30W	1600.7	-7.0	2	3062-86	8	T	C4	04 MAY 87	
05 MAY 87	1730	15.00S	165.52W	1605.0	-2.9	2	3100-86	8	T	C4	16 JUN 87	
23 MAY 87	1811	15.00S	174.27W	1613.3	-6.5	2	3134-86	8	T	C4	17 JUN 87	
21 JUN 87	0826	15.00S	172.32W	1619.8	3.7	2	3014-86	8	T	C4	30 SEP 87	
08 JUL 87	1345	15.03S	174.23W	1618.6	-7.0	2	3068-86	8	T	C4	25 SEP 87	
04 AUG 87	1631	15.00S	173.02W	1622.5	4.8	2	3142-86	8	T	C4	29 SEP 87	
18 AUG 87	2140	15.00S	177.83W	1628.6	6.6	2	3110-86	8	T	C4	29 SEP 87	
15 SEP 87	1124	15.00S	173.12W	1627.3	-6.1	2	3160-86	8	T	C4	24 NOV 87	
02 OCT 87	0106	14.73S	177.73W	1622.2	6.9	2	3174-86	8	T	C4	23 NOV 87	
13 DEC 87	1107	14.98S	172.88W	1606.8	-8.4	2	3126-86	8	T	C4	18 JAN 88	
27 DEC 87	1948	14.38S	173.98W	1607.8	-4.5	2	3010-86	8	T	C4	19 JAN 88	
22 JAN 88	1440	15.00S	165.47W	1622.4	-6.3	2	3016-86	8	T	C4	03 MAR 88	
22 JAN 88	1630	15.40S	165.90W	1621.4	2.4	2	3146-86	8	T	C4	03 MAR 88	
06 FEB 88	1134	15.00S	174.23W	1615.7	4.9	2	3078-86	8	T	C4	02 MAR 88	
24 MAR 88	2045	15.00S	174.25W	1610.6	5.5	2	3152-86	8	T	C4	25 APR 88	
24 APR 88	1448	14.98S	173.08W	1609.7	-3.1	2	3040-86	8	T	C4	20 JUN 88	
03 JUN 88	2200	15.00S	165.43W	1619.0	.7	2	3134-86	8	T	C4	28 JUL 88	
18 JUN 88	1137	15.00S	174.25W	1625.3	-5.6	2	3078-86	8	T	C4	26 JUL 88	
19 JUL 88	1925	15.00S	165.38W	1638.5	-4.1	2	3024-86	8	T	C4	12 SEP 88	
05 AUG 88	0745	14.85S	174.03W	1635.2	6.0	2	3154-86	8	T	C4	13 SEP 88	
04 SEP 88	0950	15.00S	173.15W	1635.2	6.4	2	3004-86	8	T	C4	30 JAN 89	
21 JAN 89	1920	14.72S	176.83W	1637.9	2.9	2	3086-70	8	T	C4	26 APR 89	
21 JAN 89	2053	15.00S	177.18W	1626.4	-12.8	3	3072-70	8	T	C4	26 APR 89	
08 FEB 89	0700	14.00S	173.80W	1661.0	5.3	2	3082-70	8	T	C4	14 MAR 89	
07 MAR 89	0304	15.18S	177.42W	1623.5	12.5	3	3148-70	8	T	C4	26 APR 89	
23 MAR 89	2150	14.88S	174.23W	1638.3	-9.3	2	3160-70	8	T	C4	25 APR 89	
22 APR 89	2020	15.00S	177.20W	1644.5	5.5	2	3094-70	8	T	C4	20 JUN 89	
07 MAY 89	1844	14.95S	174.25W	1654.1	-3.8	2	3112-70	8	T	C4	21 JUN 89	
07 JUN 89	2345	15.00S	177.25W	1643.1	-2.5	2	3170-70	8	T	C4	27 JUL 89	
24 JUN 89	1840	14.77S	174.13W	1643.4	3.4	2	3004-70	8	T	C4	27 JUL 89	
23 JUL 89	0215	15.00S	165.47W	1652.5	-2.0	2	3062-70	8	T	C4	14 SEP 89	
15 AUG 89	2155	15.00S	174.32W	1648.8	-3.8	2	3188-70	8	T	C4	13 SEP 89	
14 SEP 89	0116	15.52S	177.88W	1641.8	1.5	2	3146-70	8	T	C4	21 NOV 89	
01 OCT 89	0720	15.00S	178.03W	1645.8	1.3	2	3136-70	8	T	C4	20 NOV 89	
04 NOV 89	2132	15.00S	177.18W	1647.8	-5.0	2	3108-70	8	T	C4	03 JAN 90	
23 NOV 89	1400	15.00S	174.22W	1635.4	-1.5	2	3132-70	8	T	C4	03 JAN 90	
24 DEC 89	0540	15.00S	173.18W	1631.6	6.4	2	3208-70	8	T	C4	21 FEB 90	

Southland Star (S 15)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
09 JAN 90	1645	15.00S	174.22W	1649.2	1.7	2	3228-70	8	T	C4	21 FEB 90	
08 FEB 90	0000	15.00S	171.20W	1636.3	-.1	2	3056-70	8	T	C4	03 APR 90	
27 FEB 90	0820	15.00S	148.50W	1642.3	.9	2	3170-70	8	T	C4	02 APR 90	
28 MAR 90	0604	15.00S	173.22W	1626.3	2.0	2	3194-70	8	T	C4	16 MAY 90	
14 APR 90	1300	15.00S	174.17W	1639.9	-2.0	2	3078-70	8	T	C4	16 MAY 90	
14 MAY 90	0745	15.00S	177.18W	1633.2	-.7	2	3188-70	8	T	C4	20 AUG 90	
31 MAY 90	9999	15.00S	174.27W	1642.1	2.1	2	3116-70	8	T	C4	21 AUG 90	
03 JUL 90	0932	15.00S	177.25W	1649.1	1.8	2	3202-70	8	T	C4	17 AUG 90	
22 JUL 90	1720	15.00S	168.67W	1652.5	6.3	2	3214-70	8	T	C4	20 AUG 90	
20 AUG 90	0227	15.00S	172.82W	1658.2	2.4	2	3193-70	8	T	C4	31 OCT 90	
08 OCT 90	2220	15.00S	171.05W	1651.5	1.7	2	3209-70	8	T	C7	18 DEC 90	
08 OCT 90	2220	15.00S	171.05W	1653.5	.6	2	3210-70	8	T	C7	11 DEC 90	
24 OCT 90	0745	15.00S	178.01W	1653.6	2.8	2	3198-70	8	T	C7	18 DEC 90	
23 NOV 90	1625	15.00S	170.58W	1650.0	5.6	2	3026-70	8	T	C7	23 JAN 91	
14 DEC 90	1530	15.00S	150.30W	1643.5	-1.8	2	3104-70	8	T	C7	24 JAN 91	

Southland Star (S 20)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
28 DEC 86	9999	20.00S	178.65E	1598.8	-.7	2	3018-86	8	T	C4	21 JAN 87	
10 JAN 87	0025	20.00S	176.62W	1614.1	-7.5	2	3034-86	8	T	C4	21 JAN 87	
07 FEB 87	1200	20.00S	177.70E	1594.1	-4.2	2	3098-86	8	T	C4	15 MAR 87	
24 FEB 87	1751	20.00S	176.63W	1599.3	-2.1	2	3094-86	8	T	C4	15 MAR 87	
23 MAR 87	1708	20.03S	177.67E	1631.0	-5.6	2	3048-86	8	T	C4	04 MAY 87	
11 APR 87	1953	20.00S	176.72W	1600.4	.6	2	3034-86	8	T	C4	05 MAY 87	
06 MAY 87	1628	20.00S	170.38W	1607.3	.2	2	3010-86	8	T	C4	16 JUN 87	
22 MAY 87	2021	20.00S	176.93W	1612.2	-.7	2	3112-86	8	T	C4	16 JUN 87	
23 JUN 87	1037	20.00S	177.68E	1620.0	-1.5	2	3096-86	8	T	C4	28 SEP 87	
07 JUL 87	2030	20.00S	176.77W	1618.2	.4	2	3034-86	8	T	C4	25 SEP 87	
06 AUG 87	1205	20.02S	177.65E	1622.6	1.7	2	3006-86	8	T	C4	25 SEP 87	
17 AUG 87	1104	20.00S	177.68E	1626.8	-2.2	2	3085-86	8	T	C4	28 SEP 87	
17 SEP 87	1030	20.00S	177.67E	1624.3	-11.0	3	3034-86	8	T	C4	24 NOV 87	
30 SEP 87	1150	20.00S	177.68E	1623.5	-6.3	2	3176-86	8	T	C4	23 NOV 87	
15 DEC 87	1317	20.07S	177.73E	1610.8	-1.6	2	3148-86	8	T	C4	19 JAN 88	
26 DEC 87	2210	20.00S	176.63W	1621.1	-1.5	2	3008-86	8	T	C4	19 JAN 88	
23 JAN 88	1625	20.53S	171.00W	1602.9	-2.9	2	3072-86	8	T	C4	03 MAR 88	
05 FEB 88	1734	19.97S	176.62W	1633.3	4.5	2	3142-86	8	T	C4	02 MAR 88	
08 MAR 88	1153	20.07S	177.77E	1603.2	-3.7	2	3012-86	8	T	C4	26 APR 88	
23 MAR 88	2342	20.00S	176.63W	1613.5	2.6	2	3150-86	8	T	C4	25 APR 88	
26 APR 88	1050	20.00S	177.68E	1617.9	-.1	3	3118-86	8	T	C4	15 JUN 88	
27 APR 88	1940	20.02S	175.90W	1605.2	5.3	2	3102-86	8	T	C4	16 JUN 88	
04 JUN 88	2030	20.00S	170.38W	1626.3	10.9	3	3044-86	8	T	C4	26 JUL 88	
17 JUN 88	1734	20.00S	176.70W	1619.1	-2.8	2	3110-86	8	T	C4	26 JUL 88	
20 JUL 88	2135	20.00S	170.45W	1631.3	2.9	2	3020-86	8	T	C4	15 SEP 88	
20 JUL 88	2135	20.00S	170.45W	1630.5	-3.0	2	3062-86	8	T	C4	15 SEP 88	
04 AUG 88	0855	20.00S	176.67W	1635.9	3.5	2	3052-86	8	T	C4	15 SEP 88	
23 JAN 89	2332	21.07S	177.57E	1626.3	3.6	2	3096-70	8	T	C4	14 MAR 89	
06 FEB 89	0907	20.00S	176.72W	1652.9	14.0	3	3092-70	8	T	C4	14 MAR 89	
23 MAR 89	0240	20.00S	176.58W	1623.7	-3.9	2	3150-70	8	T	C4	25 APR 89	
25 APR 89	0140	20.10S	177.67E	1628.7	7.5	2	3182-70	8	T	C4	21 JUN 89	
07 MAY 89	0433	18.78S	176.08W	1638.5	5.7	2	3188-70	8	T	C4	21 JUN 89	
09 JUN 89	1520	20.00S	177.70E	1650.7	-2.1	2	3212-70	8	T	C4	26 JUL 89	
23 JUN 89	2337	20.00S	176.73W	1641.0	-.4	2	3228-70	8	T	C4	27 JUL 89	
23 JUL 89	2335	20.00S	170.48W	1646.8	6.9	2	3066-70	8	T	C4	13 SEP 89	
15 AUG 89	0505	20.00S	176.72W	1647.3	-2.4	2	3042-70	8	T	C4	13 SEP 89	
15 SEP 89	1620	21.40S	177.45E	1647.7	5.9	2	3092-70	8	T	C4	17 NOV 89	
29 SEP 89	1710	20.00S	177.75E	1651.2	-3.8	2	3174-70	8	T	C4	17 NOV 89	
07 NOV 89	0200	20.00S	177.67E	1645.6	6.8	2	3040-70	8	T	C4	04 JAN 90	
22 NOV 89	2035	20.00S	176.62W	1638.6	.3	2	3102-70	8	T	C4	29 DEC 89	
26 DEC 89	1454	20.00S	177.70E	1630.8	3.0	2	3172-70	8	T	C4	20 FEB 90	

Southland Star (S 20)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
08 JAN 90	9999	20.00S	176.63W	1651.8		1	3105-70	8	T	C4	21 FEB 90	
08 JAN 90	9999	20.00S	176.63W	1654.3		1	3106-70	8	T	C4	21 FEB 90	
08 FEB 90	1845	20.00S	173.95W	1632.8	.1	2	3166-70	8	T	C4	02 APR 90	
25 FEB 90	2015	20.00S	153.90W	1656.8	-1.5	2	3198-70	8	T	C4	03 APR 90	
30 MAR 90	1343	20.00S	177.63W	1631.1	-3.7	2	3034-70	8	T	C4	15 MAY 90	
13 APR 90	1820	20.00S	176.68W	1637.2	-2.9	2	3146-70	8	T	C4	16 MAY 90	
16 MAY 90	0200	20.00S	177.67E	1639.0	-4.1	2	3110-70	8	T	C4	20 AUG 90	
30 MAY 90	1010	20.00S	176.77W	1643.4	5.5	2	3022-70	8	T	C4	21 AUG 90	
05 JUL 90	0545	20.00S	177.72E	1650.3	-3.1	2	3014-70	8	T	C4	17 AUG 90	
19 JUL 90	1115	20.00S	170.50W	1654.7	4.4	2	3168-70	8	T	C4	21 AUG 90	
21 AUG 90	1550	20.00S	177.72E	1654.1	-1.1	2	3016-70	8	T	C4	31 OCT 90	
09 OCT 90	1652	20.00S	173.00W	1659.6	-1.4	2	3083-70	8	T	C7	18 DEC 90	
22 OCT 90	1015	20.00S	177.66E	1655.8	-3.2	2	3165-70	8	T	C7	14 DEC 90	
22 OCT 90	1015	20.00S	177.66E	1657.0	-2.6	2	3166-70	8	T	C7	10 DEC 90	
24 NOV 90	1445	20.00S	174.95W	1647.0	-.5	2	3022-70	8	T	C7	23 JAN 91	
13 DEC 90	0245	20.00S	153.98W	1642.2	4.9	2	3190-70	8	T	C7	24 JAN 91	

Southland Star (S 25)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
29 DEC 86	0020	25.00S	178.68E	1598.0	-.2	2	3022-86	8	T	C4	21 JAN 87	
09 JAN 87	0605	25.00S	179.12W	1599.9	6.1	2	3038-86	8	T	C4	22 JAN 87	
08 FEB 87	0432	25.07S	177.00E	1595.3	-1.2	2	3122-86	8	T	C4	15 MAR 87	
23 FEB 87	2315	24.98S	179.17W	1594.3	.5	2	3090-86	8	T	C4	15 MAR 87	
24 MAR 87	0900	25.00S	176.88E	1597.8	-1.9	2	3068-86	8	T	C4	04 MAY 87	
22 MAY 87	0310	24.98S	179.18E	1617.6	-7.4	2	3012-86	8	T	C4	16 JUN 87	
24 JUN 87	0255	24.98S	176.85E	1616.7	-2.1	2	3114-86	8	T	C4	28 SEP 87	
06 JUL 87	0342	25.02S	179.23W	1618.4	-3.7	2	3102-86	8	T	C4	25 SEP 87	
07 AUG 87	0430	25.10S	176.90E	1620.3	3.1	2	3012-86	8	T	C4	25 SEP 87	
16 AUG 87	1849	24.92S	176.87E	1625.7	-1.4	2	3089-86	8	T	C4	28 SEP 87	
18 SEP 87	0423	25.33S	176.82E	1627.0	-6.5	2	3162-86	8	T	C4	23 NOV 87	
29 SEP 87	1954	24.85S	177.02E	1625.5	4.5	3	3170-86	8	T	C4	23 NOV 87	
16 DEC 87	0930	25.97S	176.72E	1607.5	-1.5	2	3012-86	8	T	C4	19 JAN 88	
26 DEC 87	0150	25.02S	170.33W	1613.8	-4.5	2	3060-86	8	T	C4	18 JAN 88	
24 JAN 88	1252	25.02S	175.22W	1602.2	-2.6	2	3128-86	8	T	C4	03 MAR 88	
04 FEB 88	2350	25.03S	179.13W	1630.0	.6	2	3070-86	8	T	C4	02 MAR 88	
09 MAR 88	0345	25.00S	176.87E	1600.5	8.5	2	3090-86	8	T	C4	26 APR 88	
23 MAR 88	0355	24.98S	179.10W	1612.6	-1.0	2	3028-86	8	T	C4	25 APR 88	
27 APR 88	0330	25.03S	176.88E	1613.5	6.4	2	3038-86	8	T	C4	16 JUN 88	
05 JUN 88	1820	25.00S	175.00W	1625.8	-2.1	2	3076-86	8	T	C4	27 JUL 88	
17 JUN 88	0015	25.00S	179.10W	1615.2	-2.8	2	3028-86	8	T	C4	26 JUL 88	
21 JUL 88	2225	25.00S	175.10W	1638.2	-4.9	2	3186-86	8	T	C4	01 SEP 88	
03 AUG 88	1106	25.00S	179.13W	1633.7	-4.5	2	3070-86	8	T	C4	15 SEP 88	
24 JAN 89	1119	25.00S	176.87E	1616.3	13.3	3	3024-70	8	T	C4	14 MAR 89	
06 FEB 89	1919	24.02S	178.73W	1627.3	-3.2	2	3114-70	8	T	C4	14 MAR 89	
09 MAR 89	0524	25.33S	176.90E	1621.1	12.4	3	3038-86	8	T	C4	25 APR 89	
22 MAR 89	0804	25.00S	179.17W	1611.2	3.3	2	3059-70	8	T	C4	26 APR 89	
25 APR 89	1733	25.05S	176.92E	1634.7	0.0	2	3176-70	8	T	C4	21 JUN 89	
06 MAY 89	0428	25.00S	179.20W	1634.6	2.1	2	3114-70	8	T	C4	20 JUN 89	
10 JUN 89	0658	25.00S	176.93E	1646.2	5.4	2	3190-70	8	T	C4	26 JUL 89	
23 JUN 89	0541	24.88S	179.03W	1640.5	-2.9	2	3104-70	8	T	C4	26 JUL 89	
24 JUL 89	2330	25.00S	175.23W	1648.5	-4.6	2	3030-70	8	T	C4	13 SEP 89	
14 AUG 89	1243	25.00S	179.18W	1650.3	2.4	2	3114-70	8	T	C4	13 SEP 89	
16 SEP 89	0400	25.00S	176.87E	1652.1	-6.7	2	3086-70	8	T	C4	17 NOV 89	
29 SEP 89	0142	25.00S	176.93E	1649.9	-2.8	2	3080-70	8	T	C4	20 NOV 89	
07 NOV 89	2014	25.00S	175.87E	1640.3	8.4	2	3126-70	8	T	C4	04 JAN 90	
22 NOV 89	0356	25.00S	179.08W	1647.0	-.1	2	3186-70	8	T	C4	29 DEC 89	
27 DEC 89	0700	25.00S	176.83E	1634.1	-5.3	2	3224-70	8	T	C4	20 FEB 90	
08 JAN 90	0112	25.00S	179.13W	1631.9	-.2	2	3038-70	8	T	C4	20 FEB 90	
09 FEB 90	1400	25.00S	177.08W	1628.7	.1	2	3154-70	8	T	C4	02 APR 90	
24 FEB 90	0800	25.00S	162.93W	1646.3	-1.0	2	3104-70	8	T	C4	02 APR 90	

Southland Star (S 25)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
31 MAR 90	2000	25.00S	176.90E	1629.9	1.0	2	3196-70	8	T	C4	15 MAY 90	
12 APR 90	2330	25.00S	179.20W	1636.2	-.9	2	3128-70	8	T	C4	16 MAY 90	
16 MAY 90	1930	25.00S	176.97E	1638.9	-1.3	2	3064-70	8	T	C4	20 AUG 90	
29 MAY 90	1230	25.00S	179.23W	1646.2	-3.2	2	3038-70	8	T	C4	20 AUG 90	
06 JUL 90	0200	25.00S	176.83E	1649.9	-4.8	2	3054-70	8	T	C4	17 AUG 90	
04 SEP 90	1625	25.00S	176.92E	1654.7	3.1	2	3060-70	8	T	C4	29 OCT 90	
10 OCT 90	1055	25.00S	177.13W	1655.3	2.3	2	3067-70	8	T	C7	18 DEC 90	
21 OCT 90	0625	25.00S	176.85E	1656.1	1.1	2	3019-70	8	T	C7	14 DEC 90	
21 OCT 90	0625	25.00S	176.85E	1654.1	-7.0	2	3020-70	8	T	C7	11 DEC 90	
26 NOV 90	2045	25.00S	179.00W	1649.0	4.0	2	3054-70	8	T	C7	22 JAN 91	
11 DEC 90	0927	25.00S	162.91W	1644.1	1.6	2	3184-70	8	T	C7	23 JAN 91	

Southland Star (S 30)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
29 DEC 86	1905	30.00S	178.65E	1602.7	-4.0	2	3048-86	8	T	C4	22 JAN 87	
08 FEB 87	2049	30.00S	176.13E	1592.2	-.8	2	3100-86	8	T	C4	15 MAR 87	
25 MAR 87	0200	29.98S	176.07E	1596.9	1.5	2	3072-86	8	T	C4	04 MAY 87	
10 APR 87	0720	30.00S	178.17E	1598.0	8.4	2	3070-86	8	T	C4	04 MAY 87	
19 MAY 87	1250	29.95S	179.85E	1615.1	1.5	2	3008-86	8	T	C4	16 JUN 87	
21 MAY 87	9999	30.00S	178.20E	1615.3	-5.2	2	3136-86	8	T	C4	18 JUN 87	
24 JUN 87	1848	30.00S	175.97E	1625.3	1.9	2	3050-86	8	T	C4	28 SEP 87	
06 JUL 87	9999	30.00S	178.17E	1627.5	-.8	2	3028-86	8	T	C4	25 SEP 87	
07 AUG 87	2215	30.50S	175.97E	1619.8	-4.1	2	3078-86	8	T	C4	28 SEP 87	
16 AUG 87	0245	30.00S	176.07E	1625.0	4.4	2	3128-86	8	T	C4	29 SEP 87	
18 SEP 87	1950	30.02S	176.02E	1623.5	-7.7	2	3164-86	8	T	C4	23 NOV 87	
29 SEP 87	0352	29.97S	176.15E	1628.6	-7.3	2	3028-85	8	T	C4	24 NOV 87	
16 DEC 87	2130	29.70S	176.13E	1618.9	-2.8	2	3034-86	8	T	C4	18 JAN 88	
25 DEC 87	0723	29.85S	178.33E	1612.9	-7.6	2	3064-86	8	T	C4	18 JAN 88	
25 JAN 88	1107	30.03S	179.93E	1606.1	4.9	2	3082-86	8	T	C4	02 MAR 88	
04 FEB 88	0545	30.03S	178.20E	1603.0	4.2	2	3110-86	8	T	C4	03 MAR 88	
09 MAR 88	2004	30.05S	176.08E	1602.7	-8.7	2	3022-86	8	T	C4	25 APR 88	
22 MAR 88	0900	30.02S	178.28E	1596.8	-6.8	2	3144-86	8	T	C4	25 APR 88	
06 JUN 88	1550	29.97S	179.92E	1625.8	13.8	3	3054-86	8	T	C4	26 JUL 88	
16 JUN 88	0648	29.95S	178.27E	1620.1	-14.1	3	3034-86	8	T	C4	28 JUL 88	
22 JUL 88	2015	30.10S	179.92W	1635.4	-2.1	2	3006-86	8	T	C4	12 SEP 88	
02 AUG 88	1430	30.00S	178.20E	1639.8	-.6	2	3162-86	8	T	C4	14 SEP 88	
25 JAN 89	0735	31.53S	175.85E	1620.0	5.4	2	3084-70	8	T	C4	14 MAR 89	
05 FEB 89	2250	30.00S	178.15E	1612.4	-13.3	3	3105-70	8	T	C4	14 MAR 89	
09 MAR 89	2000	30.93S	176.23E	1620.2	-12.6	4	3080-86	8	T	C4	25 APR 89	
21 MAR 89	1256	30.00S	178.18E	1616.6	1.7	2	3008-70	8	T	C4	26 APR 89	
05 MAY 89	1022	30.00S	178.22E	1629.8	1.5	2	3096-70	8	T	C4	20 JUN 89	
11 JUN 89	0003	30.65S	176.03E	1642.3	2.1	2	3130-70	8	T	C4	26 JUL 89	
22 JUN 89	0820	30.00S	178.28E	1643.4	6.0	2	3224-70	8	T	C4	26 JUL 89	
25 JUL 89	2045	30.00S	179.98W	1649.9	-6.0	2	3184-70	8	T	C4	14 SEP 89	
13 AUG 89	2000	30.00S	178.22E	1650.4	2.5	2	3096-70	8	T	C4	14 SEP 89	
17 SEP 89	1805	29.62S	176.08E	1651.3	-8.0	2	3144-70	8	T	C4	20 NOV 89	
28 SEP 89	0945	30.00S	176.05E	1651.0	-2.8	2	3152-70	8	T	C4	20 NOV 89	
08 NOV 89	1430	30.00S	176.05E	1639.2	.9	2	3028-70	8	T	C4	03 JAN 90	
21 NOV 89	1050	30.00S	178.25E	1652.4	13.0	3	3012-70	8	T	C4	03 JAN 90	
07 JAN 90	0610	30.00S	178.13E	1629.5	3.7	2	3066-70	8	T	C4	20 FEB 90	
10 FEB 90	0900	30.00S	179.60E	1632.6	2.5	2	3054-70	8	T	C4	02 APR 90	
22 FEB 90	2146	30.00S	172.18W	1625.5	-.6	2	3046-70	8	T	C4	02 APR 90	
01 APR 90	0358	30.00S	176.00E	1633.6	-7.2	2	3192-70	8	T	C4	15 MAY 90	
12 APR 90	0130	30.00S	178.25E	1634.3	.8	2	3032-70	8	T	C4	17 MAY 90	
17 MAY 90	1353	30.00S	176.17E	1636.7	-2.8	2	3130-70	8	T	C4	17 AUG 90	

Southland Star (S 30)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
28 MAY 90	1400	30.00S	178.50E	1643.6	-4.6	2	3176-70	8	T	C4	20 AUG 90	
06 JUL 90	1840	30.00S	176.05E	1649.6	.3	2	3204-70	8	T	C4	17 AUG 90	
11 OCT 90	0520	30.00S	179.36E	1658.8	2.3	2	3119-70	8	T	C7	17 DEC 90	
11 OCT 90	0520	30.00S	179.36E	1655.9	-5.6	2	3120-70	8	T	C7	11 DEC 90	
20 OCT 90	1130	30.00S	176.00W	1661.7	-4.6	2	3133-70	8	T	C7	18 DEC 90	
27 NOV 90	1500	30.00S	179.05E	1647.5	-.8	2	3188-70	8	T	C7	22 JAN 91	
09 DEC 90	2033	30.00S	171.70W	1649.2	3.3	2	3044-70	8	T	C7	23 JAN 91	

Southland Star (S 35)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
30 DEC 86	1355	35.00S	178.62E	1606.7	-4.7	2	3052-86	8	T	C4	21 JAN 87	
08 JAN 87	1007	35.00S	999.99	1597.9	3.6	2	3050-86	8	T	C4	22 JAN 87	
22 FEB 87	0845	35.00S	175.55E	1594.5	1.4	2	3092-86	8	T	C4	15 MAR 87	
25 MAR 87	2015	35.00S	175.10E	1595.1	9.2	2	3076-86	8	T	C4	04 MAY 87	
09 APR 87	1305	34.98S	175.50E	1600.7	-5.5	2	3030-86	8	T	C4	04 MAY 87	
09 MAY 87	9999	35.00S	175.78E	1608.8	-1.5	2	3020-86	8	T	C4	16 JUN 87	
19 MAY 87	1445	35.02S	175.55E	1619.7	-2.3	2	3116-86	8	T	C4	18 JUN 87	
25 JUN 87	1234	35.00S	175.20E	1623.9	2.3	2	3074-86	8	T	C4	25 SEP 87	
08 AUG 87	1300	34.97S	175.17E	1624.8	-5.2	2	3146-86	8	T	C4	29 SEP 87	
15 AUG 87	1110	35.00S	175.17E	1625.8	-3.4	2	3022-86	8	T	C4	29 SEP 87	
19 SEP 87	1214	35.00S	175.12E	1632.1	-5.0	2	3106-86	8	T	C4	24 NOV 87	
28 SEP 87	1200	35.00S	175.13E	1631.3	1.4	2	3084-86	8	T	C4	24 NOV 87	
17 DEC 87	1555	35.00S	175.13E	1622.2	-.9	2	3150-86	8	T	C4	18 JAN 88	
26 JAN 88	0830	35.17S	176.02E	1606.7	-2.3	2	3092-86	8	T	C4	02 MAR 88	
03 FEB 88	1200	34.98S	175.52E	1602.3	2.9	2	3104-86	8	T	C4	03 MAR 88	
10 MAR 88	1136	35.00S	175.15E	1603.2	1.1	2	3148-86	8	T	C4	25 APR 88	
28 APR 88	1135	35.00S	175.20E	1606.1	2.6	2	3116-86	8	T	C4	16 JUN 88	
07 JUN 88	1130	35.00S	176.10E	1631.8	-1.3	2	3096-86	8	T	C4	26 JUL 88	
15 JUN 88	1316	34.98S	175.50E	1615.3	2.8	2	3085-86	8	T	C4	28 JUL 88	
23 JUL 88	1538	35.00S	176.20E	1632.2	-8.3	2	3122-86	8	T	C4	13 SEP 88	
01 AUG 88	2025	35.00S	175.45E	1635.6	.9	2	3126-86	8	T	C4	14 SEP 88	
25 JAN 89	1920	35.03S	175.15E	1618.1	-7.7	2	3102-70	8	T	C4	14 MAR 89	
10 MAR 89	1224	35.00S	175.15E	1623.8	-9.7	2	3154-70	8	T	C4	25 APR 89	
20 MAR 89	1737	35.00S	175.52E	1629.5	-6.5	2	3158-70	8	T	C4	25 APR 89	
27 APR 89	0100	35.00S	175.15E	1639.1	-.7	2	3024-70	8	T	C4	21 JUN 89	
04 MAY 89	1726	34.97S	175.50E	1633.0	3.9	2	3102-70	8	T	C4	21 JUN 89	
21 JUN 89	1415	34.97S	175.53E	1636.7	-3.6	2	3208-70	8	T	C4	26 JUL 89	
26 JUL 89	1606	35.00S	176.08E	1651.6	4.3	2	3182-70	8	T	C4	14 SEP 89	
13 AUG 89	0300	35.00S	175.52E	1649.1	-2.3	2	3100-70	8	T	C4	14 SEP 89	
27 SEP 89	1755	34.95S	175.20E	1642.8	-1.0	2	3076-70	8	T	C4	20 NOV 89	
09 NOV 89	0751	35.00S	175.18E	1648.3	-.3	2	3016-70	8	T	C4	03 JAN 90	
20 NOV 89	1745	35.00S	175.53E	1648.7	.1	2	3020-70	8	T	C4	03 JAN 90	
28 DEC 89	1430	35.00S	175.20E	1631.2	.8	2	3118-70	8	T	C4	20 FEB 90	
06 JAN 90	1154	35.00S	175.52E	1633.2	7.7	2	3178-70	8	T	C4	20 FEB 90	
21 FEB 90	1400	35.00S	178.50E	1622.9	-3.4	2	3050-70	8	T	C4	30 MAR 90	
01 APR 90	2355	35.00S	175.15E	1630.8	2.2	2	3004-70	8	T	C4	15 MAY 90	
11 APR 90	0700	35.00S	175.50E	1634.3	-.4	2	3039-70	8	T	C4	17 MAY 90	
18 MAY 90	0600	35.00S	175.17E	1636.7	1.8	2	3218-70	8	T	C4	17 AUG 90	
03 SEP 90	1902	35.00S	175.20E	1655.2	-1.1	2	3076-70	8	T	C4	31 OCT 90	
11 OCT 90	2240	35.00S	176.03E	1657.5	.4	2	3005-70	8	T	C7	17 DEC 90	
11 OCT 90	2240	35.00S	176.03E	1656.7	-.5	2	3006-70	8	T	C7	11 DEC 90	

Southland Star (S 35)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
19 OCT 90	1100	35.00S	175.18E	1659.8	-.6	2	3011-70	8	T	C7	18 DEC 90	
28 NOV 90	0930	35.00S	176.00E	1651.5	-3.9	2	3100-70	8	T	C7	22 JAN 91	
08 DEC 90	9999	35.00S	176.45E	1652.7	3.2	2	3062-70	8	T	C7	23 JAN 91	

Akademik Korolev (AKC)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
25 OCT 83	2103	40.00N	138.00W	1685.0	-5.0	3	3014-83	4	T	C2	02 JAN 84	
27 OCT 83	0200	35.00N	143.18W	1687.3	2.0	3	3013-83	4	T	C2	03 JAN 84	
28 OCT 83	0730	29.81N	147.65W	1684.2	-5.0	4	3011-83	4	T	C2	03 JAN 84	
29 OCT 83	1750	24.55N	151.98W	1655.0	4.0	4	3055-83	4	T	C2	02 JAN 84	
30 OCT 83	1800	20.28N	154.71W	1660.0	5.0	3	3057-83	4	T	C2	03 JAN 84	
31 OCT 83	0730	18.00N	155.00W	1656.3	-4.0	3	3058-83	4	T	C2	02 JAN 84	
31 OCT 83	2200	16.00N	155.00W	1655.7	3.0	3	3063-83	4	T	C2	30 DEC 83	
01 NOV 83	1130	14.00N	155.00W	1649.0	-1.0	3	3065-83	4	T	C2	28 DEC 83	
02 NOV 83	0300	11.90N	155.00W	1638.7	3.0	3	3037-83	4	T	C2	30 DEC 83	
02 NOV 83	1700	10.00N	155.00W	1620.0	1.0	4	3035-83	4	T	C2	28 DEC 83	
03 NOV 83	1200	07.90N	155.00W	1595.7	9.0	3	3031-83	4	T	C2	03 JAN 84	
04 NOV 83	0100	06.11N	155.00W	1587.4	2.0	3	3033-83	4	T	C2	03 JAN 84	
04 NOV 83	1345	04.13N	155.00W	1586.3	1.0	4	3027-83	4	T	C2	29 DEC 83	
05 NOV 83	0415	01.80N	155.00W	1580.1	1.0	3	3029-83	4	T	C2	03 JAN 84	
05 NOV 83	1730	00.15N	155.00W	1584.7	3.0	3	3069-83	4	T	C2	30 DEC 83	
06 NOV 83	1000	02.00S	155.00W	1580.7	3.0	3	3071-83	4	T	C2	30 DEC 83	
06 NOV 83	2220	04.03S	155.00W	1584.6	-5.0	5	3039-83	4	T	C2	28 DEC 83	
07 NOV 83	1105	06.10S	155.00W	1586.4	-3.0	3	3041-83	4	T	C2	29 DEC 83	
07 NOV 83	2250	08.00S	155.00W	1586.7	3.0	3	3023-83	4	T	C2	30 DEC 83	
08 NOV 83	1100	10.00S	155.00W	1587.0	-5.0	3	3025-83	4	T	C2	02 JAN 84	
08 NOV 83	2350	12.16S	155.00W	1583.3	5.0	4	3043-83	4	T	C2	02 JAN 84	
09 NOV 83	1110	13.90S	155.00W	1583.0	4.0	3	3045-83	4	T	C2	30 DEC 83	
10 NOV 83	0100	16.00S	155.00W	1584.4	15.0	5	3047-83	4	T	C2	28 DEC 83	
10 NOV 83	1505	18.00S	155.00W	1576.1	-5.0	5	3049-83	4	T	C2	28 DEC 83	
11 NOV 83	0415	19.92S	155.00W	1572.1	2.0	3	3051-83	4	T	C2	02 JAN 84	
11 NOV 83	2145	22.00S	155.00W	1574.1	-1.0	3	3046-83	4	T	C2	30 DEC 83	
12 NOV 83	1250	24.00S	155.00W	1569.4	4.0	3	3053-83	4	T	C2	03 JAN 84	
13 NOV 83	0630	26.00S	154.83W	1573.3	0.0	4	3061-83	4	T	C2	28 DEC 83	
14 NOV 83	1910	30.00S	155.00W	1573.3	2.0	4	3059-83	4	T	C2	29 DEC 83	

Discoverer 1983 & 1984 (DIS)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
06 MAR 83	0001	50.00N	170.00W	1681.0	4.0	2	948-82	1	P	C1	10 JUN 83	
08 MAR 83	0004	45.00N	170.00W	1670.5	-11.0	2	32-83	1	P	C1	13 JUN 83	
10 MAR 83	0001	41.11N	169.99W	1684.5	13.0	2	156-82	1	P	C1	12 JUN 83	
12 MAR 83	2349	38.00N	170.00W	1675.5	-5.0	2	390-82	1	P	C1	13 JUN 83	
15 MAR 83	0200	34.18N	170.04W	1697.5	-13.0	2	946-81	1	P	C1	12 JUN 83	
16 MAR 83	2345	28.09N	170.00W	1678.5	-5.0	2	38-83	1	P	C1	13 JUN 83	
18 MAR 83	2357	22.56N	170.00W	1662.0	-8.0	2	1694-82	1	P	C1	10 JUN 83	
21 MAR 83	0012	21.57N	162.40W	1655.5	-15.0	2	278-82	1	P	C1	13 JUN 83	
03 APR 83	2359	14.70N	158.40W	1626.0	2.0	2	150-82	1	P	C1	12 JUN 83	
05 APR 83	2328	09.00N	157.98W	1622.5	-5.0	2	812-82	1	P	C1	13 JUN 83	
07 APR 83	0001	06.02N	157.97W	1595.0	6.0	2	142-82	1	P	C1	10 JUN 83	
12 APR 83	0001	00.06N	154.20W	1631.5	-3.0	2	248-82	1	P	C1	14 JUN 83	
13 APR 83	2300	00.01N	145.00W	1589.5	15.0	2	302-82	1	P	C1	10 JUN 83	
15 APR 83	2300	00.03N	137.13W	1604.0	8.0	2	1000-82	1	P	C1	13 JUN 83	
17 APR 83	2247	00.49N	130.81W	1609.0	2.0	2	34-83	1	P	C1	12 JUN 83	
19 APR 83	2300	00.02N	127.00W	1598.5	-3.0	2	690-82	1	P	C1	13 JUN 83	
21 APR 83	2300	00.01N	119.13W	1573.6	3.0	2	52-83	1	P	C1	12 JUN 83	
24 APR 83	2300	00.03S	109.66W	1584.5	5.0	2	398-83	1	P	C1	13 JUN 83	
26 APR 83	2100	04.90S	105.00W	1584.5	-5.0	2	826-82	1	P	C1	12 JUN 83	
28 APR 83	2100	03.00N	105.00W	1582.6	-11.0	2	1038-82	1	P	C1	13 JUN 83	
01 MAY 83	2100	15.43N	104.98W	1629.0	4.0	2	40-83	1	P	C1	12 JUN 83	
05 MAY 83	2000	21.83N	110.16W	1684.5	-3.0	2	56-82	1	P	C1	13 JUN 83	
15 MAY 83	2030	38.00N	124.33W	1666.5	7.0	2	462-82	1	P	C1	12 JUN 83	
17 MAY 83	2100	43.03N	125.52W	1688.0	0.0	2	544-82	1	P	C1	14 JUN 83	
19 MAY 83	2059	46.99N	125.46W	1651.5	-3.0	2	1696-82	1	P	C1	10 JUN 83	
21 MAY 83	1400	47.00N	127.05W	1676.5	23.0	2	54-83	1	P	C1	14 JUN 83	
28 FEB 84	0430	20.01N	156.92W	1666.5	1.0	2	3038-83	4	T	C2	28 MAR 84	
28 FEB 84	1230	17.98N	154.47W	1655.0	2.0	2	3040-83	4	T	C2	28 MAR 84	
29 FEB 84	1030	16.00N	151.48W	1637.5	1.0	2	3042-83	4	T	C2	28 MAR 84	
01 MAR 84	0715	14.00N	150.00W	1642.5	3.0	2	3044-83	4	T	C2	28 MAR 84	
01 MAR 84	1515	12.01N	149.99W	1640.0	-2.0	2	3046-83	4	T	C2	28 MAR 84	
02 MAR 84	0100	10.00N	150.00W	1643.5	3.0	2	3048-83	4	T	C2	28 MAR 84	
02 MAR 84	1730	08.83N	150.83W	1630.0	0.0	2	3002-83	4	T	C2	28 MAR 84	
03 MAR 84	0245	06.00N	150.00W	1629.7	0.0	3	3004-83	4	T	C2	28 MAR 84	
03 MAR 84	2005	04.00N	150.00W	1634.0	-2.0	2	3006-83	4	T	C2	29 MAR 84	
04 MAR 84	0800	02.00N	150.00W	1625.5	-1.0	2	3008-83	4	T	C2	28 MAR 84	
05 MAR 84	0200	00.00	150.00W	1625.7	1.0	3	3010-83	4	T	C2	28 MAR 84	
05 MAR 84	2230	02.13S	150.02W	1606.5	5.0	2	3012-83	4	T	C2	28 MAR 84	
06 MAR 84	0700	04.00S	150.00W	1595.5	1.0	2	3014-83	4	T	C2	28 MAR 84	
06 MAR 84	2015	06.00S	150.00W	1583.0	-4.0	2	3016-83	4	T	C2	28 MAR 84	
07 MAR 84	0800	08.00S	150.00W	1581.5	-3.0	2	3018-83	4	T	C2	29 MAR 84	

Discoverer 1983 & 1984 (DIS)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
07 MAR 84	2245	10.00S	150.00W	1577.6	-5.0	2	3020-83	4	T	C2	29 MAR 84	
08 MAR 84	1715	14.00S	150.00W	1576.6	1.0	2	3024-83	4	T	C2	29 MAR 84	
08 MAR 84	9999	12.01S	149.99W	1577.6	-1.0	2	3022-83	4	T	C2	28 MAR 84	
15 MAR 84	2310	18.00S	149.71W	1564.1	0.0	2	3026-84	4	T	C2	25 APR 84	
16 MAR 84	0930	20.00S	150.00W	1564.1	0.0	3	3028-84	4	T	C2	25 APR 84	
17 MAR 84	0205	22.00S	150.00W	1564.7	2.0	3	3030-84	4	T	C2	25 APR 84	
17 MAR 84	1215	24.00S	150.00W	1562.4	2.0	3	3032-84	4	T	C2	25 APR 84	
18 MAR 84	0545	26.00S	150.00W	1559.4	4.0	3	3034-84	4	T	C2	25 APR 84	
18 MAR 84	1400	28.00S	150.00W	1559.7	0.0	3	3036-84	4	T	C2	25 APR 84	
20 MAR 84	0000	33.02S	149.97W	1558.4	3.0	3	3062-84	4	T	C2	25 APR 84	
21 MAR 84	0000	36.73S	149.91W	1559.1	4.0	3	3064-84	4	T	C2	24 APR 84	
22 MAR 84	0000	40.00S	150.00W	1560.1	-7.0	3	3066-84	4	T	C2	25 APR 84	
23 MAR 84	1930	45.00S	150.00W	1559.1	-3.0	3	3068-84	4	T	C2	25 APR 84	
28 MAR 84	0035	52.65S	157.86W	1558.7	3.0	3	3070-84	4	T	C2	25 APR 84	
29 MAR 84	0400	57.36S	158.18W	1562.4	2.0	3	3072-84	4	T	C2	25 APR 84	
31 MAR 84	0615	55.00S	164.76W	1559.1	-6.0	3	3050-84	4	T	C2	25 APR 84	
31 MAR 84	0830	55.00S	164.76W	1558.4	5.0	3	3052-84	4	T	C2	01 MAY 84	
01 APR 84	0110	52.54S	167.32W	1564.4	-1.0	3	3054-84	4	T	C2	02 MAY 84	
02 APR 84	0215	50.00S	170.06W	1559.4	1.0	3	3056-84	4	T	C2	01 MAY 84	
03 APR 84	0000	48.00S	170.00W	1560.6	1.0	2	3058-84	4	T	C2	01 MAY 84	
04 APR 84	0200	45.16S	170.08W	1563.1	1.0	3	3060-84	4	T	C2	01 MAY 84	
05 APR 84	0010	43.36S	170.00W	1560.4	-3.0	3	3086-84	4	T	C2	02 MAY 84	
06 APR 84	0100	41.58S	170.00W	1564.4	3.0	3	3088-84	4	T	C2	02 MAY 84	
06 APR 84	2205	40.00S	170.00W	1564.1	4.0	2	3090-84	4	T	C2	01 MAY 84	
08 APR 84	0205	36.18S	170.06W	1566.1	-3.0	3	3092-84	4	T	C2	01 MAY 84	
09 APR 84	0210	32.85S	170.01W	1568.4	8.0	3	3094-84	4	T	C2	02 MAY 84	
10 APR 84	0100	28.45S	170.03W	1566.4	9.0	3	3096-84	4	T	C2	25 APR 84	
10 APR 84	2115	25.00S	170.00W	1572.1	-2.0	2	3074-84	4	T	C2	01 MAY 84	
11 APR 84	2040	21.38S	170.05W	1574.7	-1.0	3	3076-84	4	T	C2	01 MAY 84	
11 APR 84	2110	21.38S	170.05W	1574.1	-6.0	3	3078-84	4	T	C2	01 MAY 84	
12 APR 84	0715	20.00S	170.00W	1570.1	0.0	3	3080-84	4	T	C2	01 MAY 84	
12 APR 84	2130	16.95S	170.08W	1569.4	-6.0	3	3082-84	4	T	C2	25 APR 84	
13 APR 84	0630	15.33S	170.00W	1571.4	2.0	3	3084-84	4	T	C2	01 MAY 84	

Discoverer 1985 (DSC)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
27 FEB 85	1710	28.47N	154.85W	1674.8	4.9	2	3054-83	4	T	C2	23 APR 85	
27 FEB 85	1724	32.22N	153.38W	1690.8	-2.7	2	3018-84	4	T	C2	23 APR 85	
28 FEB 85	2255	37.90N	150.72W	1669.5	1.9	2	3010-83	4	T	C2	23 APR 85	
02 MAR 85	0020	46.41N	146.90W	1672.2	-1.6	2	3034-83	4	T	C2	23 APR 85	
04 MAR 85	2340	42.12N	148.95W	1714.0	6.9	2	3008-83	4	T	C2	23 APR 85	
20 APR 85	1550	41.85N	127.59W	1717.6	-2.2	2	3001-83	4	T	C2	30 MAY 85	
23 APR 85	0532	27.00N	133.73W	1681.2	-.1	2	3041-84	4	T	C2	29 MAY 85	
23 APR 85	1858	24.00N	134.92W	1683.2	1.8	2	3066-84	4	T	C2	30 MAY 85	
24 APR 85	2202	18.00N	137.36W	1683.2	-3.0	2	3065-84	4	T	C2	30 MAY 85	
26 APR 85	0615	11.98N	139.72W	1669.7	-3.7	2	3084-84	4	T	C2	30 MAY 85	
28 APR 85	1936	00.00	140.15W	1615.6	1.6	2	3002-84	4	T	C2	30 MAY 85	
02 MAY 85	2335	00.00	135.01W	1600.7	-1.8	2	3001-84	4	T	C2	29 MAY 85	
04 MAY 85	0052	00.00	129.99W	1603.6		1	3038-83	4	T	C2	29 MAY 85	
07 MAY 85	2000	00.00	115.05W	1596.6	.1	2	3021-84	4	T	C2	30 MAY 85	
08 MAY 85	2015	00.06N	110.05W	1595.6	2.1	2	3022-84	4	T	C2	30 MAY 85	
10 MAY 85	0000	03.07N	108.80W	1596.1	1.3	2	3064-83	4	T	C2	30 MAY 85	
11 MAY 85	1503	06.00N	109.53W	1602.6	3.5	2	3063-83	4	T	C2	30 MAY 85	
12 MAY 85	0355	08.99N	110.47W	1632.8	6.1	2	3009-85	4	T	C2	17 JUL 85	
12 MAY 85	1724	12.01N	111.22W	1659.9	1.2	2	3011-85	4	T	C2	17 JUL 85	
13 MAY 85	0704	14.99N	112.11W	1677.7	.1	2	3010-85	4	T	C2	17 JUL 85	
13 MAY 85	2112	17.99N	112.93W	1691.8	4.3	2	3007-85	4	T	C2	17 JUL 85	
14 MAY 85	1026	20.99N	113.97W	1710.5	7.1	3	3008-85	4	T	C2	17 JUL 85	
27 MAY 85	0845	15.00N	111.00W	1654.2		1	3004-85	4	T	C2	17 JUL 85	
27 MAY 85	2240	11.98N	109.85W	1642.2	1.0	2	3005-85	4	T	C2	17 JUL 85	
28 MAY 85	2330	08.99N	109.99W	1630.0	-2.5	2	3014-85	4	T	C2	17 JUL 85	
29 MAY 85	1630	06.01N	110.00W	1608.4	1.6	2	3006-85	4	T	C2	17 JUL 85	
30 MAY 85	1145	03.00N	110.00W	1613.6	-1.6	2	3064-84	4	T	C2	18 JUL 85	
01 JUN 85	1130	00.00	110.00W	1610.4	1.0	2	3008-84	4	T	C2	18 JUL 85	
02 JUN 85	0315	02.00S	109.95W	1597.2	-1.7	2	3086-84	4	T	C2	18 JUL 85	
03 JUN 85	1945	03.00S	110.00W	1601.6	1.5	2	3030-84	4	T	C2	18 JUL 85	
04 JUN 85	1820	05.03S	109.88W	1601.8	3.3	2	3104-83	4	T	C2	18 JUL 85	
05 JUN 85	2130	05.01S	115.00W	1604.9	-2.2	2	3026-84	4	T	C2	18 JUL 85	
06 JUN 85	2200	05.04S	120.12W	1601.9	5.1	2	3040-84	4	T	C2	18 JUL 85	
07 JUN 85	1830	05.01S	124.97W	1601.4	-2.1	2	3096-83	4	T	C2	18 JUL 85	
08 JUN 85	1930	04.98S	130.00W	1595.5	3.6	2	3050-83	4	T	C2	18 JUL 85	
09 JUN 85	2030	05.03S	135.00W	1592.4	-1.6	2	3024-84	4	T	C2	18 JUL 85	
10 JUN 85	1920	06.43S	138.75W	1592.4	-3.7	2	3028-83	4	T	C2	18 JUL 85	
12 JUN 85	0145	02.98S	139.99W	1595.8	-1.0	2	3056-84	4	T	C2	18 JUL 85	
13 JUN 85	2055	00.06S	140.26W	1602.8	.1	2	3076-84	4	T	C2	17 JUL 85	
14 JUN 85	2020	02.98N	140.00W	1611.3	1.6	2	3074-84	4	T	C2	17 JUL 85	
16 JUN 85	0000	07.36N	142.47W	1611.9	-5.6	2	3016-83	4	T	C2	18 JUL 85	

Discoverer 1985 (DSC)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
17 JUN 85	0015	11.01N	146.92W	1625.6	-2.5	2	3012-84	4	T	C2	18 JUL 85	
18 JUN 85	0015	14.87N	151.22W	1639.0	-3.0	2	3078-83	4	T	C2	18 JUL 85	
18 JUN 85	2345	18.77N	155.79W	1646.5	-1.4	2	3058-84	4	T	C2	18 JUL 85	
29 JUN 85	0600	21.85N	156.01W	1654.6	1.1	2	3034-83	4	T	C3	15 AUG 85	
29 JUN 85	1800	23.08N	154.95W	1678.5	1.5	2	3072-83	4	T	C3	16 AUG 85	
30 JUN 85	1300	25.00N	154.99W	1682.8	1.9	2	3060-83	4	T	C3	14 AUG 85	
01 JUL 85	0000	26.49N	155.03W	1675.0	.2	2	3092-83	4	T	C3	15 AUG 85	
02 JUL 85	0020	27.88N	155.06W	1655.8	-.2	2	3046-83	4	T	C3	15 AUG 85	
07 JUL 85	0001	30.01N	154.15W	1658.0	1.1	2	3054-83	4	T	C3	15 AUG 85	
07 JUL 85	1106	31.14N	153.85W	1662.0	.7	2	3066-84	4	T	C3	16 AUG 85	
07 JUL 85	2000	31.99N	153.53W	1655.4	-.4	2	3010-84	4	T	C3	16 AUG 85	
08 JUL 85	1856	34.99N	152.17W	1682.0	-1.4	2	3002-85	4	T	C3	16 AUG 85	
09 JUL 85	1000	36.69N	151.41W	1648.7	-4.7	2	3042-84	4	T	C3	16 AUG 85	
09 JUL 85	2100	37.79N	150.95W	1650.4	3.9	2	3002-83	4	T	C3	15 AUG 85	
10 JUL 85	2100	40.01N	149.97W	1654.5	0.0	2	3022-84	4	T	C3	15 AUG 85	
11 JUL 85	0410	40.99N	149.56W	1653.5	-1.3	2	3084-84	4	T	C3	15 AUG 85	
12 JUL 85	0148	42.01N	148.89W	1650.6	-2.7	2	3038-83	4	T	C3	15 AUG 85	
12 JUL 85	2000	44.18N	147.99W	1675.5	5.0	2	3052-83	4	T	C3	16 AUG 85	
13 JUL 85	0800	45.06N	147.61W	1676.6	-1.9	2	3080-83	4	T	C3	16 AUG 85	
13 JUL 85	2000	46.19N	146.98W	1668.4	3.1	2	3002-84	4	T	C3	16 AUG 85	
14 JUL 85	1700	47.98N	146.00W	1663.7	.4	2	3064-83	4	T	C3	16 AUG 85	
16 JUL 85	0159	50.02N	149.98W	1678.7	.4	2	3018-84	4	T	C3	15 AUG 85	
21 JUL 85	0007	51.79N	145.09W	1687.2	-1.0	2	3068-83	4	T	C3	15 AUG 85	
21 JUL 85	1830	54.25N	144.89W	1684.1	-2.9	2	3044-84	4	T	C3	15 AUG 85	
22 JUL 85	0013	55.02N	144.91W	1682.6	4.5	2	3082-83	4	T	C3	15 AUG 85	
22 JUL 85	1110	57.02N	144.84W	1686.3	-.4	2	3006-84	4	T	C3	14 AUG 85	
22 JUL 85	2250	57.40N	148.43W	1656.4	1.5	2	3052-84	4	T	C3	15 AUG 85	
23 AUG 85	0054	48.99N	126.83W	1685.9	-1.0	2	3030-84	4	T	C3	04 NOV 85	
23 AUG 85	1630	50.00N	129.61W	1646.8	.1	2	3016-83	4	T	C3	01 NOV 85	
24 AUG 85	1000	51.02N	133.37W	1715.3	-.9	2	3078-83	4	T	C3	01 NOV 85	
25 AUG 85	0830	52.00N	138.28W	1723.1	.3	2	3026-84	4	T	C3	01 NOV 85	
26 AUG 85	0757	52.99N	143.83W	1695.0	-2.2	2	3054-84	4	T	C3	01 NOV 85	
28 AUG 85	0358	54.00N	154.38W	1718.2	.2	2	3040-84	4	T	C3	01 NOV 85	
01 SEP 85	0851	56.00N	167.34W	1734.1	1.0	2	3008-83	4	T	C3	01 NOV 85	
01 SEP 85	1525	57.49N	167.97W	1734.1	-1.0	2	3028-84	4	T	C3	01 NOV 85	
01 SEP 85	2304	59.00N	168.70W	1726.1	3.3	2	3044-83	4	T	C3	04 NOV 85	
02 SEP 85	0555	60.56N	169.26W	1719.7	-2.8	2	3074-83	4	T	C3	01 NOV 85	
02 SEP 85	1229	61.99N	170.05W	1728.1	-.3	2	3098-83	4	T	C3	01 NOV 85	
03 SEP 85	1022	63.50N	167.71W	1732.2	-2.8	2	3100-83	4	T	C3	04 NOV 85	
05 SEP 85	2045	64.50N	166.57W	1735.2	1.7	2	3014-84	4	T	C3	04 NOV 85	
06 SEP 85	0322	66.00N	168.28W	1746.9	-1.2	2	3096-84	4	T	C3	04 NOV 85	
06 SEP 85	0924	67.50N	167.61W	1740.2	-1.4	2	3082-84	4	T	C3	04 NOV 85	

Discoverer 1985 (DSC)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
06 SEP 85	1545	69.00N	166.44W	1737.4	2.7	2	3032-84	4	T	C3	04 NOV 85	
07 SEP 85	0000	70.50N	164.02W	1744.7	-1.5	2	3106-83	4	T	C3	04 NOV 85	
08 SEP 85	0606	72.00N	154.00W	1708.9	-.7	2	3058-84	4	T	C3	04 NOV 85	

Mexico Naval Oceanographic Research Ship H-02 (ESG)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
21 JUL 86	2125	27.66N	96.96W	1656.5	-2.1	2	2-83	1	P	C4	15 OCT 86	
25 JUL 86	1245	21.70N	97.30W	1683.1		1	860-83	1	P	C4	15 OCT 86	
26 JUL 86	0330	20.03N	96.43W	1689.3		1	710-85	1	P	C4	15 OCT 86	
29 JUL 86	0615	18.75N	95.01W	1656.5	-2.1	2	366-85	1	P	C4	15 OCT 86	
06 AUG 86	0615	23.48N	89.85W	1657.7		1	700-83	1	P	C4	15 OCT 86	
06 AUG 86	1830	24.90N	89.71W	1666.8	-5.5	2	1308-82	1	P	C4	15 OCT 86	
07 AUG 86	1330	27.66N	89.55W	1654.5	-4.1	2	386-85	1	P	C4	14 OCT 86	
07 AUG 86	1830	28.46N	90.00W	1651.9	-6.5	2	816-83	1	P	C4	14 OCT 86	
07 AUG 86	1840	28.46N	90.00W	1668.8	6.6	2	628-83	1	P	C4	15 OCT 86	
08 AUG 86	2000	28.86N	92.75W	1665.6	1.3	2	342-85	1	P	C4	15 OCT 86	

Korolev (KOR)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
19 MAY 87	0848	42.33N	159.58E	1743.9	3.2	2	3025-83	5	T	C4	02 OCT 87	
19 MAY 87	0848	42.33N	159.58E	1745.4	-4.1	2	3026-83	5	T	C4	02 OCT 87	
19 MAY 87	0848	42.33N	159.58E	1748.2	-.9	2	4101-87	9	N	C4	16 SEP 87	
20 MAY 87	0930	36.80N	160.00E	1714.9	-3.8	2	4110-87	9	N	C4	16 SEP 87	
20 MAY 87	2215	34.60N	160.10E	1708.0	-.7	2	4089-85	9	N	C4	16 SEP 87	
21 MAY 87	0830	32.05N	160.01E	1709.3	3.7	2	3007-84	5	T	C4	02 OCT 87	
21 MAY 87	0830	32.05N	160.01E	1709.2	2.1	2	3008-84	5	T	C4	02 OCT 87	
21 MAY 87	2140	29.40N	160.00E	1705.1	-8.3	2	4093-85	9	N	C4	16 SEP 87	
23 MAY 87	0100	23.30N	160.00E	1684.3	-2.9	2	4112-87	9	N	C4	17 SEP 87	
23 MAY 87	0815	21.83N	160.00E	1697.0	-.8	2	3045-83	5	T	C4	02 OCT 87	
23 MAY 87	0815	21.83N	160.00E	1698.4	4.2	2	3046-83	5	T	C4	02 OCT 87	
23 MAY 87	2015	19.30N	160.00E	1675.5	1.3	2	4204-87	9	N	C4	17 SEP 87	
24 MAY 87	0900	16.70N	160.00E	1675.0	-4.0	2	4088-85	9	N	C4	16 SEP 87	
24 MAY 87	2240	13.70N	160.00E	1674.1	4.9	2	4099-85	9	N	C4	16 SEP 87	
26 MAY 87	0900	09.30N	160.00E	1669.0	5.4	2	4084-85	9	N	C4	16 SEP 87	
26 MAY 87	0915	09.16N	159.90E	1669.6	-6.0	2	3011-84	5	T	C4	02 OCT 87	
26 MAY 87	0915	09.16N	159.90E	1666.7	-3.7	2	3012-84	5	T	C4	02 OCT 87	
26 MAY 87	2315	06.50N	160.00E	1675.7	10.5	3	4098-85	9	N	C4	16 SEP 87	
27 MAY 87	0930	04.50N	160.00E	1661.5	.8	2	4095-85	9	N	C4	16 SEP 87	
27 MAY 87	2245	01.70N	160.00E	1653.3	9.3	2	4114-87	9	N	C4	17 SEP 87	
28 MAY 87	0815	01.50N	160.00E	1638.1	-3.9	2	3035-84	5	T	C4	02 OCT 87	
28 MAY 87	0815	01.50N	160.00E	1634.3	-.4	2	3036-84	5	T	C4	02 OCT 87	
28 MAY 87	2135	01.60S	160.00E	1610.4	-8.0	2	4085-85	9	N	C4	16 SEP 87	
29 MAY 87	2130	05.70S	160.50E	1612.6	-.3	2	4092-85	9	N	C4	16 SEP 87	
30 MAY 87	0830	06.50S	162.40E	1609.3	3.0	2	4080-85	9	N	C4	16 SEP 87	
30 MAY 87	2130	07.80S	165.30E	1613.0	-2.3	2	4096-85	9	N	C4	16 SEP 87	
30 MAY 87	9999	05.93S	161.10E	1613.1	-.9	2	3074-83	5	T	C4	02 OCT 87	
31 MAY 87	0900	08.70S	167.30E	1617.6	6.4	2	4201-87	9	N	C4	17 SEP 87	
31 MAY 87	2120	09.80S	169.50E	1620.1	5.3	2	4087-85	9	N	C4	16 SEP 87	
01 JUN 87	0140	10.30S	170.00E	1610.2	6.6	2	4097-85	9	N	C4	16 SEP 87	
01 JUN 87	0145	10.43S	170.01E	1616.0	.4	2	3058-83	5	T	C4	02 OCT 87	
02 JUN 87	0950	15.60S	170.00E	1607.7	-12.1	3	4202-87	9	N	C4	17 SEP 87	
04 JUN 87	0830	22.20S	170.00E	1615.0	-2.3	2	4111-87	9	N	C4	17 SEP 87	
04 JUN 87	2327	25.19S	170.00E	1613.4	-1.1	2	3099-83	5	T	C4	02 OCT 87	
04 JUN 87	2327	25.19S	170.00E	1615.2	3.4	2	3100-83	5	T	C4	02 OCT 87	
05 JUN 87	0150	25.70S	170.00E	1616.5	3.5	2	4094-85	9	N	C4	16 SEP 87	
06 JUN 87	0030	29.40S	170.00E	1616.3	1.2	2	4113-87	9	N	C4	17 SEP 87	
06 JUN 87	0930	30.40S	170.00E	1609.7	-.6	2	4203-87	9	N	C4	17 SEP 87	
06 JUN 87	2100	34.26S	170.00E	1615.4	-1.0	2	3103-83	5	T	C4	02 OCT 87	
06 JUN 87	2100	34.26S	170.00E	1617.2	.9	2	3104-83	5	T	C4	02 OCT 87	
06 JUN 87	2100	34.26S	170.00E	1619.0	6.6	3	4102-87	9	N	C4	16 SEP 87	

Korolev (KOR)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
07 JUN 87	0830	36.70S	170.70E	1615.5	8.4	2	4091-85	9	N	C4	16 SEP 87	
07 JUN 87	2000	38.80S	172.40E	1621.5	-4.2	2	4083-85	9	N	C4	16 SEP 87	
01 JUL 87	0500	03.28S	096.05E	1643.6	-4.4	2	3085-84	5	T	C4	02 OCT 87	
01 JUL 87	0500	03.28S	096.05E	1647.8	-2.2	3	3086-84	5	T	C4	02 OCT 87	
24 JUL 87	0050	06.53N	176.58W	1636.2	-1.7	2	3083-84	5	T	C4	02 OCT 87	
24 JUL 87	0050	06.53N	176.58W	1636.0	-1.2	2	3084-84	5	T	C4	06 OCT 87	

Long Lines Expedition (LLE)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
08 OCT 83	0002	04.35N	003.91W	1609.0	-6.0	2	948-82	1	P	C2	13 APR 84	
08 OCT 83	2020	03.00N	003.77W	1630.0	-2.0	2	1442-82	1	P	C2	13 APR 84	+
09 OCT 83	1957	00.72N	003.57W	1598.0	4.0	2	50-83	1	P	C2	13 APR 84	
10 OCT 83	0950	00.00	003.46W	1600.5	-1.0	2	296-83	1	P	C2	14 APR 84	
11 OCT 83	0930	02.25S	003.28W	1623.0	4.0	2	860-82	1	P	C2	13 APR 84	+
12 OCT 83	1440	05.10S	003.03W	1593.0	0.0	2	218-83	1	P	C2	13 APR 84	
13 OCT 83	1648	04.07S	001.54W	1584.5	-3.0	2	1410-82	1	P	C2	13 APR 84	
14 OCT 83	1100	08.65S	000.20W	1607.0		1	800-82	1	P	C2	14 APR 84	
15 OCT 83	1822	11.06S	000.86E	1588.4	7.0	3	1812-82	1	P	C2	13 APR 84	
16 OCT 83	2332	14.00S	000.94E	1590.5	1.0	2	1474-82	1	P	C2	14 APR 84	
18 OCT 83	1004	15.97S	000.99E	1580.0	0.0	2	1530-82	1	P	C2	14 APR 84	
19 OCT 83	1455	18.54S	001.17E	1585.0	0.0	2	1446-82	1	P	C2	14 APR 84	
20 OCT 83	1745	21.01S	001.31E	1597.0	0.0	2	994-81	1	P	C2	14 APR 84	
21 OCT 83	2325	23.50S	001.47E	1591.0	-4.0	2	1568-82	1	P	C2	14 APR 84	
23 OCT 83	1128	26.98S	001.66E	1582.5	-5.0	2	162-83	1	P	C2	14 APR 84	
24 OCT 83	2225	30.00S	001.83E	1578.6	-5.0	2	58-83	1	P	C2	14 APR 84	
25 OCT 83	1720	31.77S	001.36E	1589.0	2.0	2	1694-82	1	P	C2	14 APR 84	
27 OCT 83	1127	35.46S	001.05E	1587.5	1.0	2	198-82	1	P	C2	14 APR 84	
28 OCT 83	1853	37.99S	000.98E	1584.5	3.0	2	156-82	1	P	C2	14 APR 84	
29 OCT 83	1040	39.02S	000.97E	1584.0	0.0	2	18-83	1	P	C2	14 APR 84	
30 OCT 83	1455	42.20S	001.34E	1583.5	3.0	2	1012-82	1	P	C2	13 APR 84	
31 OCT 83	1740	45.01S	001.33E	1579.6	5.0	2	1010-82	1	P	C2	14 APR 84	
02 NOV 83	1600	41.69S	006.62E	1578.0	-7.0	3	210-83	1	P	C2	13 APR 84	
16 JAN 84	0813	42.65S	001.33E	1559.6	-3.0	2	1416-82	1	P	C2	16 APR 84	
17 JAN 84	1105	45.01S	001.31E	1565.6	-1.0	2	1444-82	1	P	C2	16 APR 84	
18 JAN 84	1105	47.00S	001.31E	1561.1	-2.0	2	1432-82	1	P	C2	16 APR 84	
19 JAN 84	0015	47.99S	001.32E	1570.4	-6.0	3	1460-82	1	P	C2	16 APR 84	
20 JAN 84	1035	50.85S	001.33E	1564.1	0.0	2	56-82	1	P	C2	16 APR 84	
21 JAN 84	0910	53.00S	001.36E	1565.6	-5.0	2	1028-82	1	P	C2	16 APR 84	
22 JAN 84	1048	52.87S	001.27E	1565.1	-4.0	2	406-82	1	P	C2	16 APR 84	
23 JAN 84	0915	57.04S	001.53E	1564.6	1.0	2	620-83	1	P	C2	16 APR 84	
24 JAN 84	0945	59.15S	001.26E	1562.1	-2.0	2	618-83	1	P	C2	16 APR 84	
26 JAN 84	1004	63.11S	000.56E	1565.1	0.0	2	614-83	1	P	C2	14 APR 84	
27 JAN 84	0538	65.00S	000.08E	1561.1	2.0	2	612-83	1	P	C2	16 APR 84	
28 JAN 84	1300	67.99S	000.31W	1560.7	4.0	3	176-82	1	P	C2	17 APR 84	
28 JAN 84	1545	67.09S	000.29W	1563.1	0.0	2	1810-82	1	P	C2	16 APR 84	
29 JAN 84	0340	69.36S	000.31W	1559.1	0.0	2	926-82	1	P	C2	16 APR 84	
03 FEB 84	0800	59.94S	020.99W	1592.7	0.0	3	1538-82	1	P	C2	16 APR 84	
06 FEB 84	0225	58.52S	027.37W	1557.1	-2.0	2	1552-82	1	P	C2	16 APR 84	

Oceanographer (OCE)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
16 APR 86	1444	20.01N	113.57W	1686.5	-.2	2	3074-84	5	T	C4	21 JUL 86	
17 APR 86	1435	15.03N	111.25W	1659.1	1.5	2	3060-84	5	T	C4	21 JUL 86	
20 APR 86	1421	05.01N	110.03W	1666.2	3.3	2	3070-84	5	T	C4	21 JUL 86	
21 APR 86	0455	03.00N	110.00W	1657.9	2.3	2	3022-83	5	T	C4	21 JUL 86	
22 APR 86	1729	00.00	109.99W	1607.4	2.1	2	3060-83	5	T	C4	21 JUL 86	
23 APR 86	2140	03.30S	110.02W	1615.9	-2.7	2	3006-83	5	T	C4	21 JUL 86	
24 APR 86	0800	04.97S	109.99W	1620.2	-3.2	2	3015-85	5	T	C4	22 JUL 86	
25 APR 86	2338	10.01S	109.98W	1596.6	-1.3	2	3068-84	5	T	C4	21 JUL 86	
27 APR 86	1417	14.99S	110.00W	1594.4	.7	2	3088-84	5	T	C4	21 JUL 86	
28 APR 86	2026	14.99S	105.00W	1594.0	.7	2	3095-83	5	T	C4	22 JUL 86	
01 MAY 86	1217	15.00S	094.10W	1597.0	-3.0	2	3066-84	5	T	C4	22 JUL 86	
03 MAY 86	1212	15.00S	086.01W	1604.2	4.4	2	3100-83	5	T	C4	29 JUL 86	
04 MAY 86	2037	13.89S	080.84W	1596.4	-5.2	2	3044-83	5	T	C4	29 JUL 86	
06 MAY 86	0526	12.47S	078.02W	1618.7	1.9	2	3028-83	5	T	C4	29 JUL 86	
10 MAY 86	1138	05.01S	084.02W	1622.8	1.4	2	3082-84	5	T	C4	29 JUL 86	
14 MAY 86	1839	05.05N	084.78W	1647.6	-5.2	2	3054-84	5	T	C4	29 JUL 86	
22 MAY 86	2220	03.03N	085.88W	1623.8	.2	2	3106-83	5	T	C4	21 JUL 86	
25 MAY 86	2025	00.02N	099.96W	1594.9	-7.7	2	3058-84	5	T	C4	21 JUL 86	
27 MAY 86	1620	00.00	108.01W	1599.4	-4.8	2	3078-83	5	T	C4	21 JUL 86	
03 JUN 86	1600	00.00	115.66W	1608.2	-1.3	2	3032-84	5	T	C4	21 JUL 86	
07 JUN 86	1715	00.00	124.97W	1606.2	-6.7	2	3096-84	5	T	C4	21 JUL 86	
09 JUN 86	1715	00.00	129.98W	1612.8	-5.5	2	3026-84	5	T	C4	21 JUL 86	
10 JUN 86	2300	00.02N	134.99W	1679.3	-.8	2	3036-85	5	T	C4	24 AUG 86	
14 JUN 86	0720	00.03S	139.97W	1624.9	7.6	2	3014-84	5	T	C4	21 JUL 86	
15 JUN 86	2315	04.95N	141.97W	1630.1	2.7	2	3054-83	5	T	C4	21 JUL 86	
16 JUN 86	2315	09.28N	146.24W	1654.8	1.9	2	3028-84	5	T	C4	21 JUL 86	
18 JUN 86	0115	13.39N	150.43W	1655.5	-3.9	2	3014-85	5	T	C4	21 JUL 86	
19 JUN 86	0200	17.37N	154.36W	1674.8	-3.9	2	3016-84	5	T	C4	21 JUL 86	
20 JUN 86	0545	19.96N	156.21W	1679.4	8.5	2	3076-84	5	T	C4	21 JUL 86	
01 JUL 86	1935	26.00N	155.00W	1663.3	1.4	2	3034-85	5	T	C4	17 AUG 86	
05 JUL 86	2035	14.99N	145.50W	1666.4	-9.9	2	3010-84	5	T	C4	17 AUG 86	
07 JUL 86	1935	20.03N	141.90W	1682.7	-3.7	2	3098-84	5	T	C4	17 AUG 86	
09 JUL 86	1830	25.04N	138.45W	1669.8	-2.4	2	3006-85	5	T	C4	17 AUG 86	
12 JUL 86	0250	34.98N	135.02W	1663.3	3.3	2	3068-83	5	T	C4	24 AUG 86	
13 JUL 86	2300	40.02N	135.00W	1689.0	-7.5	2	3086-84	5	T	C4	17 AUG 86	
16 JUL 86	0115	46.00N	135.02W	1695.5	.3	2	3056-84	5	T	C4	17 AUG 86	
17 JUL 86	1735	50.00N	135.22W	1699.8	2.3	2	3012-85	5	T	C4	17 AUG 86	
19 JUL 86	2100	49.95N	144.97W	1688.0	-1.5	2	3080-84	5	T	C4	17 AUG 86	
21 JUL 86	1850	54.77N	144.98W	1689.6	-2.3	2	3090-84	5	T	C4	17 AUG 86	
22 JUL 86	1800	55.92N	147.91W	1680.1	-5.6	2	3078-84	5	T	C4	17 AUG 86	

Polar Star (PML)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
04 OCT 86	2141	71.33N	156.90W	1757.1		1	326-85	1	P	C4	10 DEC 86	
06 OCT 86	0000	71.96N	152.60W	1756.4	-7.3	2	344-85	1	P	C4	10 DEC 86	
07 OCT 86	0020	71.67N	154.79W	1757.6	-5.8	2	328-85	1	P	C4	09 DEC 86	
09 OCT 86	0145	70.96N	146.66W	1754.6	-7.0	2	312-85	1	P	C4	09 DEC 86	
10 OCT 86	0050	71.10N	146.60W	1760.4	5.8	2	170-85	1	P	C4	09 DEC 86	
11 OCT 86	0010	70.90N	146.70W	1743.3	-7.8	2	340-85	1	P	C4	09 DEC 86	
12 OCT 86	2030	69.32N	143.27W	1761.7	5.5	2	906-83	1	P	C4	10 DEC 86	
14 OCT 86	0615	70.70N	141.06W	1755.9	-3.7	2	548-83	1	P	C4	10 DEC 86	
15 OCT 86	0530	70.33N	141.80W	1757.6	-3.6	2	322-85	1	P	C4	09 DEC 86	
16 OCT 86	0540	70.53N	144.20W	1752.9	-5.9	2	330-85	1	P	C4	09 DEC 86	
17 OCT 86	2150	71.80N	152.75W	1765.6	-15.4	3	592-85	1	P	C4	10 DEC 86	
18 OCT 86	0000	71.76N	153.21W	1785.5	5.1	2	346-85	1	P	C4	10 DEC 86	

John Biscoe (RRS)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
01 JAN 85	0000	40.13S	051.04W	1574.3	-1.7	2	3068-83	4	T	C2	23 APR 85	
02 JAN 85	2325	44.91S	051.00W	1574.3	-1.0	2	3006-84	4	T	C2	23 APR 85	
04 JAN 85	0830	49.35S	056.19W	1574.9	-4.2	2	3096-84	4	T	C2	23 APR 85	
06 JAN 85	0000	55.18S	057.83W	1588.4	2.4	2	3064-84	4	T	C2	23 APR 85	
08 JAN 85	0024	60.08S	055.63W	1575.4	-4.2	2	3052-84	4	T	C2	23 APR 85	
18 MAR 85	0000	58.68S	050.24W	1568.3	-10.4	3	3024-84	4	T	C2	23 APR 85	
21 MAR 85	2125	54.03S	035.44W	1568.6	7.0	2	3082-83	4	T	C2	23 APR 85	
24 MAR 85	2011	44.89S	038.25W	1569.1	3.0	2	3026-83	4	T	C2	24 APR 85	
26 MAR 85	0030	39.96S	039.61W	1567.6	4.1	2	3040-84	4	T	C2	24 APR 85	
27 MAR 85	0915	33.67S	041.10W	1575.9	.5	2	3030-83	4	T	C2	24 APR 85	

Surveyor (SUR)

Sample Date (GMT)	Sample Time (GMT)	Latitude (Deg)	Longitude (Deg)	Mean CH4 Conc (ppb)	1st-2nd Aliquot (ppb)	# of Aliquots	Flask I.D.	Flask Type	Collection Method	Analysis G.C.	Analysis Date	Flag
09 SEP 86	0400	20.16N	999.99	1646.7	-6.2	2	3028-83	5	T	C4	09 OCT 86	
09 SEP 86	0636	20.33N	156.01W	1653.6	-1.4	2	3030-84	5	T	C4	09 OCT 86	
24 SEP 86	0600	18.78N	155.51W	1672.9	-2.9	2	3100-83	5	T	C4	09 OCT 86	
24 SEP 86	1000	19.00N	155.20W	1676.2	-4.8	2	3064-84	5	T	C4	09 OCT 86	
24 SEP 86	1500	19.61N	154.83W	1694.9	0.0	2	3042-84	5	T	C4	09 OCT 86	
29 SEP 86	2230	19.49N	154.75W	1689.4		1	3090-84	5	T	C4	22 OCT 86	
30 SEP 86	0030	19.30N	155.05W	1679.4	2.1	2	3008-85	5	T	C4	22 OCT 86	
01 OCT 86	0229	18.86N	155.64W	1697.3	-10.2	2	3046-84	5	T	C4	22 OCT 86	
16 OCT 86	1153	20.32N	155.96W	1690.9	2.4	2	3056-83	5	T	C4	22 OCT 86	
16 OCT 86	1438	20.28N	155.51W	1687.4	1.0	2	3040-85	5	T	C4	20 OCT 86	
20 OCT 86	2240	19.90N	155.05W	1706.4	-5.5	2	3051-84	5	T	C4	13 NOV 86	
21 OCT 86	0152	20.07N	155.46W	1707.4	-5.0	2	3086-84	5	T	C4	13 NOV 86	
21 OCT 86	0330	20.36N	155.79W	1705.8	-1.0	2	3034-85	5	T	C4	13 NOV 86	
08 NOV 86	1919	20.29N	155.77W	1680.9	2.6	2	3038-83	5	T	C4	13 NOV 86	
08 NOV 86	2039	20.17N	155.52W	1683.4	-3.7	2	3096-84	5	T	C4	13 NOV 86	
08 NOV 86	2318	19.89N	155.03W	1679.6	-3.6	2	3060-84	5	T	C4	13 NOV 86	
14 NOV 86	1330	22.21N	157.57W	1691.9	-2.8	2	3052-83	5	T	C4	08 JAN 87	
14 NOV 86	2142	24.01N	157.46W	1692.8	-7.4	2	3057-84	5	T	C4	08 JAN 87	
15 NOV 86	1600	28.00N	157.31W	1705.1	2.5	2	3032-85	5	T	C4	08 JAN 87	
15 NOV 86	2247	29.47N	157.25W	1710.5	5.3	2	3016-85	5	T	C4	08 JAN 87	
17 NOV 86	0727	32.08N	157.20W	1710.2	5.7	2	3008-83	5	T	C4	08 JAN 87	
17 NOV 86	1545	33.97N	157.08W	1704.4	.8	2	3016-84	5	T	C4	08 JAN 87	
18 NOV 86	0040	36.06N	157.09W	1708.8	2.6	2	3040-83	5	T	C4	08 JAN 87	
18 NOV 86	0923	38.04N	157.14W	1712.0	7.2	2	3092-83	5	T	C4	08 JAN 87	
20 NOV 86	2040	42.32N	146.34W	1739.2	7.1	2	3048-84	5	T	C4	08 JAN 87	
21 NOV 86	1844	44.04N	140.48W	1727.6	10.2	2	3002-84	5	T	C4	08 JAN 87	
22 NOV 86	1841	46.01N	133.91W	1729.7	-3.1	2	3010-83	5	T	C4	08 JAN 87	
22 NOV 86	2324	46.39N	132.54W	1726.9	9.5	2	3106-83	5	T	C4	09 JAN 87	
13 JAN 89	1700	64.15S	061.84W	1617.3	15.2	3	3048-70	8	T	C4	18 APR 89	
15 JAN 89	2230	60.19S	047.70W	1623.7	-3.1	2	3032-70	8	T	C4	18 APR 89	
16 JAN 89	1930	56.85S	042.69W	1625.6	-.8	2	3038-70	8	T	C4	18 APR 89	
17 JAN 89	1200	54.11S	039.32W	1618.2	6.1	2	3036-70	8	T	C4	18 APR 89	
20 JAN 89	1220	53.90S	036.03W	1619.7	1.6	2	3044-70	8	T	C4	18 APR 89	
20 JAN 89	2050	54.30S	036.05W	1624.1	1.0	2	3040-70	8	T	C4	19 APR 89	
21 JAN 89	1730	54.52S	035.69W	1619.6	4.4	2	3130-70	8	T	C4	19 APR 89	
24 JAN 89	2245	54.55S	036.75W	1627.8	-5.3	2	3126-70	8	T	C4	19 APR 89	
25 JAN 89	1545	54.32S	037.33W	1614.0	6.9	2	3128-70	8	T	C4	18 APR 89	
27 JAN 89	9999	54.11S	038.79W	1617.5	5.9	2	3124-70	8	T	C4	18 APR 89	
30 JAN 89	1705	53.55S	050.21W	1613.6	14.8	3	3046-70	8	T	C4	12 APR 89	
31 JAN 89	1100	53.24S	057.03W	1612.6	8.9	2	3034-70	8	T	C4	12 APR 89	

Appendix B
Annual Mean Methane Mixing Ratios From the *Southland Star* Flask Samples

Annual mean methane mixing ratios are tabulated for the sites sampled from the *Southland Star* (see Section 2). The annual means were calculated from monthly means for each site in a calendar year. Monthly means for each site were calculated as the arithmetic means of all flask measurements made in a month. In cases where both members of a flask pair were analyzed for CH_4, all the accepted measurements from both flasks were averaged to give a single methane mixing ratio for that sampling event which was used in the monthly mean calculation.

The average sampling interval was approximately three weeks, but for sites near the southern end of the cruise track, two samples were usually collected within ten days as the ship enters port, unloads its cargo, and then sails again soon after. It requires about six weeks before the ship returns to this location again, so for some sites there are months when no samples were collected. To insure that a properly weighted annual mean is calculated, we fit curves to the data (see *Steele et al.*, 1992 for details of the curve fitting process). Monthly means are determined for the sites with missing data by averaging daily values picked off of the fitted curves for the months that are missing flask samples.

Samples are collected only during one leg of the cruise for the three most northern sites (N45, N40, and N35), so the average sampling interval was greater than six weeks for these sites. We do not report annual means for these sites, because there is insufficient data to properly fit curves to fill in the missing data.

We were not able to get flask samples for several months in 1988 due to logistical problems, so we do not report annual means for that year.

Annual Mean Methane Mixing Ratios from the *Southland Star* Flask Samples

Sites (Latitude Bins)	1987 CH_4(ppb)	1988 CH_4(ppb)	1989* CH_4(ppb)	1990+ CH_4(ppb)
N45	[ ]	[ ]	[ ]	[ ]
N40	[ ]	[ ]	[ ]	[ ]
N35	[ ]	[ ]	[ ]	[ ]
N30	1712.7	[ ]	1734.2	1744.0
N25	1703.1	[ ]	1721.3	1726.4
N20	1691.6	[ ]	1704.1	1727.1
N15	1684.9	[ ]	1699.3	1718.9
N10	1671.8	[ ]	1681.0	1696.9
N05	1647.7	[ ]	1668.3	1680.0
000	1637.9	[ ]	1667.3	1668.9
S05	1631.7	[ ]	1657.0	1666.5
S10	1622.6	[ ]	1651.1	1655.8
S15	1614.0	[ ]	1644.0	1645.5
S20	1616.1	[ ]	1640.2	1647.0
S25	1612.6	[ ]	1637.3	1644.4
S30	1614.2	[ ]	1636.0	1643.8
S35	1616.1	[ ]	1636.7	1643.1

* See *Novelli et al.* (1990).

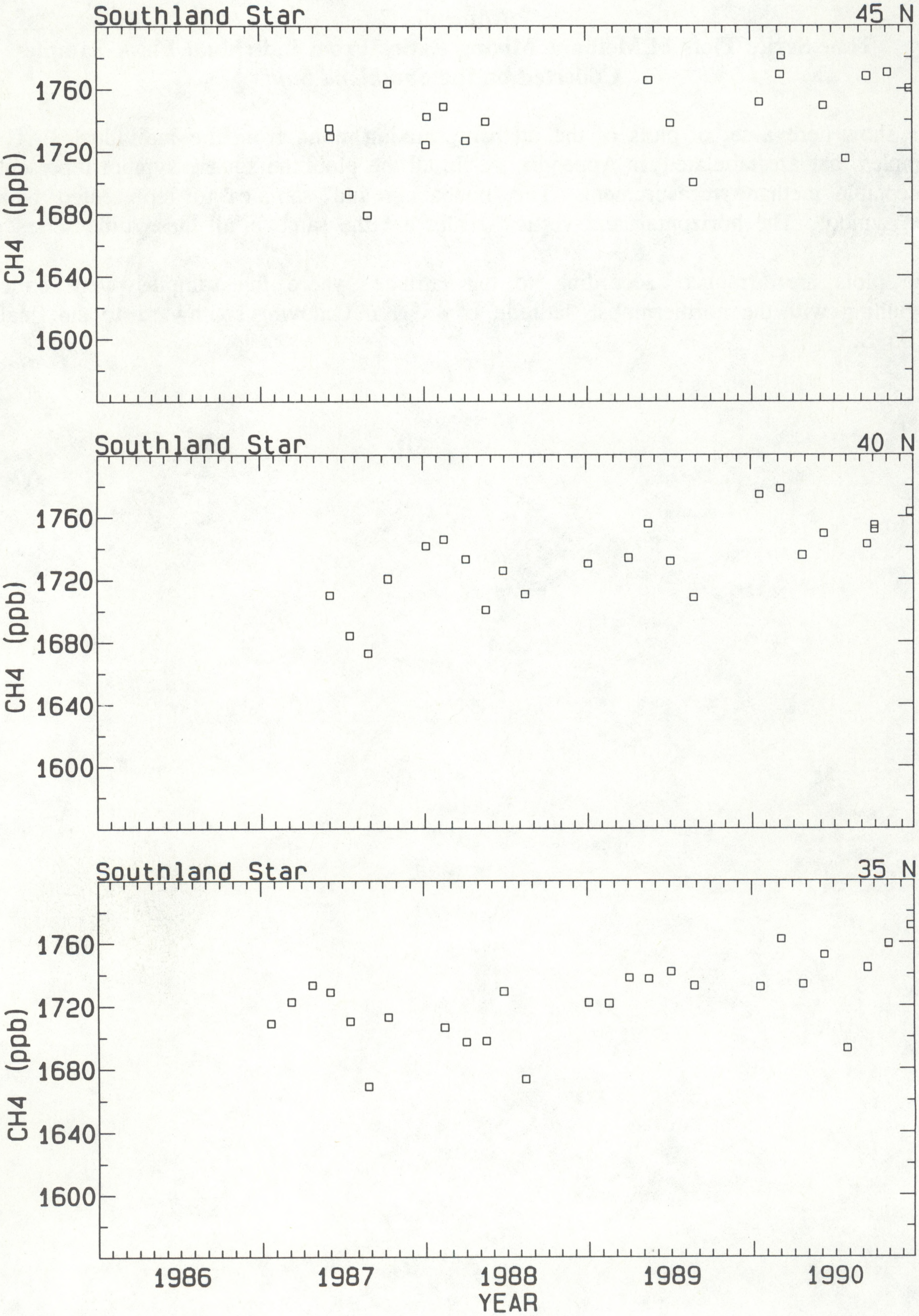
+ See *Tans et al.* (1991).

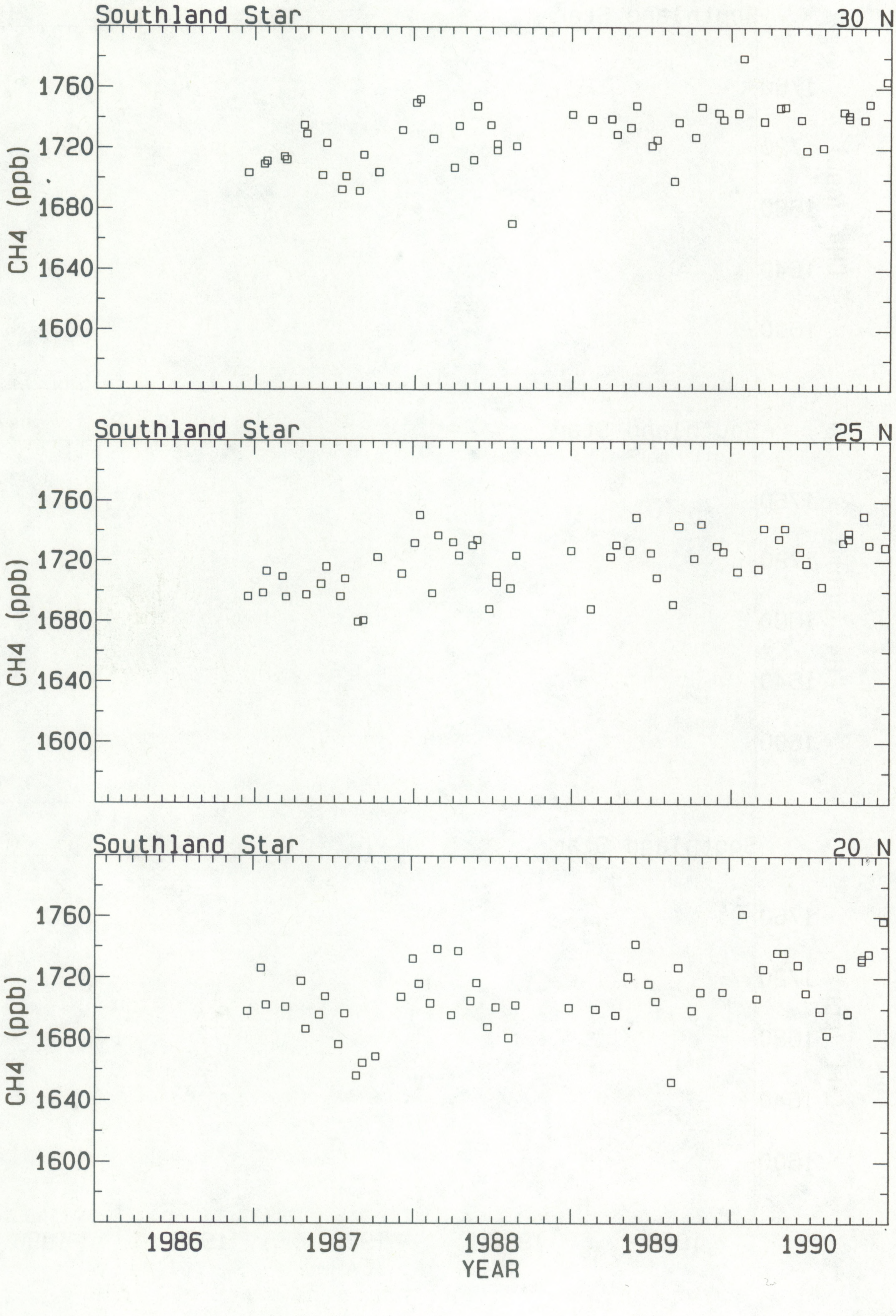
Note: [ ] indicates data were insufficient to calculate an annual mean.

Appendix C
Time Series Plots of Methane Mixing Ratios From Individual Flask Samples Collected on the *Southland Star*

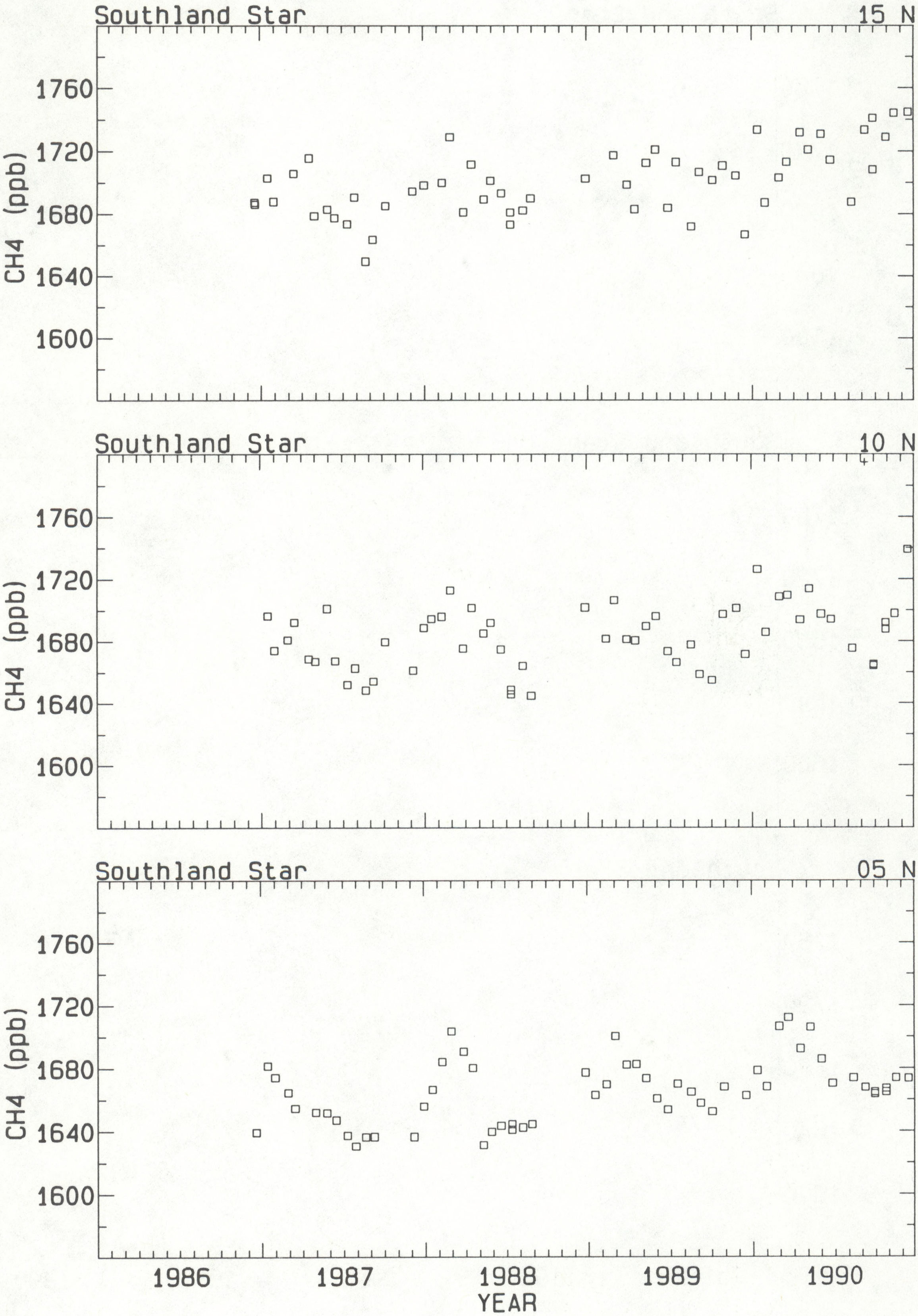
We show here a set of plots of the methane mixing ratios from the individual PAC flask samples that are tabulated in Appendix A. In all the plots the square symbol represents an acceptable methane measurement. The "nonbackground" samples are represented by a plus (+) symbol. The horizontal and vertical scales are the same in all these time series plots.

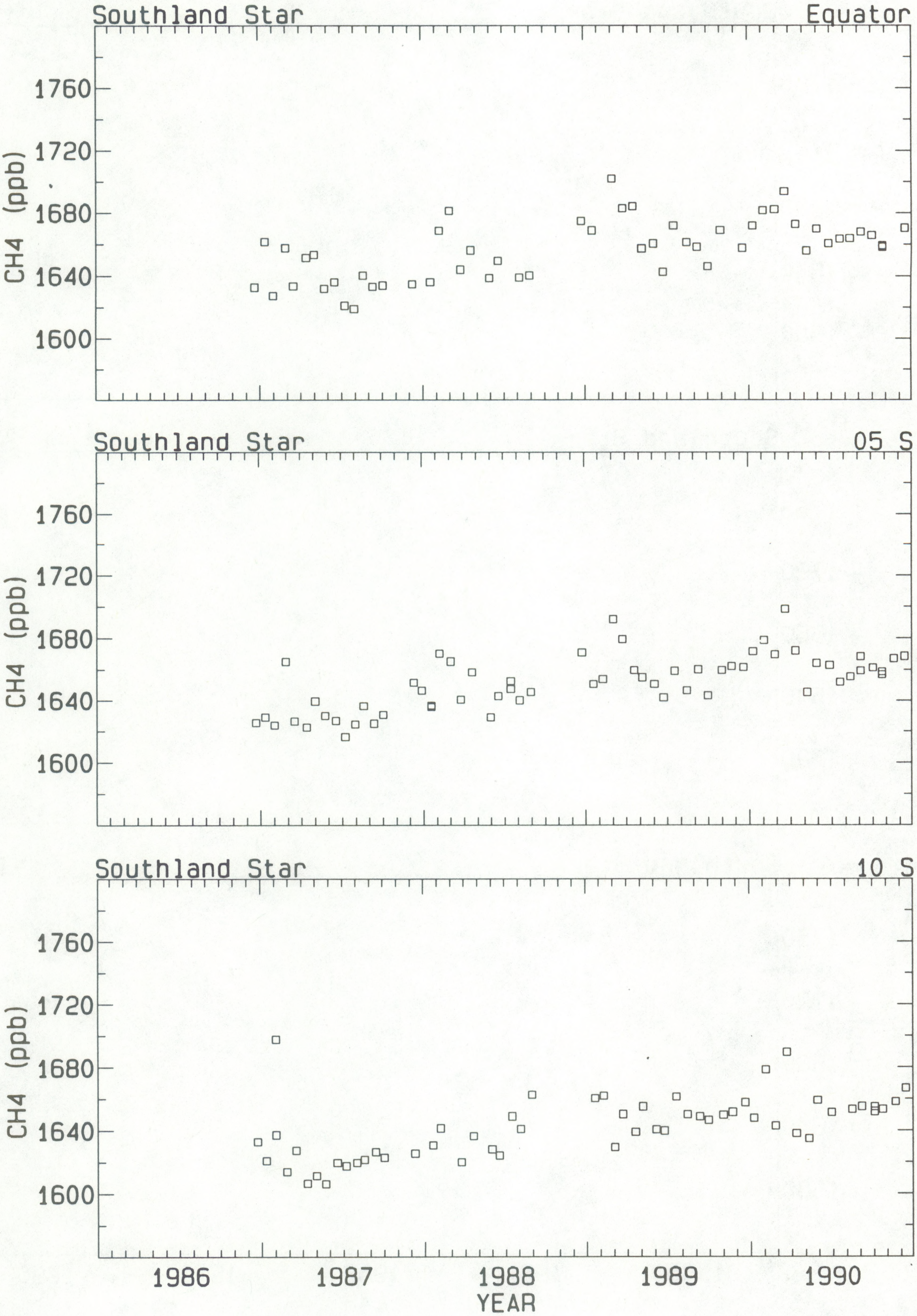
The plots are arranged according to the latitude where the samples were collected, beginning with the northernmost latitude of 45°N and moving southward to the final plot of 35°S.


Southland Star
45 N
40 N
35 N
CH4 (ppb)
1760
1720
1680
1640
1600
1986
1987
1988
1989
1990
YEAR

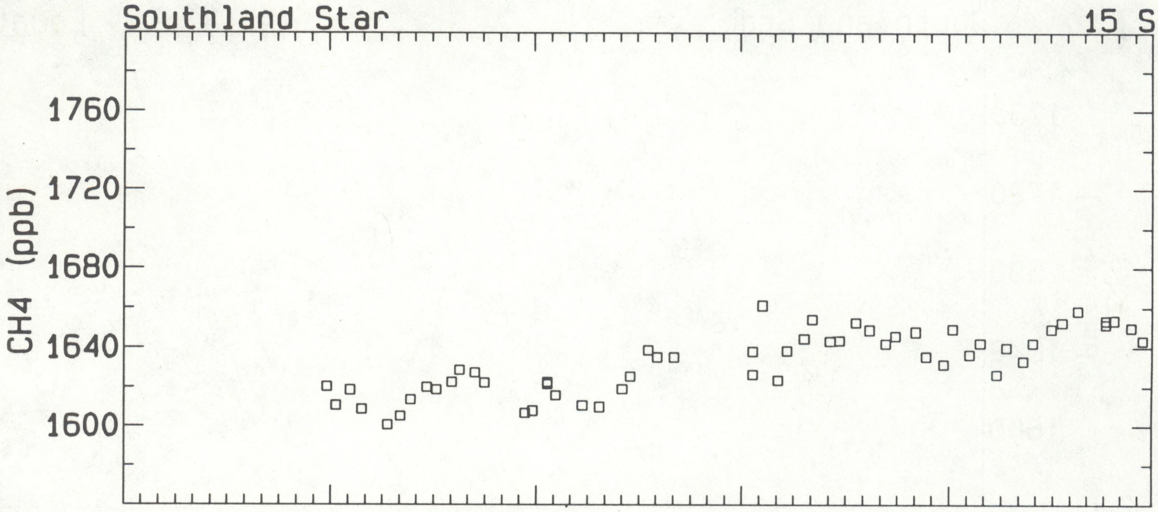


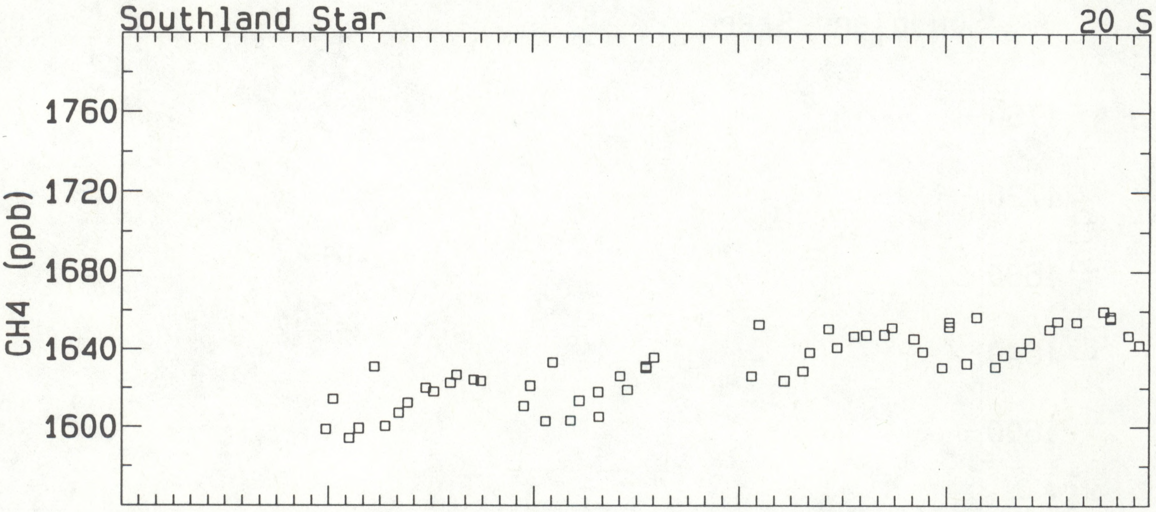
Southland Star
30 N
Southland Star
25 N
Southland Star
20 N
1760
1720
1680
1640
1600
CH4 (ppb)
1986
1987
1988
1989
1990
YEAR

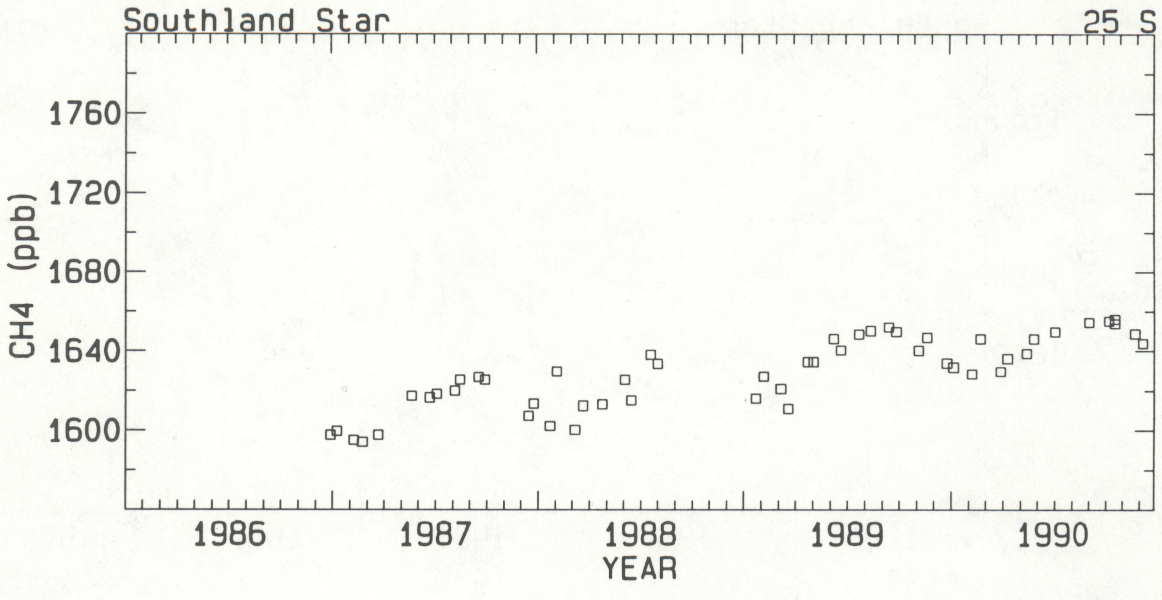

Southland Star
15 N
CH4 (ppb)
1760
1720
1680
1640
1600
Southland Star
10 N
CH4 (ppb)
1760
1720
1680
1640
1600
Southland Star
05 N
CH4 (ppb)
1760
1720
1680
1640
1600
1986
1987
1988
1989
1990
YEAR

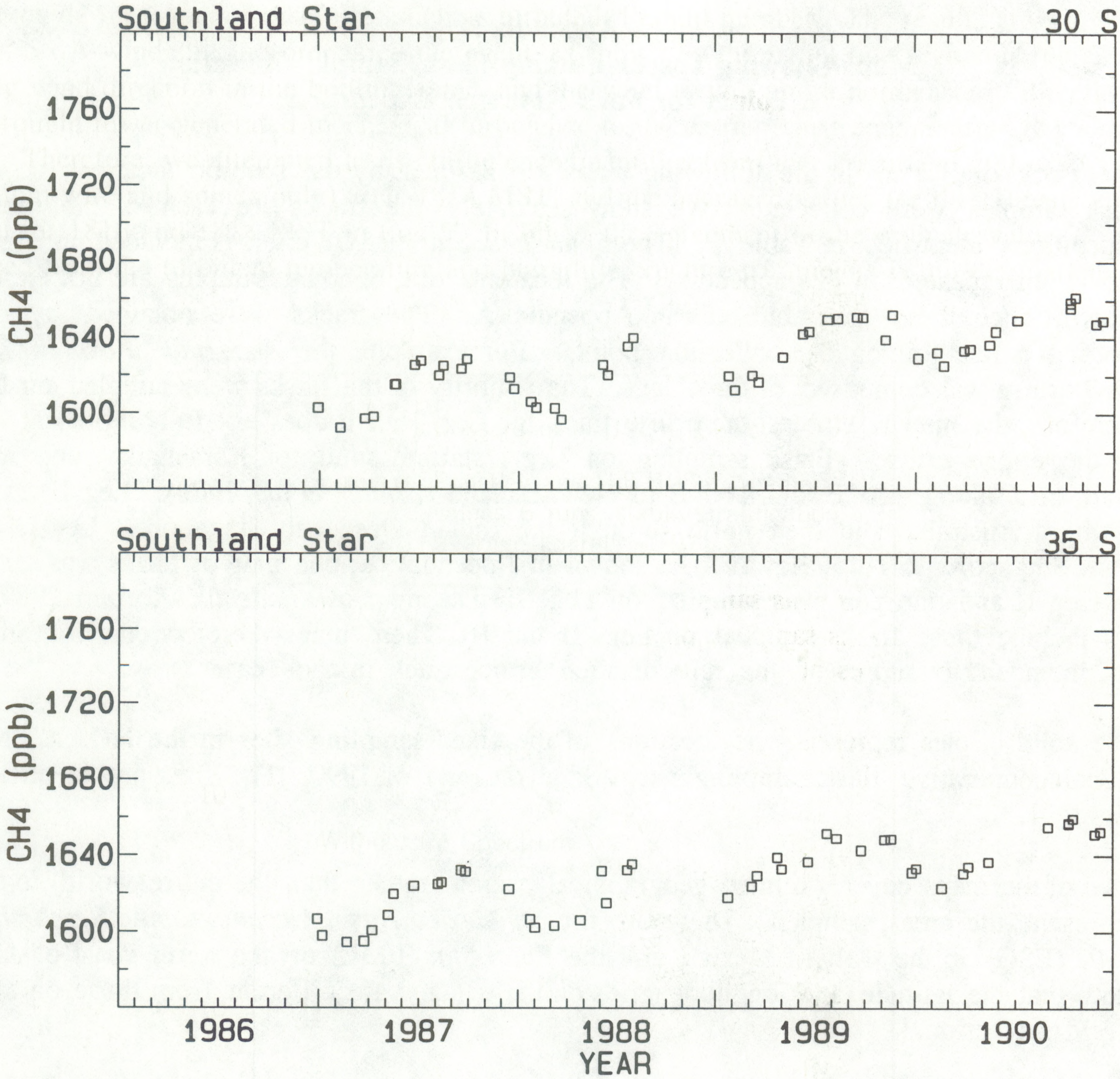


Southland Star
Equator
Southland Star
05 S
Southland Star
10 S
CH4 (ppb)
1600
1640
1680
1720
1760
1986
1987
1988
1989
1990
YEAR


Southland Star
15 S
CH4 (ppb)
1760
1720
1680
1640
1600


Southland Star
20 S
CH4 (ppb)
1760
1720
1680
1640
1600


Southland Star
25 S
CH4 (ppb)
1760
1720
1680
1640
1600
1986
1987
1988
1989
1990
YEAR

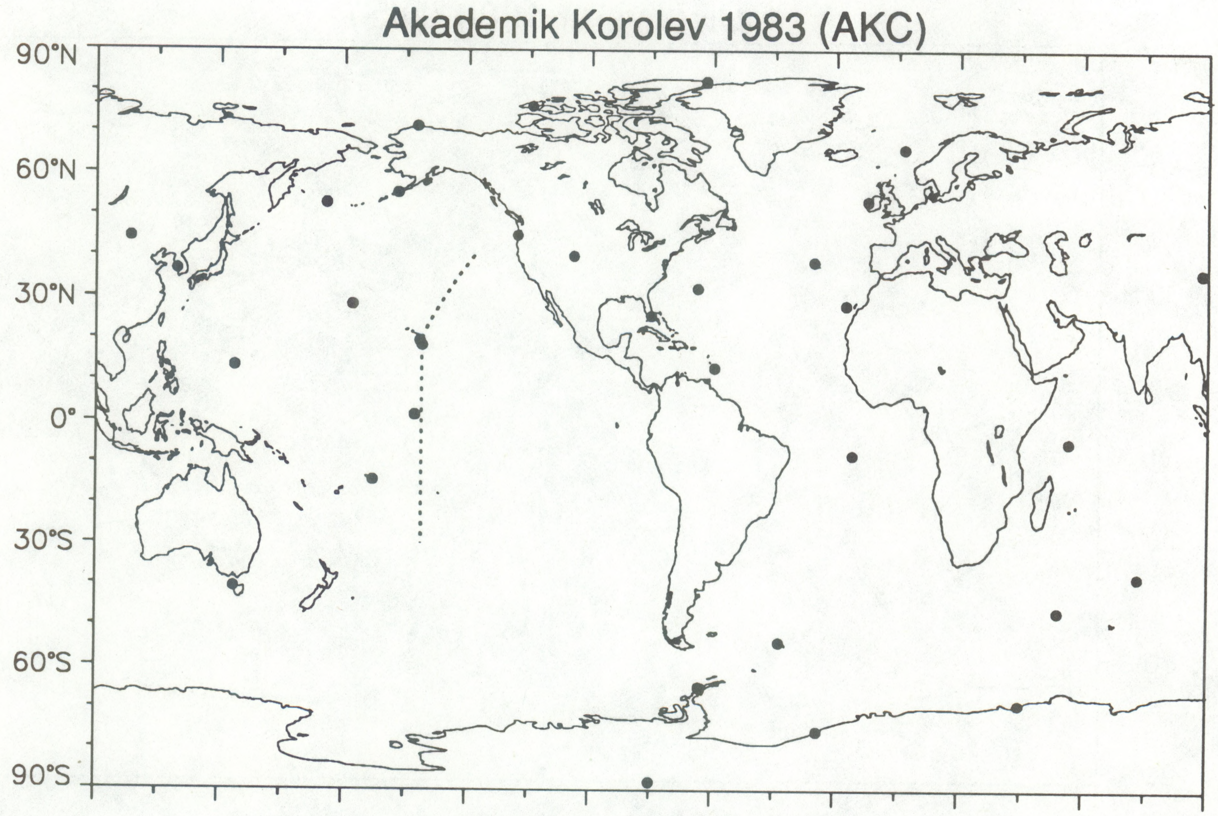

Southland Star
30 S
1760
1720
1680
1640
1600
CH4 (ppb)
Southland Star
35 S
1760
1720
1680
1640
1600
CH4 (ppb)
1986
1987
1988
1989
1990
YEAR

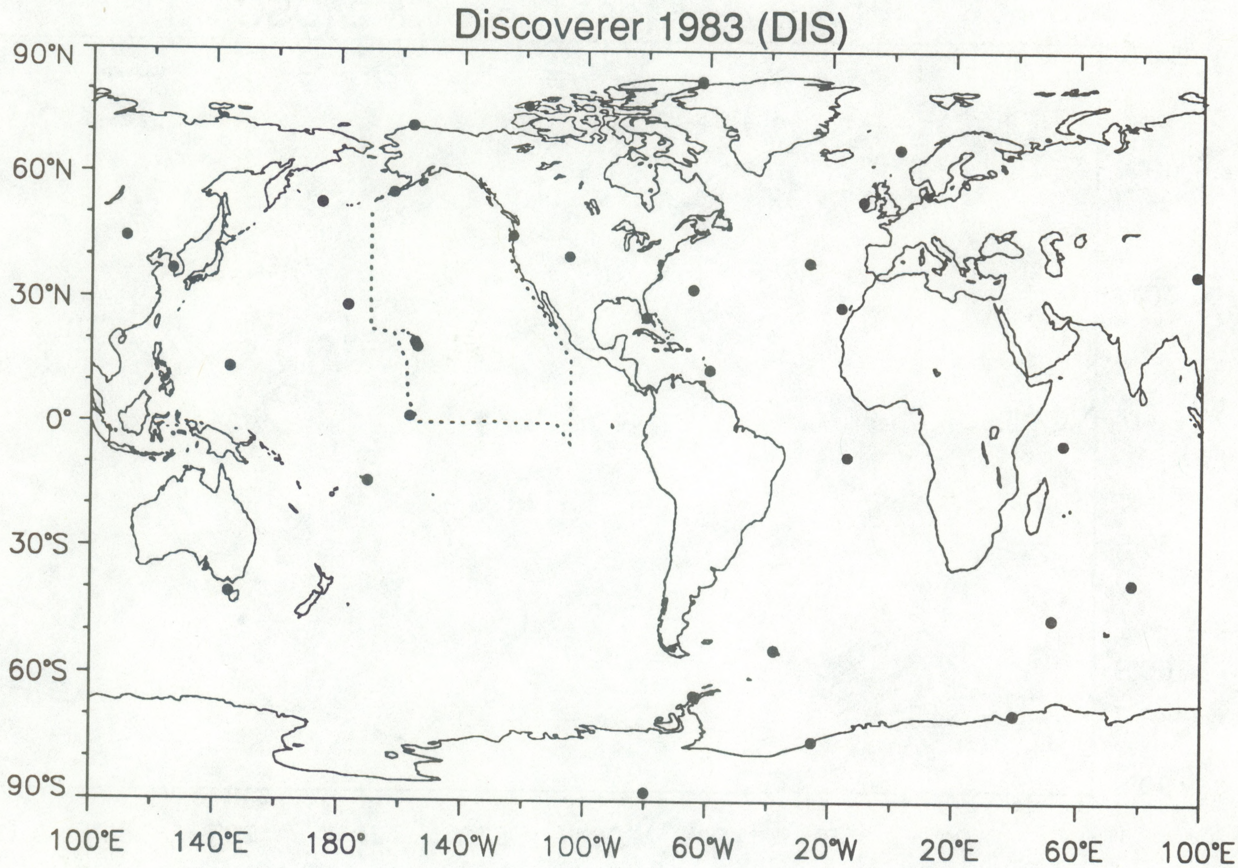
Appendix D
Maps Showing Tracks Linking Flask Sample Collection Points for Each Research Expedition

The tracks indicated in the following maps are defined by the specific locations at which flask samples were collected. We show separately the tracks for each of the research expeditions identified in Table 1. [The *Southland Star* (PAC) track is included in Figure 1 and is not repeated in this appendix.] The locations of individual samples are not explicitly shown, since these are tabulated in Appendix A. The tracks were obtained by simply plotting a line joining the collection points. For example, the *Akademik Korolev* (KOR) 1987 cruise was composed of three legs. The majority of the flasks were sampled on Leg I; therefore the map resembles the cruise track for Leg I but it does not fully represent Leg I or the entire cruise. Flask sampling on Leg I started south of Kamchatka and moved southward along 150°E and 160°E to New Zealand (*Butler et al.*, 1988). Leg II traveled south of Australia and then north through the Indian Ocean to Singapore. Leg III went from Singapore to Hilo, Hawaii. As shown in Appendix A, one pair of flasks was sampled on Leg II and one pair was sampled on Leg III. The map of *Akademik Korolev* 1987 does not include those flasks sampled on Legs II and III. These maps therefore do not, and are not intended to, represent the fully detailed cruise track in each case.

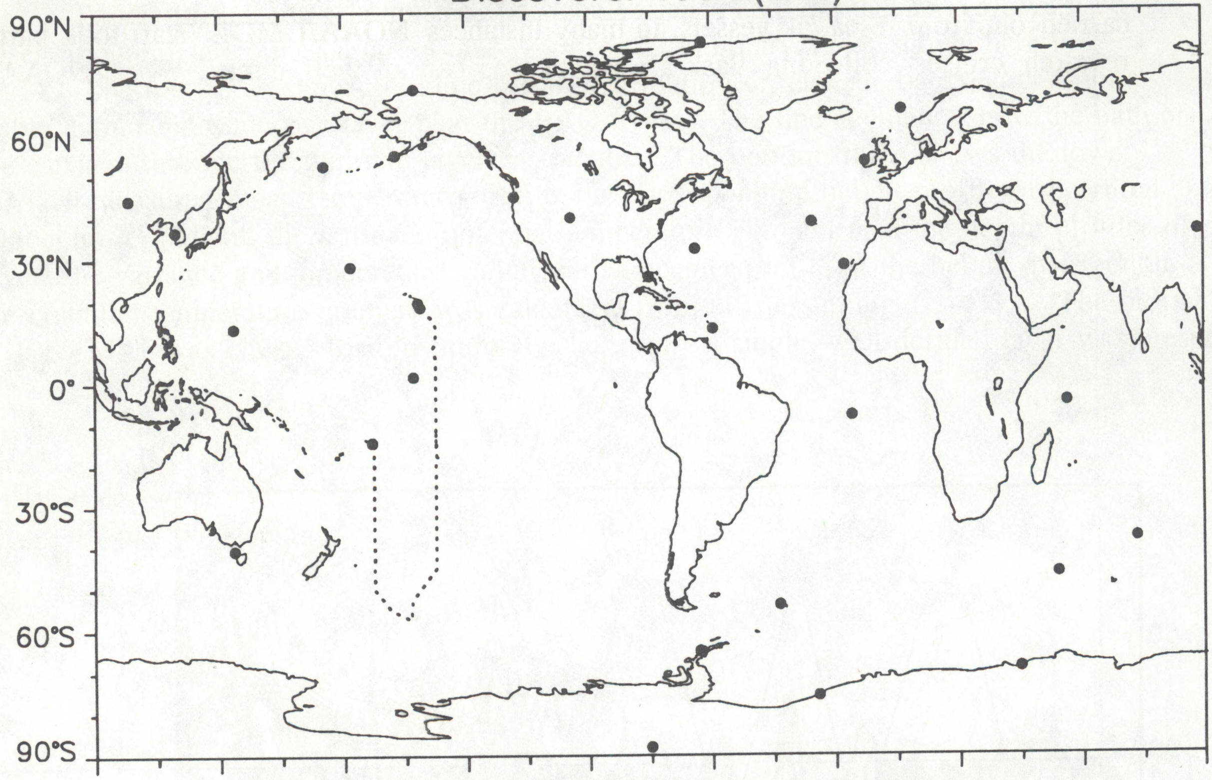
The solid circles represent the locations of the fixed sampling sites in the NOAA/CMDL global cooperative flask sampling network at the end of 1990. The sites are identified in Figure 1.

Two of the maps cover a limited geographical region (rather than the entire world) to better represent the areas sampled. These are for the *Mexico Naval Oceanographic Research Ship H-02* (ESG) in the Gulf of Mexico, and the *Polar Star* (PML) off the north coast of Alaska. Note that the latitude and longitude grids on these maps are different from those on the full world projection.

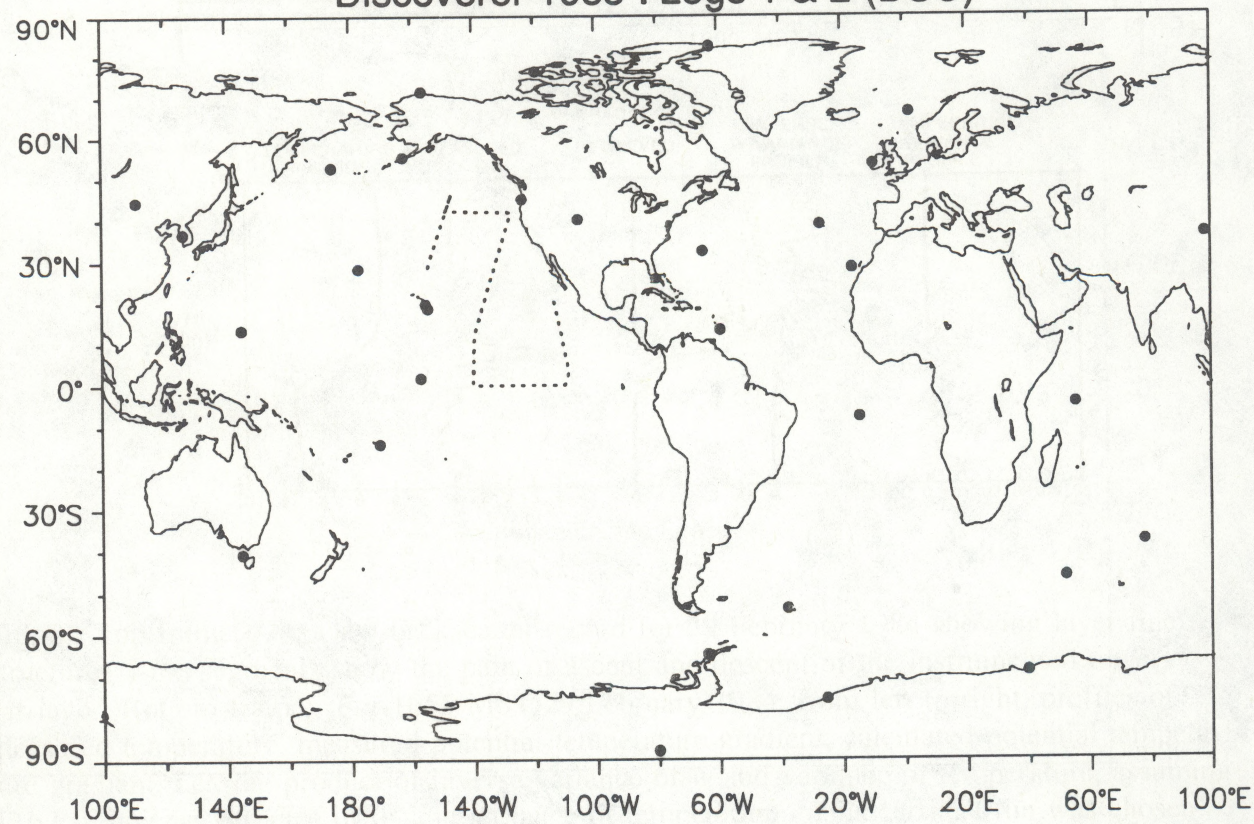

Akademik Korolev 1983 (AKC)
90°N
60°N
30°N
0°
30°S
60°S
90°S


Discoverer 1983 (DIS)
90°N
60°N
30°N
0°
30°S
60°S
90°S
100°E
140°E
180°
140°W
100°W
60°W
20°W
20°E
60°E
100°E

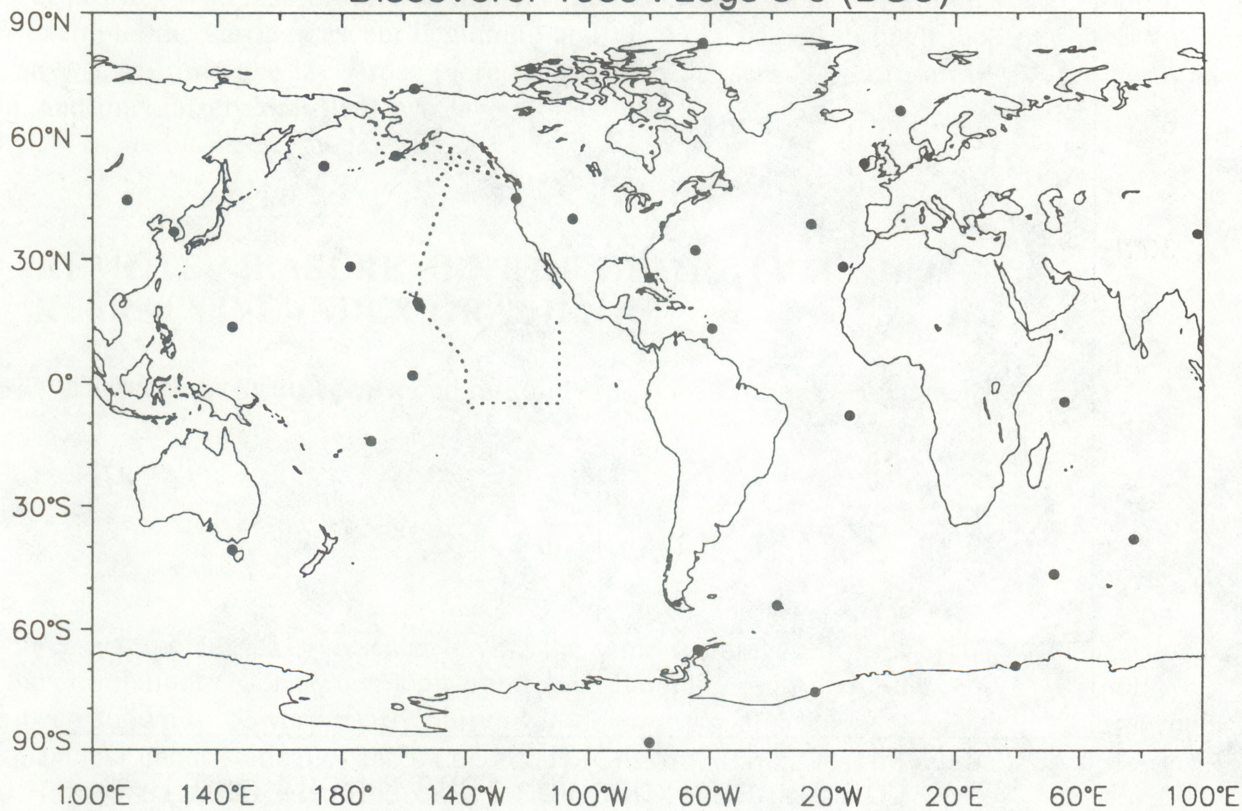
Discoverer 1984 (DIS)



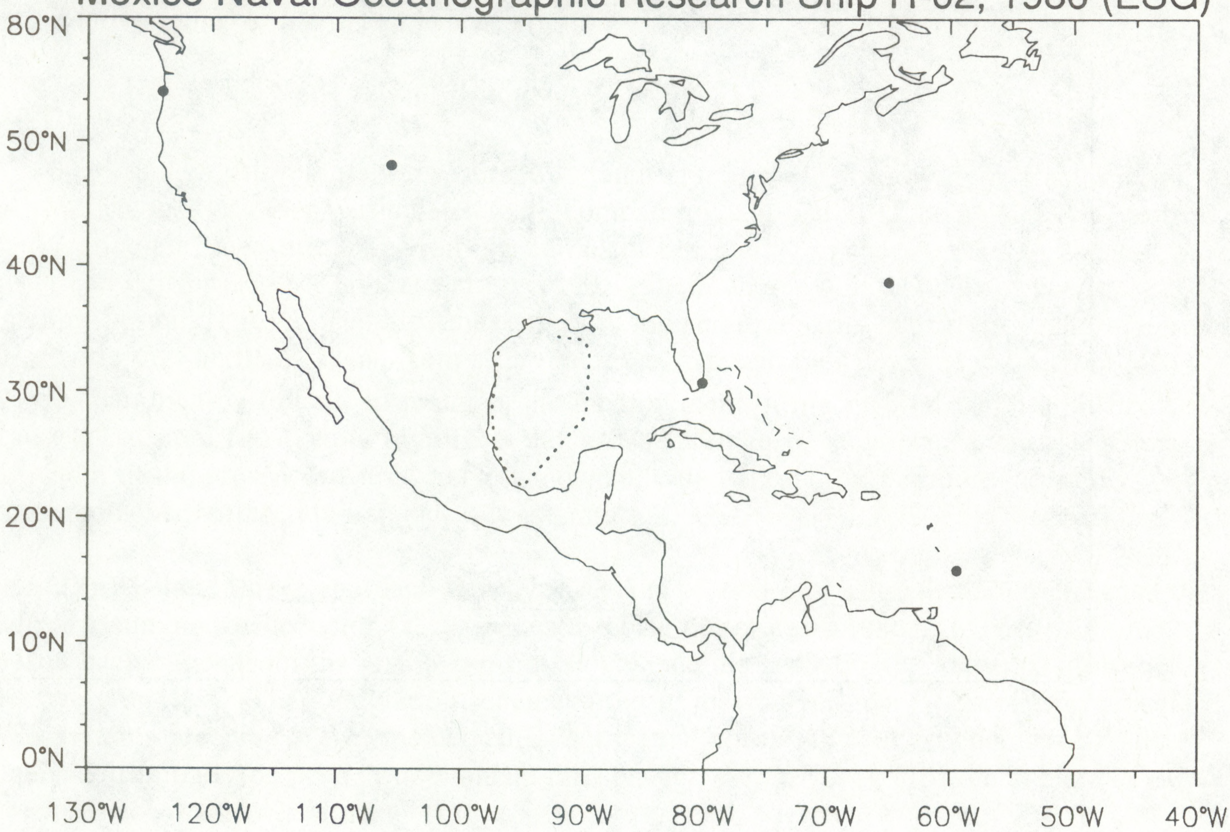
Discoverer 1985 : Legs 1 & 2 (DSC)



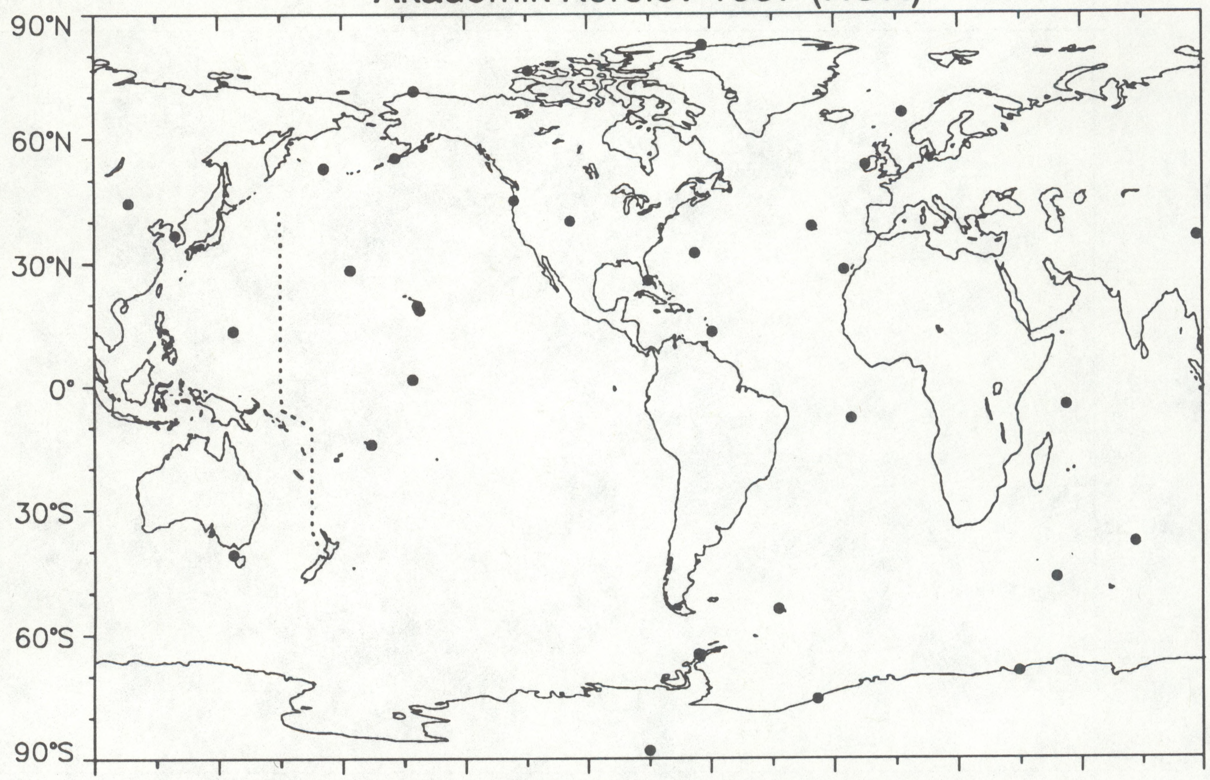
Discoverer 1985 : Legs 3-5 (DSC)



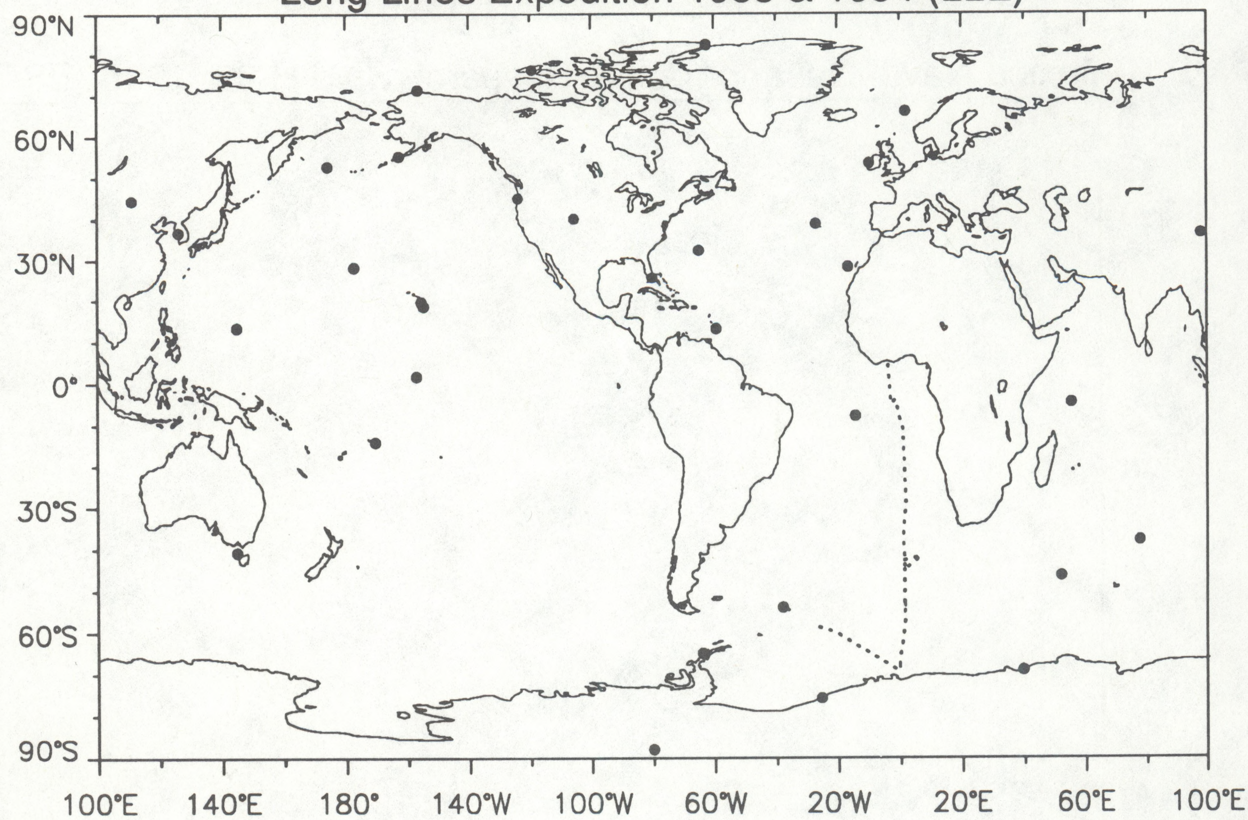
Mexico Naval Oceanographic Research Ship H-02, 1986 (ESG)

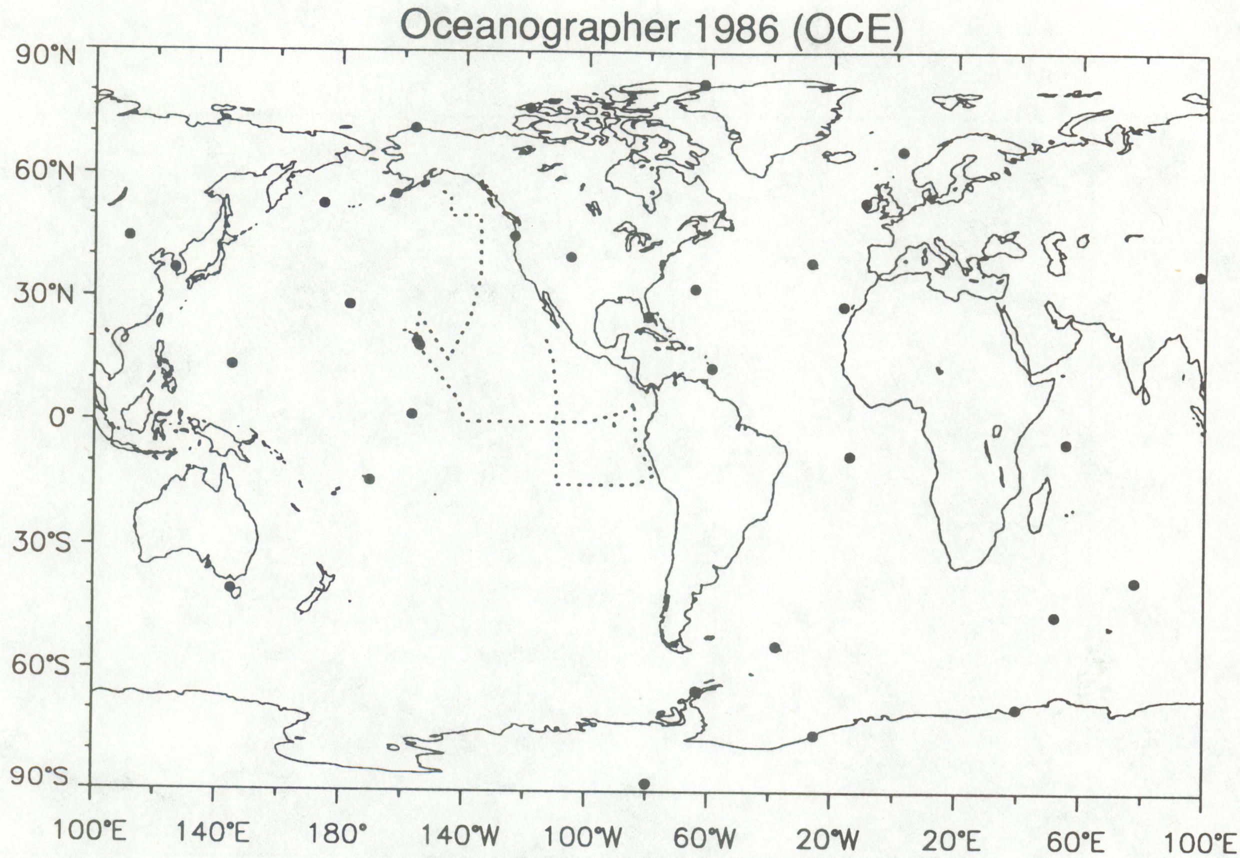


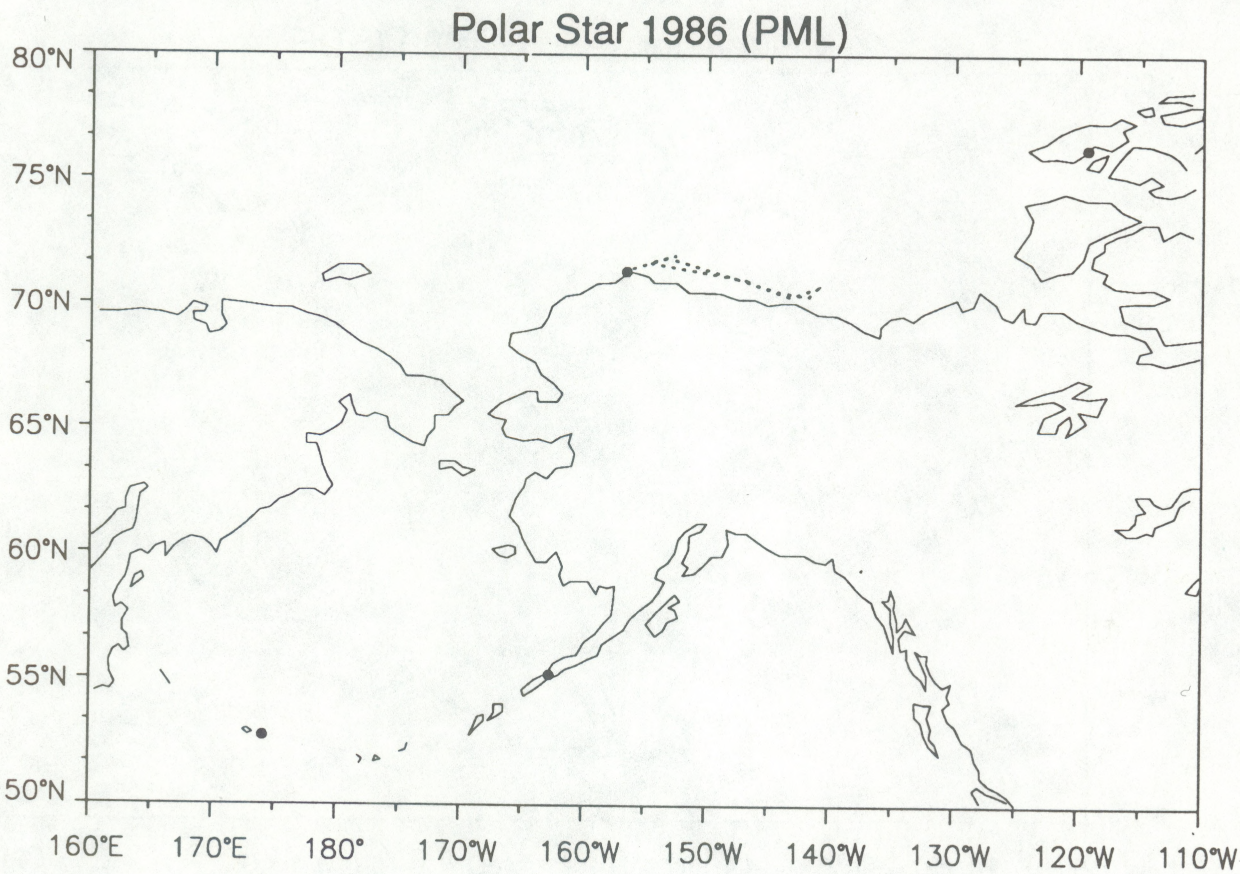
Akademik Korolev 1987 (KOR)



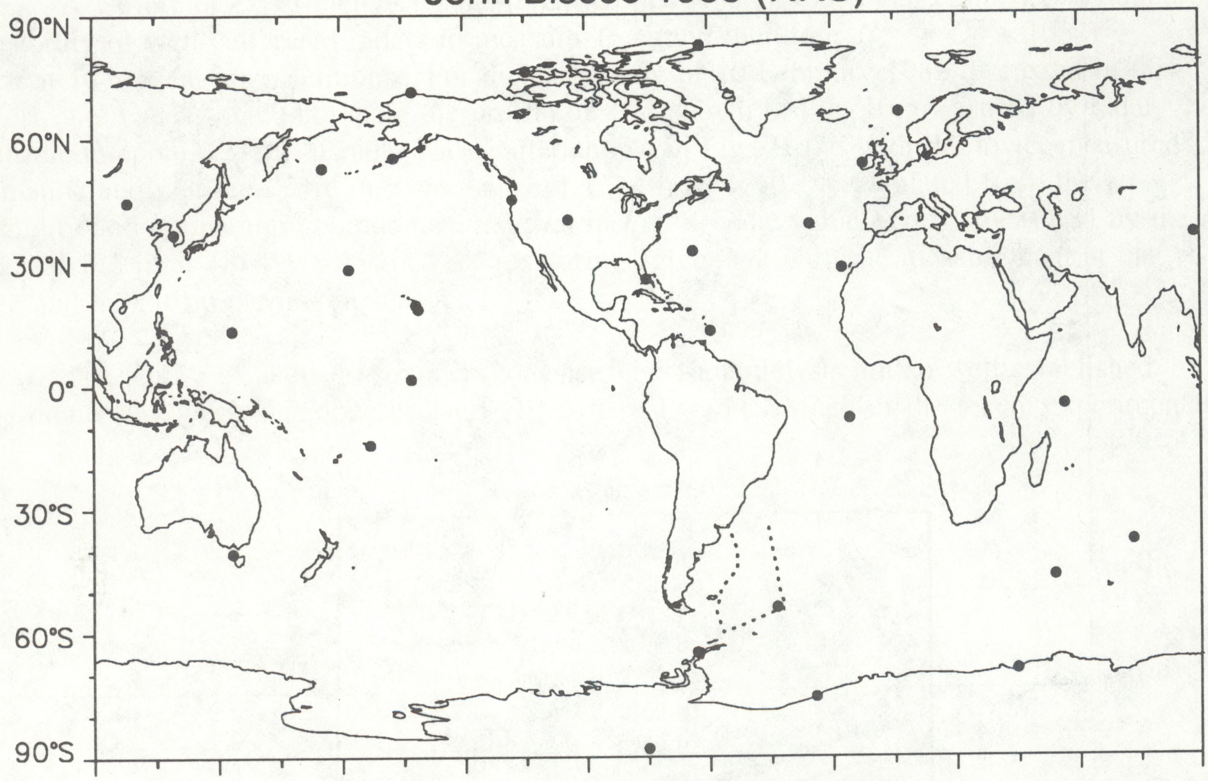
Long Lines Expedition 1983 & 1984 (LLE)



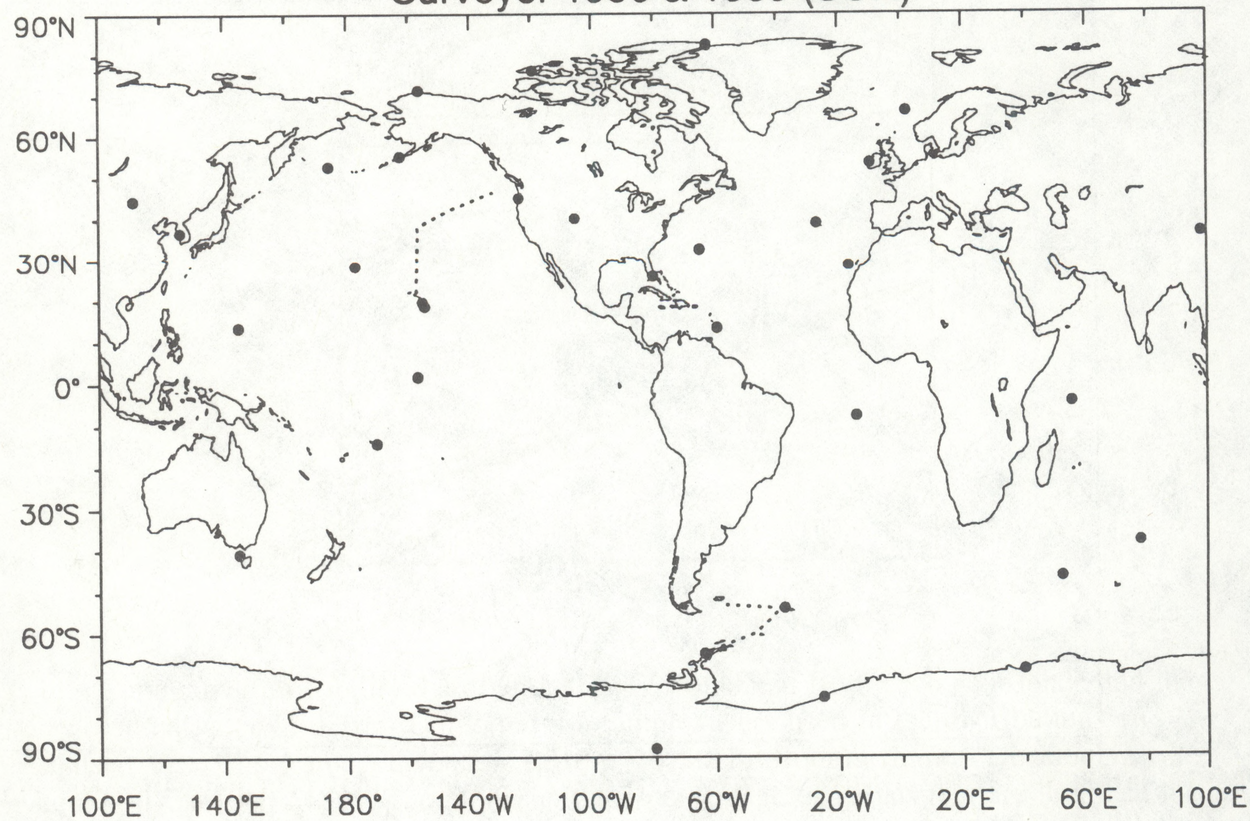

Oceanographer 1986 (OCE)
90°N
60°N
30°N
0°
30°S
60°S
90°S
100°E
140°E
180°
140°W
100°W
60°W
20°W
20°E
60°E
100°E


Polar Star 1986 (PML)
80°N
75°N
70°N
65°N
60°N
55°N
50°N
160°E
170°E
180°
170°W
160°W
150°W
140°W
130°W
120°W
110°W

John Biscoe 1985 (RRS)

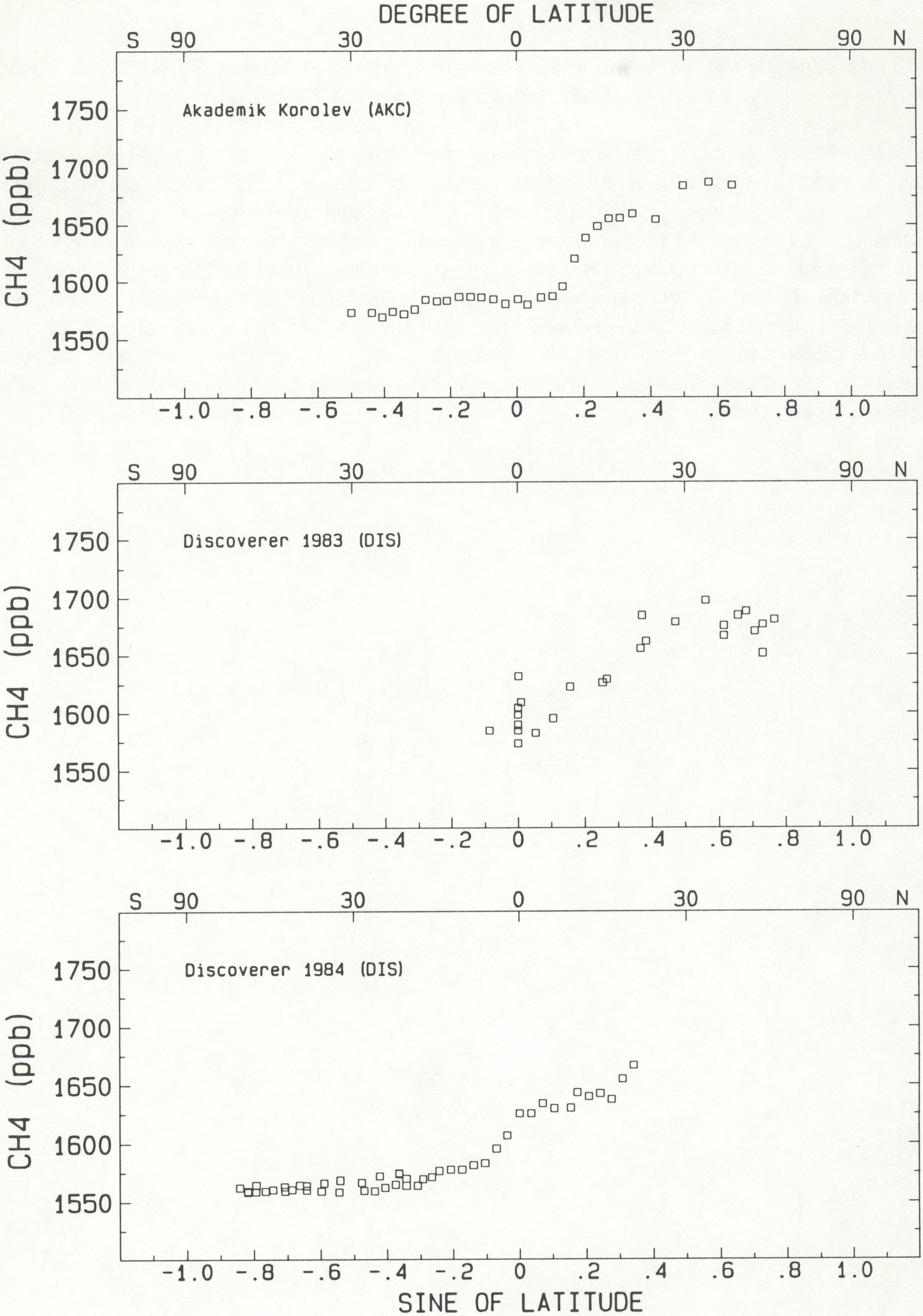


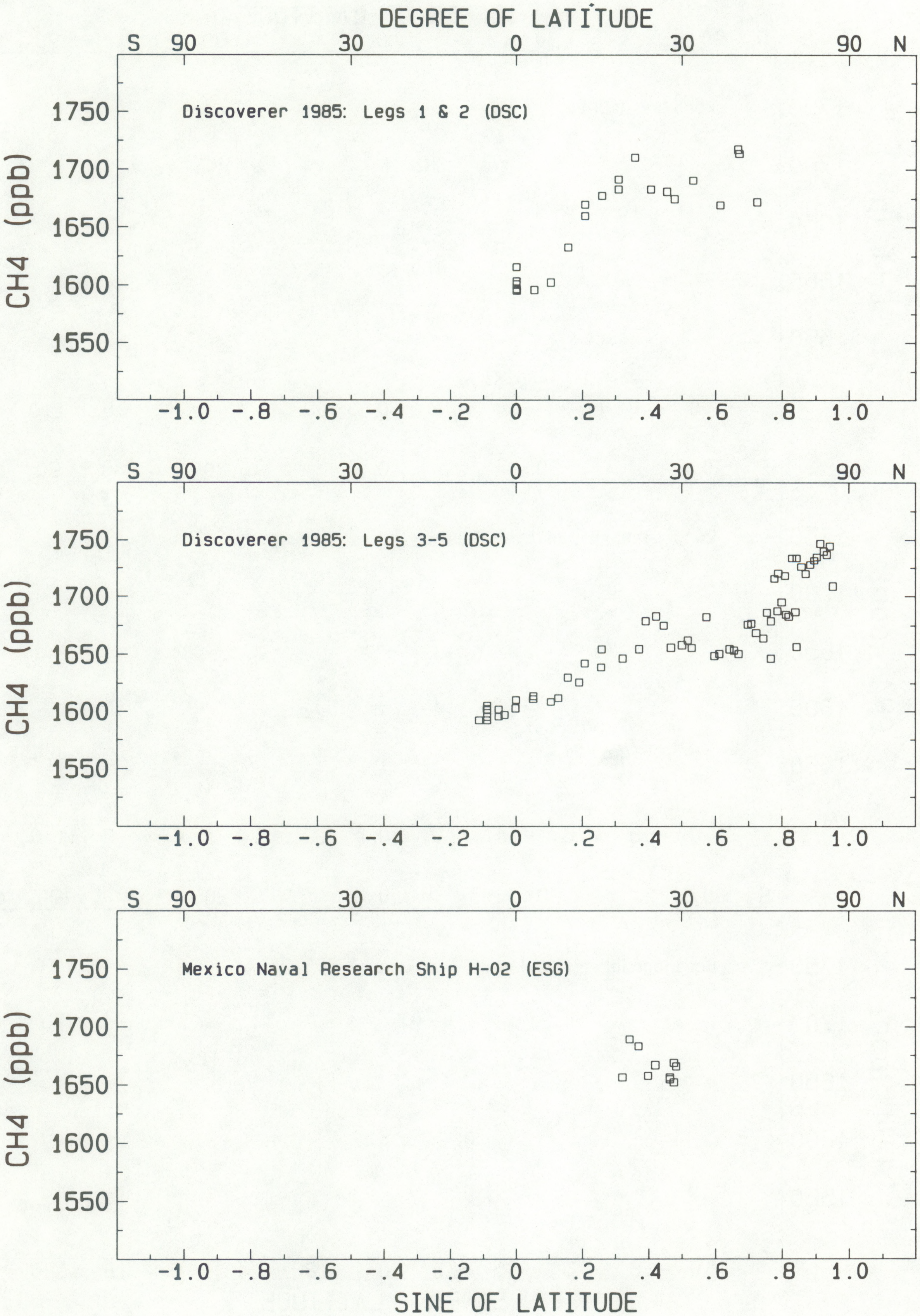
Surveyor 1986 & 1989 (SUR)

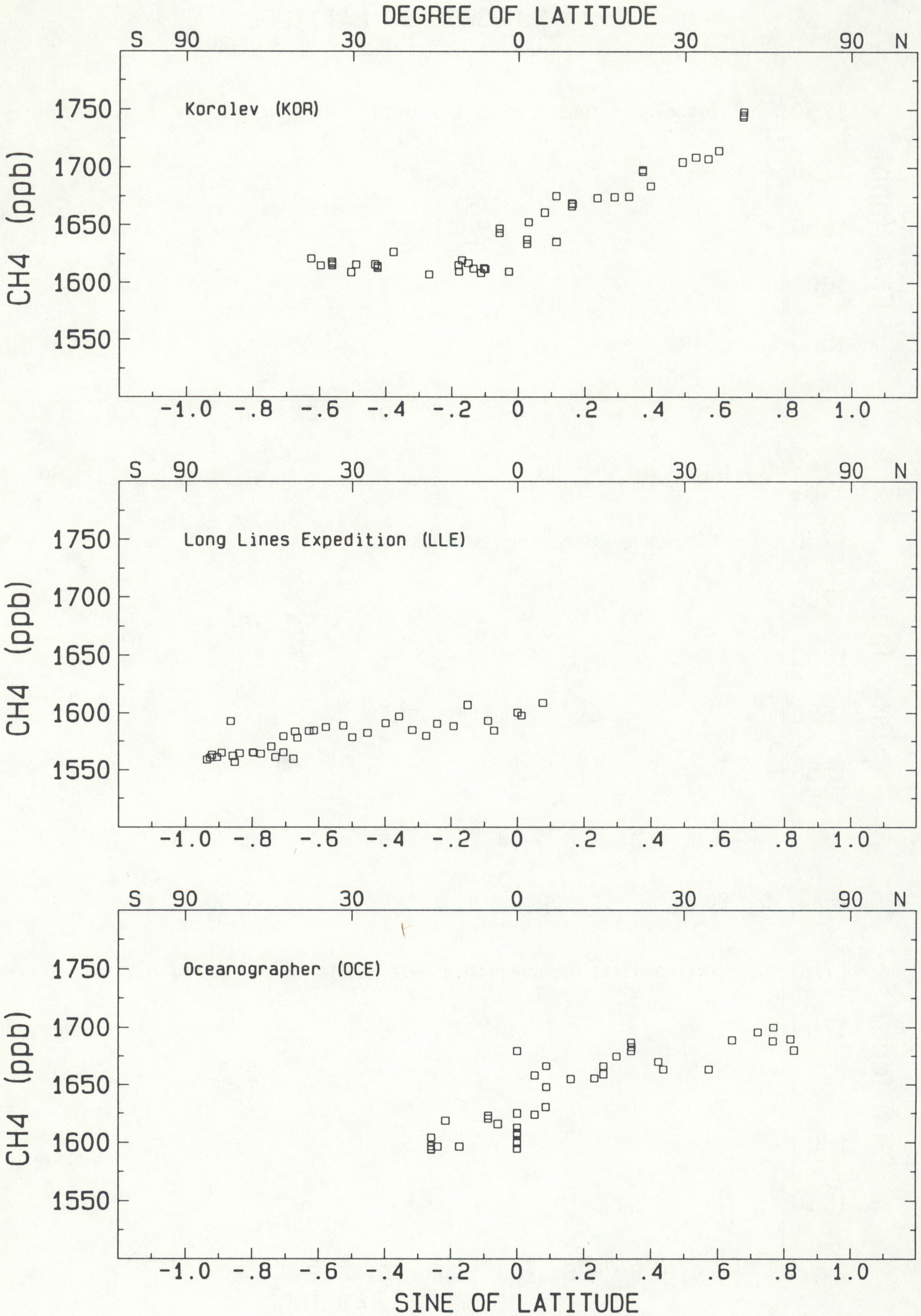


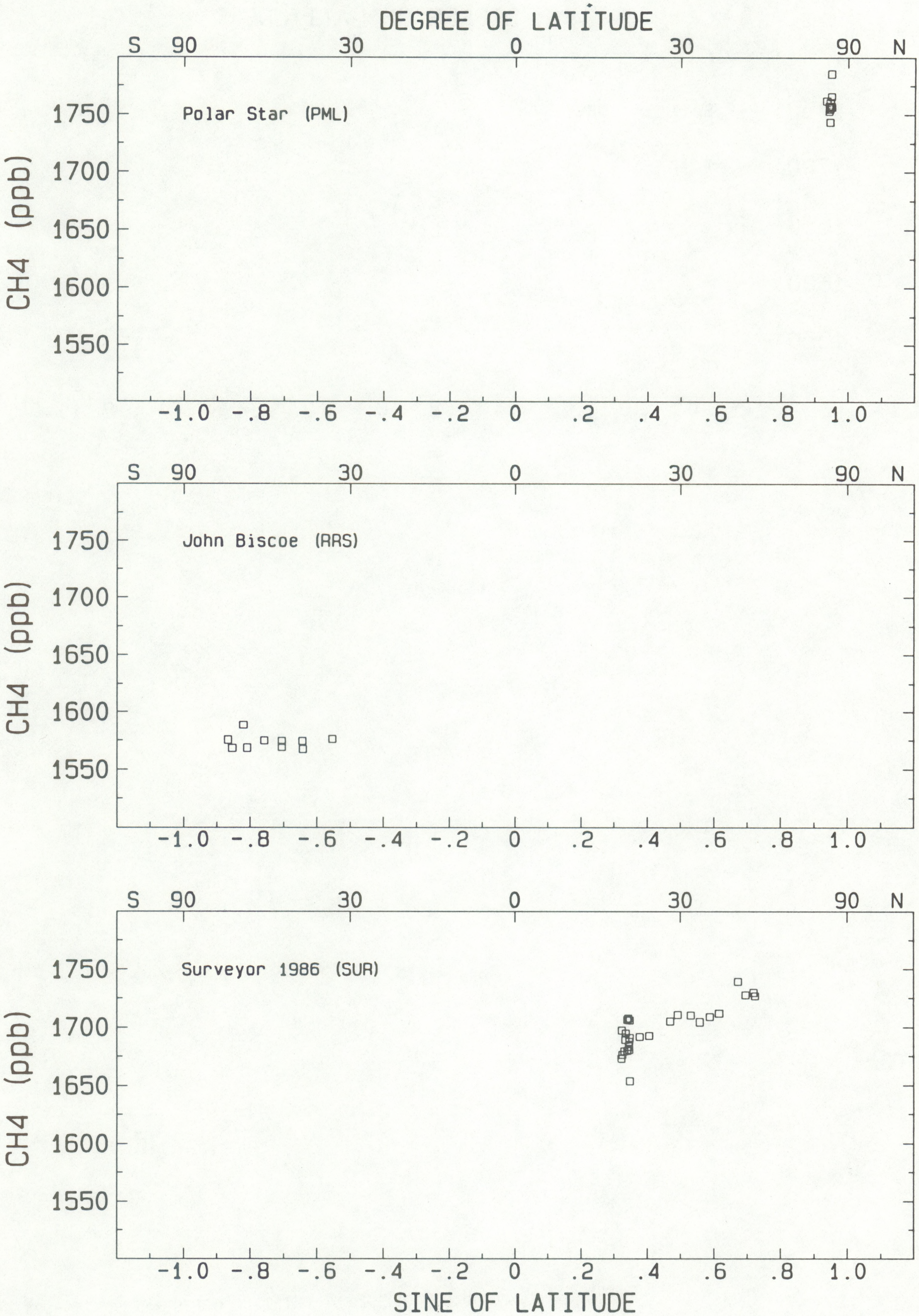
Appendix E
Plots Showing the Variation With Latitude of Methane Mixing Ratios From Flask Samples Collected on the Research Expeditions

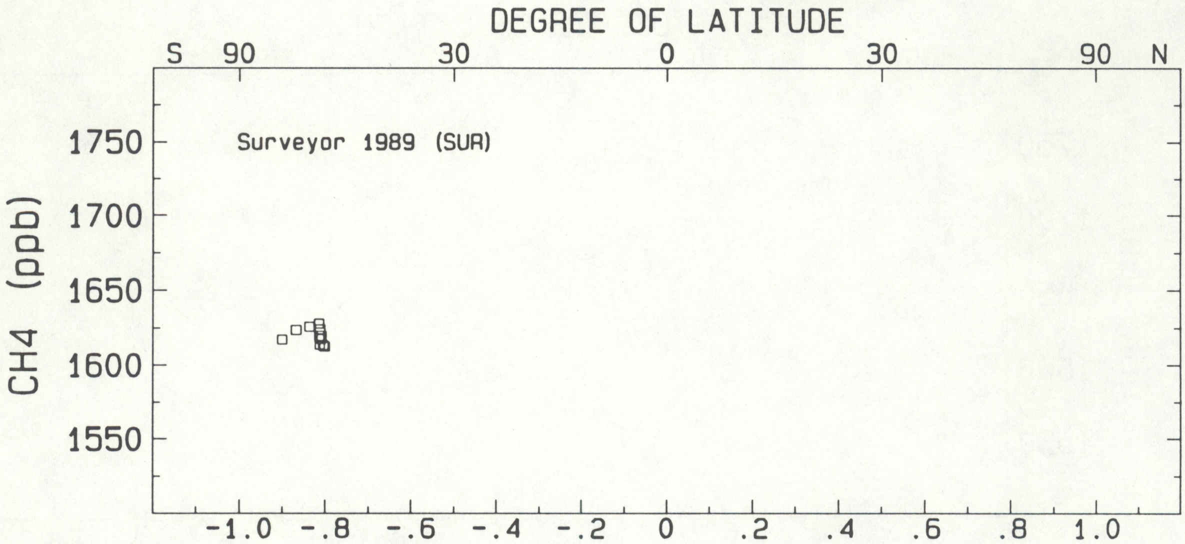
In each of these plots, the methane mixing ratio determined for individual flask samples, and tabulated in Appendix A, are shown versus sine latitude. The panels are identified by the name of the ship or experiment and the three-letter code given in Table 1. As in Appendix D, some of the plots represent a particular segment or segments of an expedition. This was done to give a better representation of the data. It is clear from the tracks shown in Appendix D that in some of these experiments, the same latitude region was traversed more than once. Therefore, because the methane mixing ratios are plotted only as a function of latitude and not time, the apparent scatter in the data in some of the panels reflects either mean seasonal variations, or even the long-term growth of atmospheric methane mixing ratios.


DEGREE OF LATITUDE
S 90 30 0 30 90 N
CH4 (ppb)
1750
1700
1650
1600
1550
Akademik Korolev (AKC)
-1.0 -.8 -.6 -.4 -.2 0 .2 .4 .6 .8 1.0
Discoverer 1983 (DIS)
Discoverer 1984 (DIS)
SINE OF LATITUDE


DEGREE OF LATITUDE
S 90 30 0 30 90 N
Discoverer 1985: Legs 1 & 2 (DSC)
Discoverer 1985: Legs 3-5 (DSC)
Mexico Naval Research Ship H-02 (ESG)
CH4 (ppb)
1550 1600 1650 1700 1750
-1.0 -.8 -.6 -.4 -.2 0 .2 .4 .6 .8 1.0
SINE OF LATITUDE


DEGREE OF LATITUDE
S 90 30 0 30 90 N
Korolev (KOR)
CH4 (ppb)
1750
1700
1650
1600
1550
-1.0 -.8 -.6 -.4 -.2 0 .2 .4 .6 .8 1.0
Long Lines Expedition (LLE)
Oceanographer (OCE)
SINE OF LATITUDE


DEGREE OF LATITUDE
S 90 30 0 30 90 N
Polar Star (PML)
John Biscoe (RRS)
Surveyor 1986 (SUR)
CH4 (ppb)
1550 1600 1650 1700 1750
-1.0 -.8 -.6 -.4 -.2 0 .2 .4 .6 .8 1.0
SINE OF LATITUDE



*U.S. GOVERNMENT PRINTING OFFICE: 1992-774-025/69035