Surface Treatment of Canister

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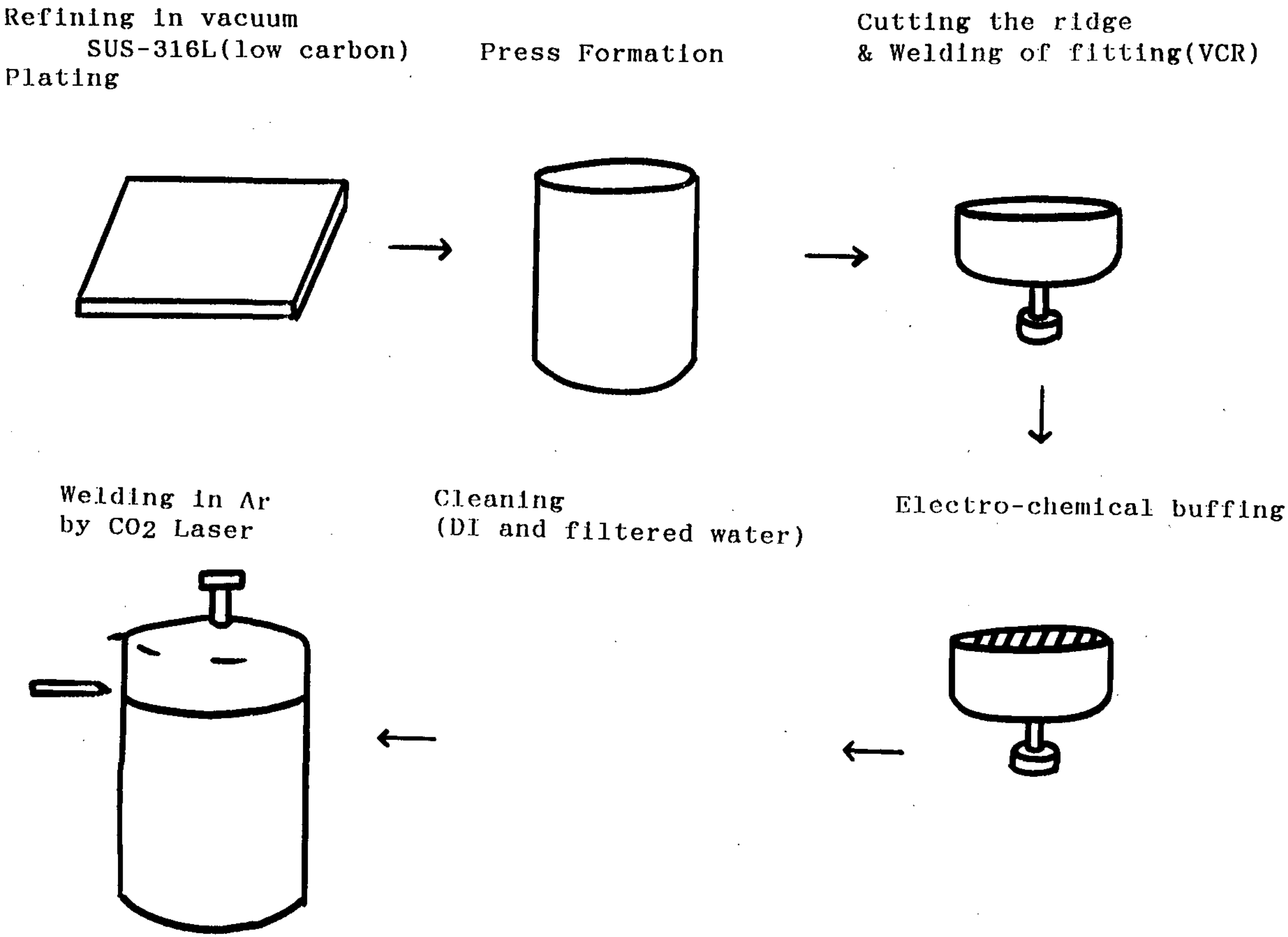
Purpose — No Adsorption, Desorption and Out gas
Development of Standard Gas Cylinder

Direction of Approach

- Selection of material
- Minimize the effective surface area
- Stabilize the surface chemically
- Processing in Vacuum or in Ar
- Minimize the dead volume of valves
- Cleansing by water
  (Never by CFC nor other organic solvent)
- Light weight
- Not expensive

1. Treatment process
2. Qualification of surface
3. Preservation characteristics
4. Further application


Refining in vacuum
SUS-316L(low carbon)
Plating
Press Formation
Cutting the ridge
& Welding of fitting(VCR)
Electro-chemical buffing
Cleaning
(DI and filtered water)
Welding in Ar
by CO2 Laser

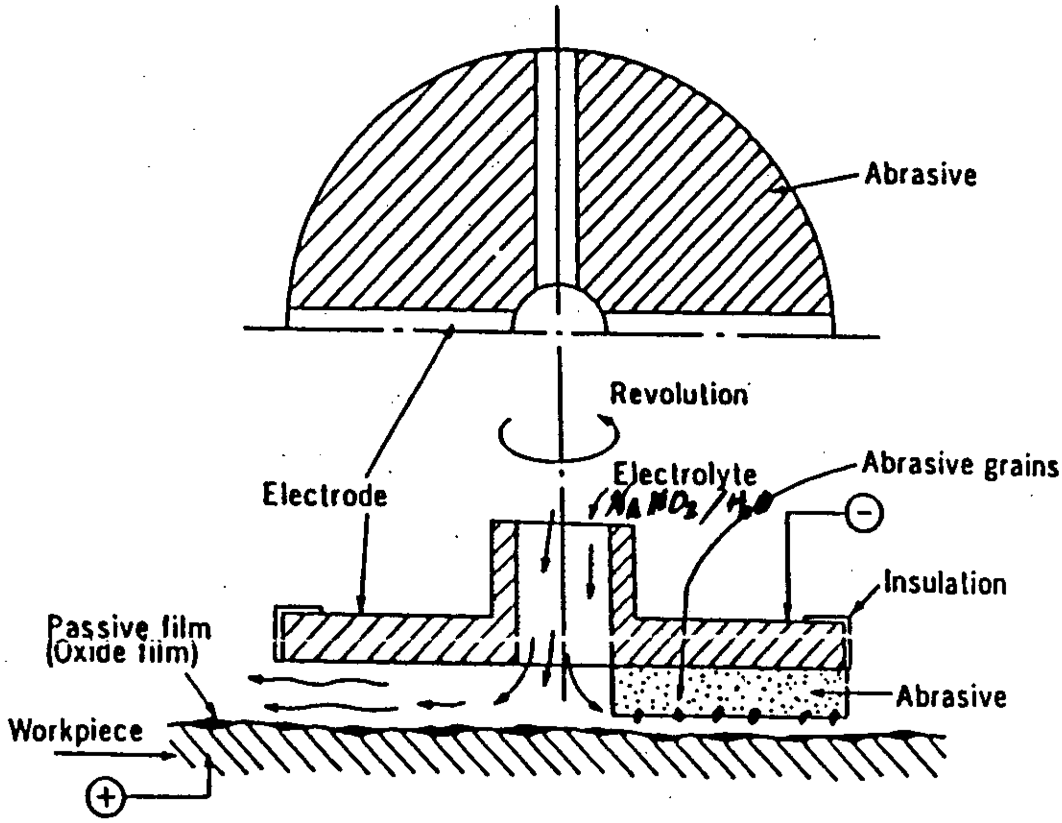


FIG. 2. Principle of electrochemical buffing.

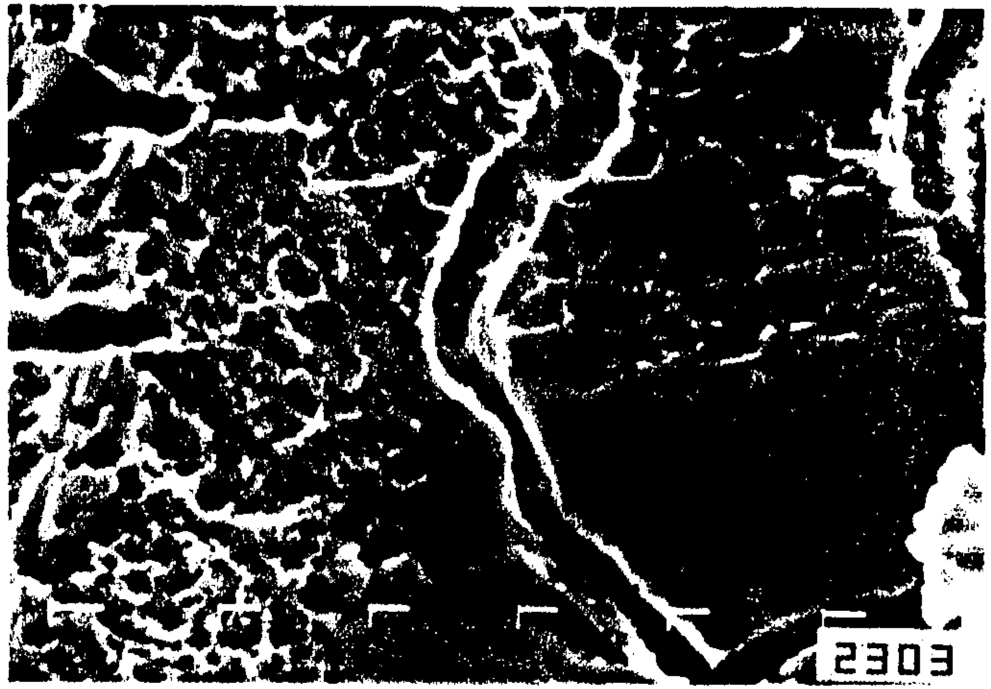


図3-3-1(a)　熱間圧延材（ＳＵＳ３０４　１０ｔ）
Hot Roller Press

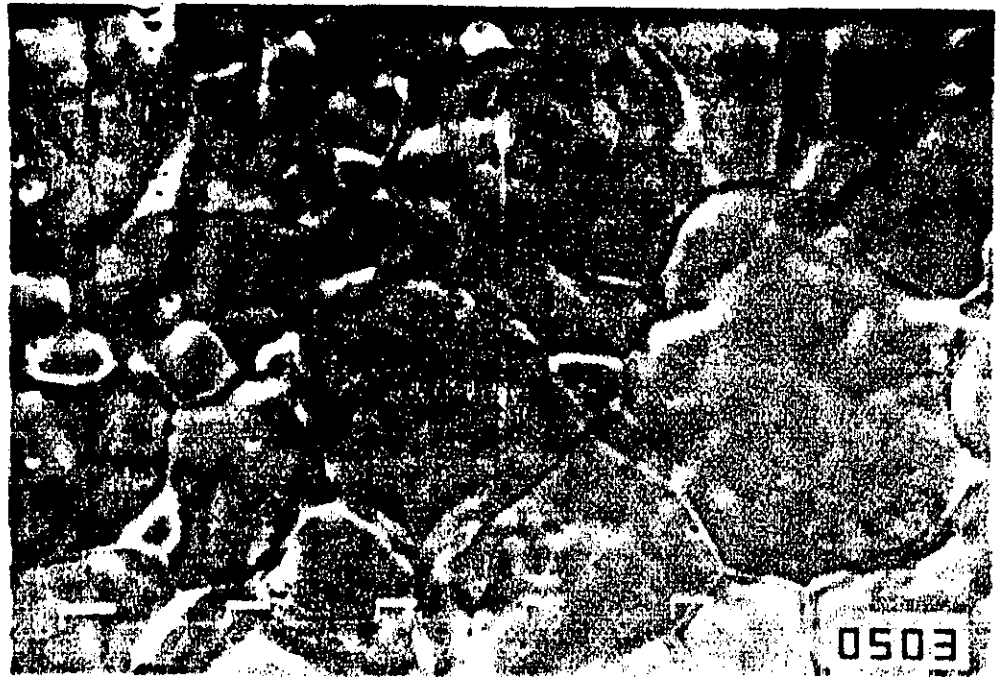
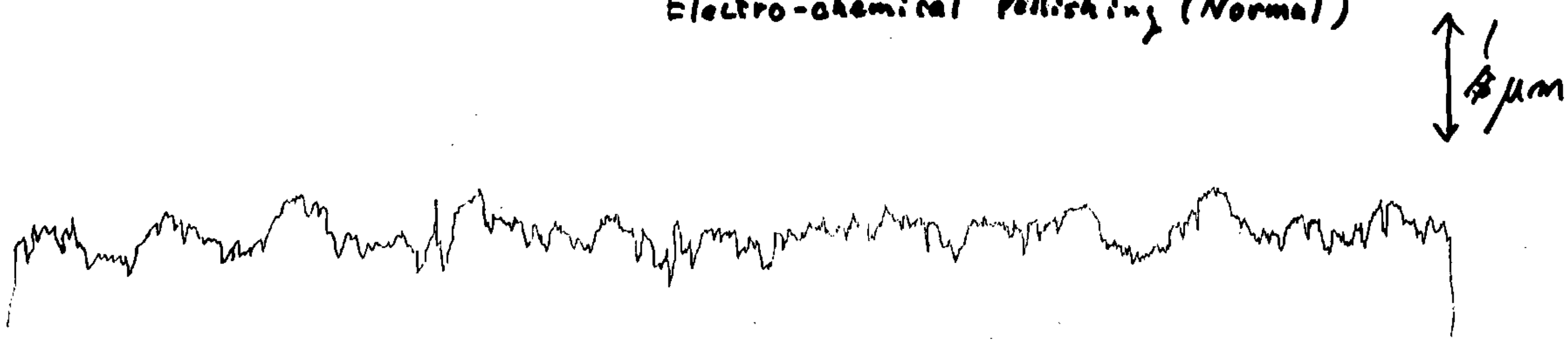


図3-3-1(e)　電解研磨　(＃４００＋ＥＰ)

Electro-chemical Pollishing (Normal)



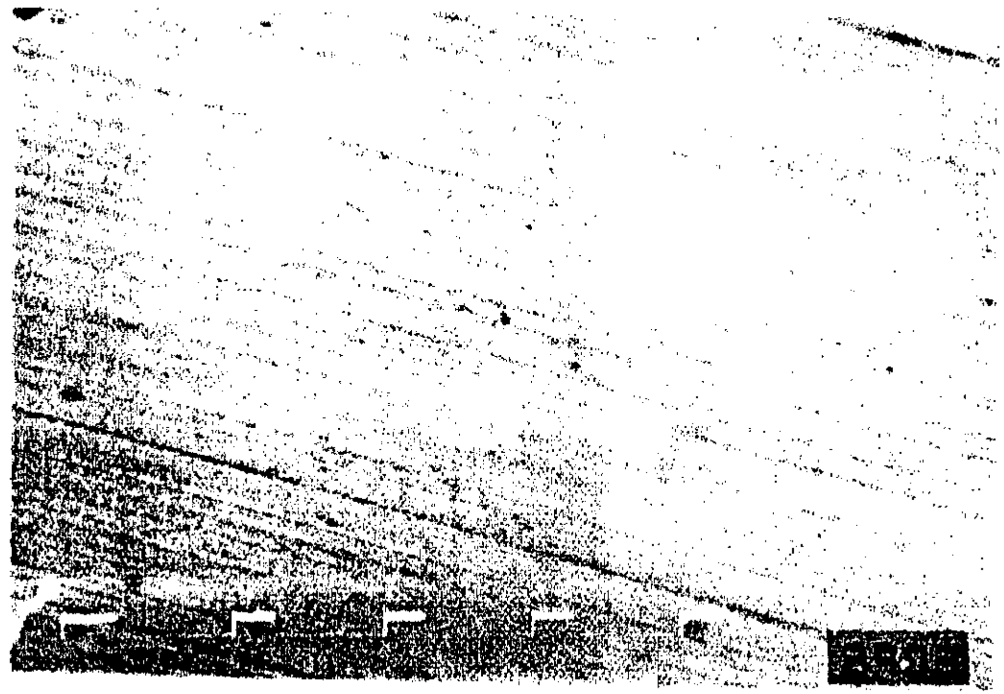


図3-3-1(f)　電解複合研磨（ＥＣＢ　ＭＡグレード）
Electro-chemical buffing

TABLE I. Surface atomic compositions (at. %) of a type 316L stainless steel before and after electrochemical buffing (ECB) measured by XPS without sputter etching.

Xray Photoemission Spect.

Elements	Before ECB	After ECB	
O	77.4	71.0	0.92
Cr	8.1	14.6	1.80
Mn	0.6	1.8	3.0
Fe	11:3	9.3	0.82
Ni	2.3	2.3	1.0
The other	0.3	0.5	1.67

no C was observed!

After/Before

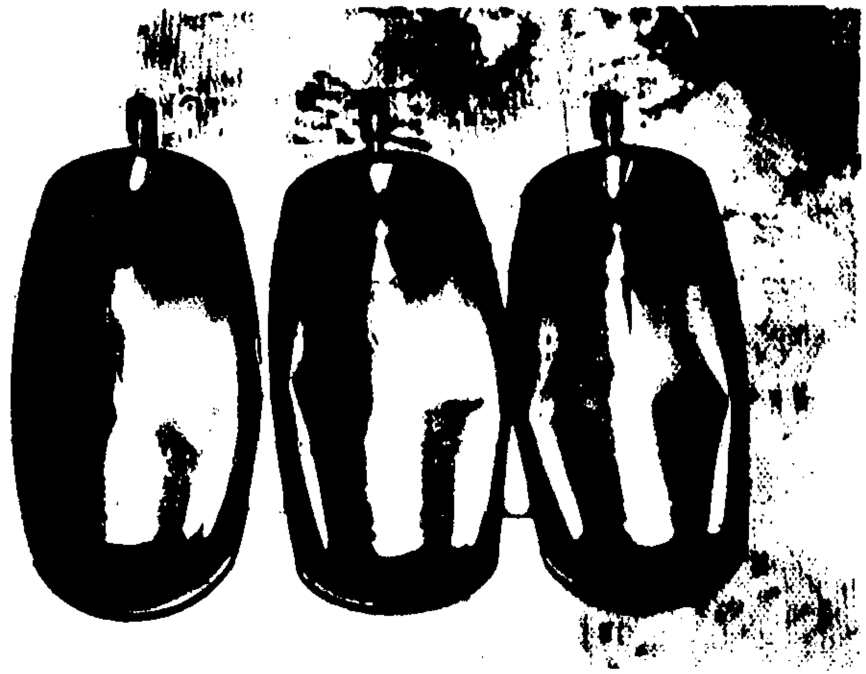


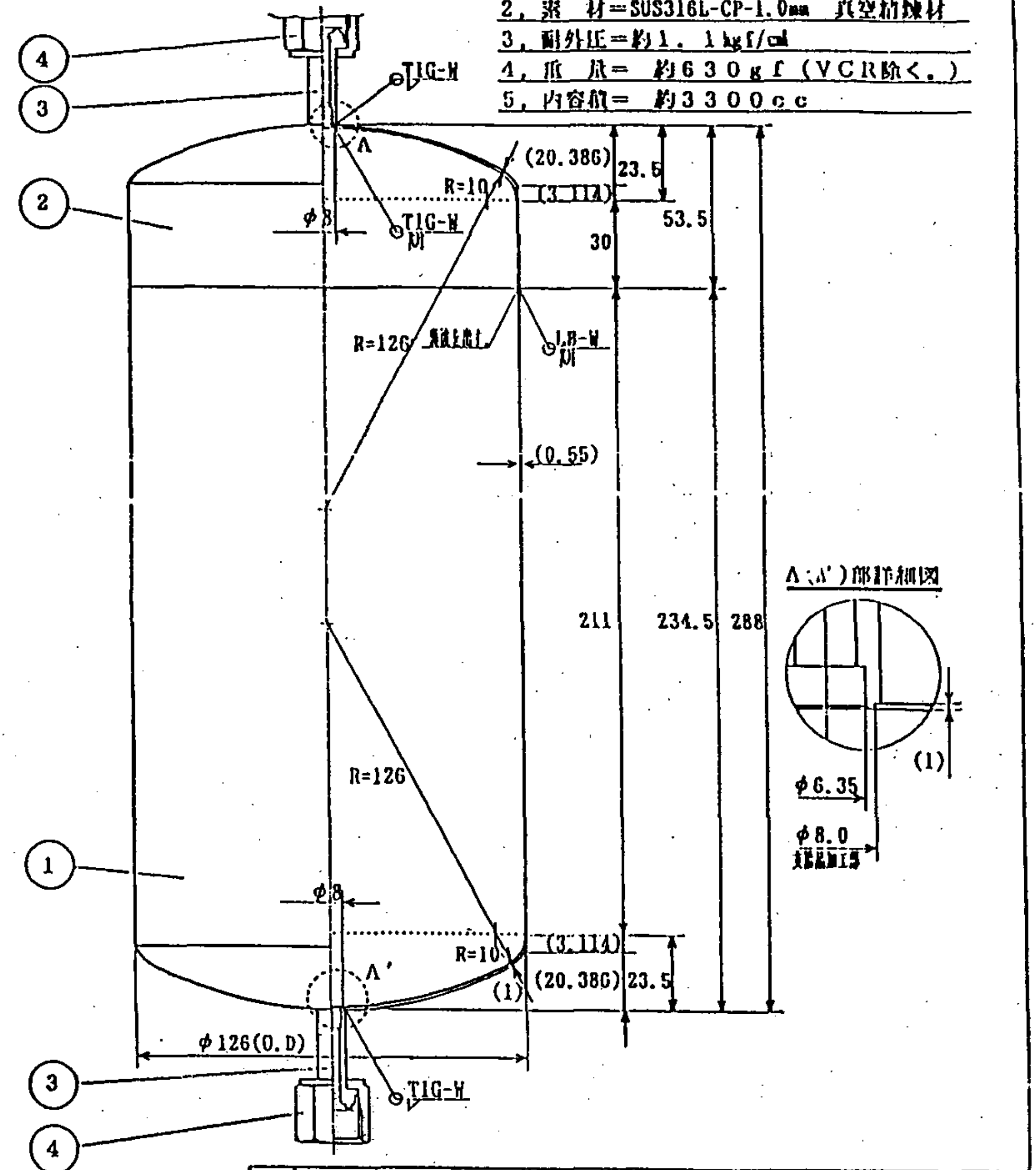
写真8 耐圧試験をした容器の破壊状況

62.8 60.9 63.4 kg/cm^2

客先図番

製品仕様

1，外面梨地仕上、内面ＥＣＢ研磨仕上
2，素　材＝SUS316L-CP-1.0mm　真空精錬材
3，耐外圧＝約１．１kgf/cm²
4，重　量＝　約６３０ｇｆ（ＶＣＲ除く．）
5，内容積＝　約３３００ｃｃ



品番	部品名	部品材質	数量	備考
4	ガスケット継手ユニオンナット	SUS316	2	支給品 UJR-6.35N
3	真空用ガスケット継手スリーブ	SUS316	2	支給品 UJR-6.35S
2	さら形鏡板	SUS316L	1	D/# NK-901-1
1	下部タンク	SUS316L	1	D/# NK-902-2

改訂記事		
客先		
品名	ガスサンプリング真空容器用 3ℓ用通気型ボトル組立図	
材質	SUS316L	図法 三角法 / 尺度 1／2
図番		

製図	照査	検図	承認
	2.12.3		

図5-1-1　大気サンプリング容器の試作

Preservation Characteristic of Canister

	Conc. ppm	Cv value %	Pres. %	
CH4 Standard Gas				
Standard Gas filled	2.04			
after 3 months	2.04	0.059	99.94	-0.06
after 4 months	2.04	0.043	100.19	+0.19
	2.04	0.129	100.17	+0.17
CH4 Environment Air				
immediately	1.801	0.265	---	
after 3 months	1.802	0.116	100.06	+0.06
	1.803	0.063	100.11	+0.11
	1.797	0.079	99.78	-0.22
				(0.14)

Preservation Characteristic of Canister

N2O Standard Gas

	Conc. ppm	Cv value %	Pres. %	
Standard Gas filled	0.3002	0.165		
after 3 months	0.2993	0.435	99.70	-0.30
	0.3004	0.345	100.08	+0.08
	0.3026	0.148	100.79	+0.79
after 6 months	0.2991	0.213	99.65	-0.35
	0.3000	0.170	99.94	-0.06
	0.3006	0.103	100.12	+0.12

N2O Environmental Air

	Conc. ppm	Cv value %	Pres. %	
immediately	0.3073	0.3073	---	
	0.3088	0.149	---	
after 6 months	0.3103	0.547	100.73	+0.73
	0.3112	0.355	101.02	+1.02
	0.3131	0.222	101.64	+1.64
				10.5%

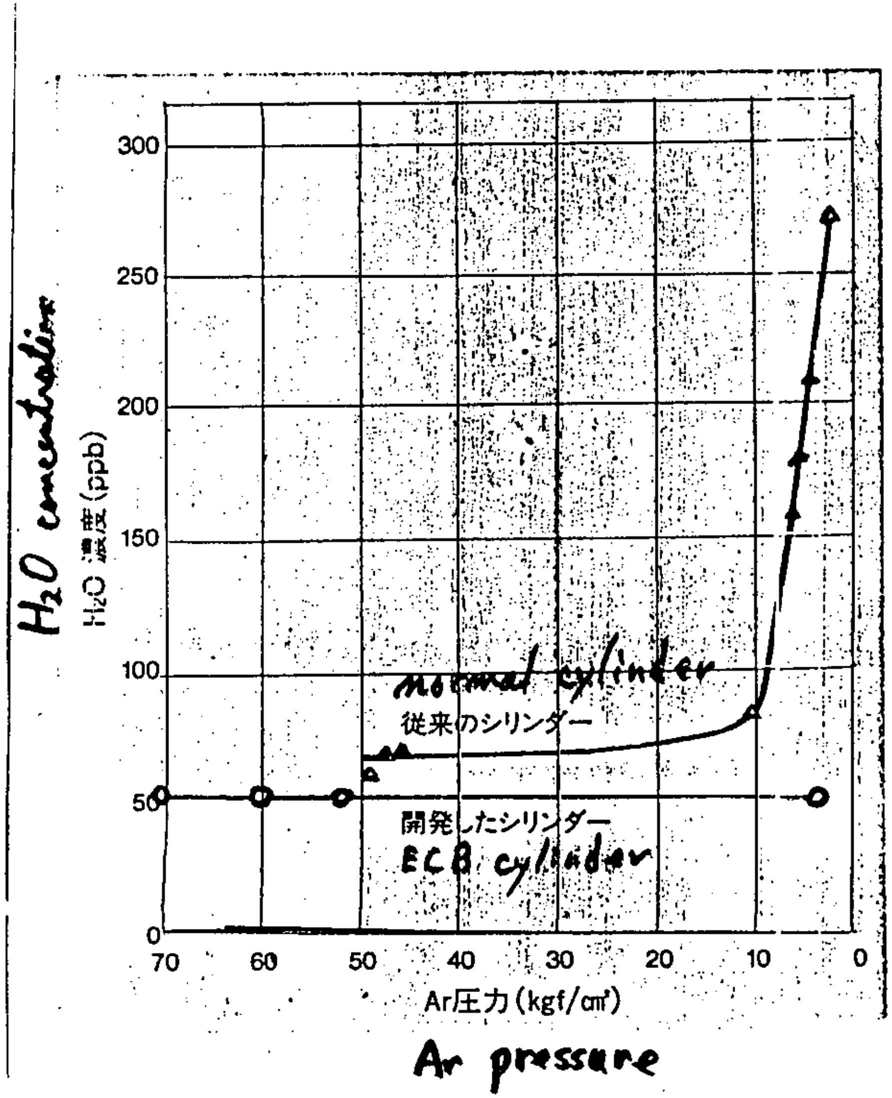
No 16

INUBOSAKI SAMPLING BOTTLE
sampling 91.8.14 ppt

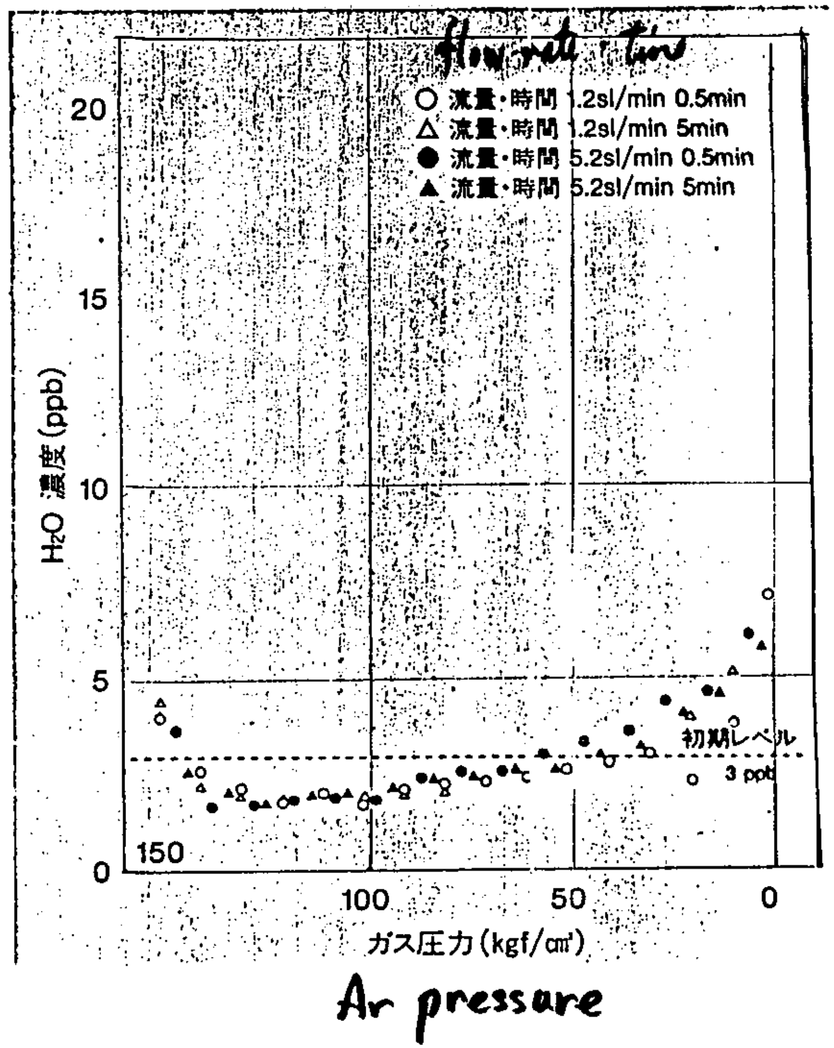
CFC-11
CFC-12

		JUST	AFTER 1M	AFTER 3M
BOTTLE 1	F11	319 1.010	316 1.001	320 1.013
	F12	577 1.005	577 1.005	569 0.991
BOTTLE 2	F11	319 1.010	315 0.998	310 0.982
	F12	581 1.012	579 1.009	576 1.003
BOTTLE 3	F11			320 1.013
	F12			582 1.014
BOTTLE 4	F11			320 1.013
	F12			586 1.021
BOTTLE 7	F11	314 0.994	320 1.013	312 0.988
	F12	570 0.993	574 1.000	577 1.005
BOTTLE 8	F11	311 0.985	313 0.991	empty
	F12	568 0.990	569 0.991	
BOTTLE 9	F11		320 1.013	308 0.975
	F12		588 1.024	573 0.998
BOTTLE 10	F11		317 1.004	313 0.991
	F12		584 1.023	558 0.972
Av.		1回のみ 1.	1.003 1.002	0.996 1.001

1 measurement / time



H2O concentration
H2O 濃度 (ppb)
300
250
200
150
100
50
0
70
60
50
40
30
20
10
0
normal cylinder
従来のシリンダー
開発したシリンダー
ECB cylinder
Ar圧力 (kgf/cm²)
Ar pressure



flow rate : time
○ 流量・時間 1.2sl/min 0.5min
△ 流量・時間 1.2sl/min 5min
● 流量・時間 5.2sl/min 0.5min
▲ 流量・時間 5.2sl/min 5min
H2O 濃度 (ppb)
20
15
10
5
0
初期レベル
3 ppb
150
100
50
0
ガス圧力 (kgf/cm²)
Ar pressure

Standard Gases of Tohoku University for Measurements of Atmospheric CO_2 Concentration

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At present, a non-dispersive infrared analyzer is widely used for the measurements of the atmospheric CO_2 concentration. This analyzer requires the standard gases with known CO_2 concentrations. In this document, descriptions of CO_2 standard gases of Tohoku University, Japan are briefly described.

In order to maintain the consistency of the data obtained from different programs over a long period, our standard gases are classified into three categories, i.e. primary, secondary and working. Currently used standard gases are shown in Fig. 1. All standard gases are CO_2-in-air mixtures. The purity of CO_2 is higher than 99.995%. The CO_2 concentration in the purified air is lower than 0.05 ppmv and its dew-point temperature is confirmed by a conductivity hygrometer to be below -70°C. The working standard gases are stored in 47 l aluminum or manganese-steel cylinders, the secondary standards in 47 l aluminum cylinders and the primary standards in 10 l aluminum cylinders.

Steel cylinders are washed by an acid solution and steamy water, dried out with pure N_2 gas, and evacuated to a pressure of $\sim 10^{-3}$ mm Hg for about 6 hours at a temperature of 150°C. Aluminum cylinders are treated by almost the same procedure as above, but without washing with the acid solution. A CO_2-in-air mixture with CO_2 concentration of about ten times that of the standards is then put in the cylinders to a pressure of about 0.5 atm for three days, to make an adsorption layer of CO_2 on inner wall of the cylinder. Then, known amounts of CO_2 and air are introduced in order using two precise pressure gauges with different ranges after evacuating the cylinders to a pressure of $\sim 10^{-3}$ mm Hg for about 1 hour, and the cylinders are heated to 50°C for more than half a day to ensure the mixing of both gases. The total pressures of the standard gases thus prepared are 150 kg/cm^2.

The primary standard gases were prepared gravimetrically by a two-stage dilution using 10 l manganese-steel cylinders and an extremely precise balance with a standard deviation of 1.5 mg in a wide range of 1 mg to 100 kg at the beginning of our program in 1979. Our primary standard gases were prepared again in 1981 by the same procedures. The result of comparison showed that the standard-gas scales established in 1979 and 1981 were consistent with each other within estimated uncertainties of ±0.3-0.4 ppmv. However, a considerable effort was also maintained from that time to reduce uncertainties in the standard-gas scale. In 1983 and 1985, primary standard gases were prepared repeatedly by adopting a three-stage dilution and the 10 l aluminum cylinders. Treatment procedure of the aluminum cylinders was the same as above. The original gas of about 5% concentration was first prepared by mixing the CO_2 and air. The second stage gas of about 3700 ppmv was obtained by diluting it with air and then the primary standard gases were obtained by further dilution. Total pressure of the primary standard gases thus prepared was about 120 kg/cm^2. The uncertainty in the concentration was estimated to be 0.13 ppmv, on the basis of the estimated uncertainty of ±25 mg in weighing each component gas on the balance, due mainly to adhesion of dust particles and adsorption of water vapor on the outer wall of the cylinder. To minimize the uncertainties in calibrated values, CO_2 concentrations of the primary standard gases were corrected by a least-squares-fit technique assuming a quadratic relation between the response of our analyzer and the CO_2 concentration. The original calibration values and those corrected by the above-mentioned procedure are shown in Table 1. The amount of correction hardly exceeded 0.04 ppmv. Both scales of 1983 and 1985 agreed within estimated uncertainties of respective scales, but were systematically lower by about 0.5 ppmv than the previous scales, as seen in Table 1. The reason for this large discrepancy exceeding the limit of estimated uncertainties of the respective scales is unsolved yet. However, since great care was taken in preparing the primary standard gases in 1983 and 1985, we employ the 1983 scale for our standard gases.

To confirm the drift in concentration of both standard gas systems and to extend their CO_2 concentrations to higher levels, we prepared the primary standard gases by the same procedure as above using new aluminum cylinders in 1990, but their CO_2 concentrations were lower by almost 10 ppmv than the gravimetrically determined values. To seek the cause of such a phenomenon, we cut the cylinders and found that the bottom inside the cylinders were incrusted with rust, although they were all new. We therefore are in the progress of preparing the primary standard gases again, polishing the inner wall of the cylinders mechanically to a roughness of 1 μm. However, we have several sets of the semi-parmanent standard gas systems calibrated by our primary standard gases in different years, and the CO_2 concentrations of respective systems agree well with each other within 0.05 ppmv. Therefore, the drift in concentration of our primary standard gas system is thought to be small.

The CO_2 concentrations of the working standard gases are determined against our secondary standard gas system, using the NDIR analyzer with a precision of 0.01 ppmv. The calibration is repeated about 6 times over a 6-month period after their preparation, and if the standard gases with concentration drift larger than 0.1 ppmv are found, such gases are discarded. The calibration is also made after their use. The secondary standard gases are calibrated against our primary standard gas system once or twice a year, using the same analyzer. The secondary and working standard gases are calibrated after being aged for about one month before their calibration, to minimize a possible drift of the CO_2 concentration. Since the drift in concentration occurs with decrease of the pressure in the cylinders, as shown in Fig. 2, the usage of the secondary and working standard gases are terminated at pressures of about 50 and 30 kg/cm^2, respectively.

At present, the concentration scale established manometrically in Scripps Institution of Oceanography, University of California, San Diego are widely used in the measurements of the atmospheric CO_2 concentration. In 1987, four standard gases with different CO_2 concentrations of approximately 331, 339, 351 and 366 ppmv were calibrated by using the manometric system installed at SIO, and it was confirmed that their determined values agree with ours within 0.1 ppmv, as shown in Table 2. In 1991, we also compared our standard gases with those of NOAA/CMDL. As shown in Table 3, agreement between both scales is excellent, but differences of the CO_2 concentrations of DC9131 and DF4633 are somewhat larger than others, reflecting the fact that the CO_2 concentration of DF4633 was determined by extrapolating the concentration scale based on our primary standard gases and that DC9131 showed the drift in concentration during this intercomparison. The CO_2 concentration of DC9131 obtained by averaging the results on October 12, 1991 and February 28, 1992 is 338.95 ppmv, concentration difference between CMDL and us being reduced to 0.11 ppmv.

Figure 3 shows the differences of the CO_2 concentrations of 117 working standard gases before and after their use. These standard gases were stored in 47 l manganese-steel cylinders. Concentration differences for 87% of all gases fall within ±0.1 ppmv, average value of the differences being 0.034±0.056 ppmv. The maximum difference is +0.19 ppmv. Such large differences were found in the standard gases used in the early stage of our program. Concentration differences of recent standard gases are reduced to less than 0.1 ppmv by discarding the standard gases with large concentration drifts, repeating the calibration before their use.

We are changing the cylinders from manganese-steel to aluminum, because these cylinders are lighter, as compared with manganese-steel cylinders. We are further trying to reduce the roughness of the inner wall of aluminum cylinders to 1 μm by polishing mechanically, to minimize the drift in CO_2 concentration occured with decreasing the pressure in the cylinders. Preliminary results are given in Fig. 4. Upper and lower panels show the CO_2 concentration drifts of the standard gases filled in polished and unpolished aluminum cylinders, respectively. The CO_2 concentration is more stable in the polished cylinder than in the unpolished cylinder.

Table and figure captions

Table 1. Intercomparison of the CO_2 primary standard gases prepared in 1979, 1981, 1983 and 1985

Table 2. CO_2 concentrations of four CO_2 standard gases determined gravimetrically and manometrically by Tohoku University and Scripps Institution of Oceanography, respectively

Table 3. Results of intercomparison of CO_2 standard gases between Tohoku University and NOAA/CMDL

Fig. 1. Standard gases of Tohoku University for measurements of atmospheric CO_2 concentration

Fig. 2. Drifts of the CO_2 concentration occured with decrease of the pressure in manganese-steel cylinders

Fig. 3. Differences of the CO_2 concentrations of 117 working standard gases filled in manganese-steel cylinders before and after their use

Fig. 4. CO_2 concentration drifts of the standard gases filled in polished and unpolished aluminum cylinders

Fig. 1

Primary Standard Gases

Cylinder	CO_2 (ppmv)
DC4573	320.76
DC4754	329.81
DC4755	339.74
DC4756	350.12
DC4757	359.49
DC4758	368.26

Secondary Standard Gases

Cylinder	CO_2 (ppmv)
HA7411	321.10
HA3190	331.64
HA7412	341.20
HA7413	351.34
HA7410	360.77
HA3206	370.82

Working Standard Gases

Cylinder	CO_2 (ppmv)

Table 1

Cylinder	1979 CO2 (ppmv)	
4K-12313	310.3 (310.27)	
1K-44382	331.1 (331.25)	
1K-44342	346.3 (346.12)	
3K-31033	359.3 (359.37)	

Cylinder	1981 CO2 (ppmv)	Calibration by the 1979 standards
3K-49048	310.8 (310.71)	310.78
3K-41954	318.4 (318.54)	318.70
CX-84702	330.0 (330.02)	330.19
CX-55802	338.9 (338.86)	338.97
CX-52083	349.4 (349.31)	349.24
3K-98609	359.5 (359.56)	359.23

Cylinder	1983 CO2 (ppmv)	Calibration by the 1979 standards
DC4753	320.76 (320.77)	321.28
DC4754	329.81 (329.81)	330.40
DC4755	339.74 (339.73)	340.25
DC4756	350.12 (350.11)	350.58
DC4757	359.49 (359.53)	359.87
DC4758	368.26 (368.24)	

Cylinder	1985 CO2 (ppmv)	Calibration by the 1983 standards
DC7338	319.91 (319.93)	320.04
DC7339	328.81 (328.78)	328.87
DC7340	340.89 (340.85)	340.91
DC7341	350.33 (350.37)	350.39
DC7342	360.83 (360.85)	360.82
DC7343	369.52 (369.50)	369.41

Tohoku University

Date	DF4826	DF4827	DF4828	DF4829
Dec. 23, 1986	330.97	339.36	351.48	366.22
Jan. 2, 1987	330.98	339.37	351.48	366.24
Jan. 6, 1987	330.98	339.37	351.49	366.25
Jan. 21, 1987	330.97	339.37	351.48	366.22
Jan. 31, 1987	330.96	339.37	351.49	366.22

↓

Scripps Institution of Oceanography

Apr. 1987	330.88	339.27	351.42	366.21

↓

Tohoku University

Jul. 15, 1987	330.96	339.39	351.50	366.23
Apr. 2, 1988	330.96	339.37	351.51	366.23
Apr. 12, 1989			351.50	
Jul. 23, 1990	330.97	339.38	351.49	366.24
Dec. 30, 1990	330.98	339.37	351.49	366.24
Apr. 2, 1991	330.97	339.38	351.48	366.22

↓

Tohoku-SIO	0.09	0.10	0.07	0.02

Table 3

Tohoku University

Date	Cylinder			
	DF4794	DC9131	DF4665	DF4633
Jun. 6, 1991	326.53±0.013	339.12±0.016	362.68±0.016	375.61±0.016
Sep. 23, 1991	326.58±0.018	338.99±0.020	362.67±0.004	375.63±0.009
Oct. 12, 1991	326.56±0.017	338.99±0.011	362.70±0.027	375.65±0.022

NOAA/CMDL

Nov. 1991	326.57	338.84	362.71	375.72

Tohoku University

Feb. 28,1992	326.58±0.010	338.90±0.012	362.70±0.013	375.66±0.013

Tohoku-CMDL	0.01	-0.16	0.02	0.08

Fig. 2

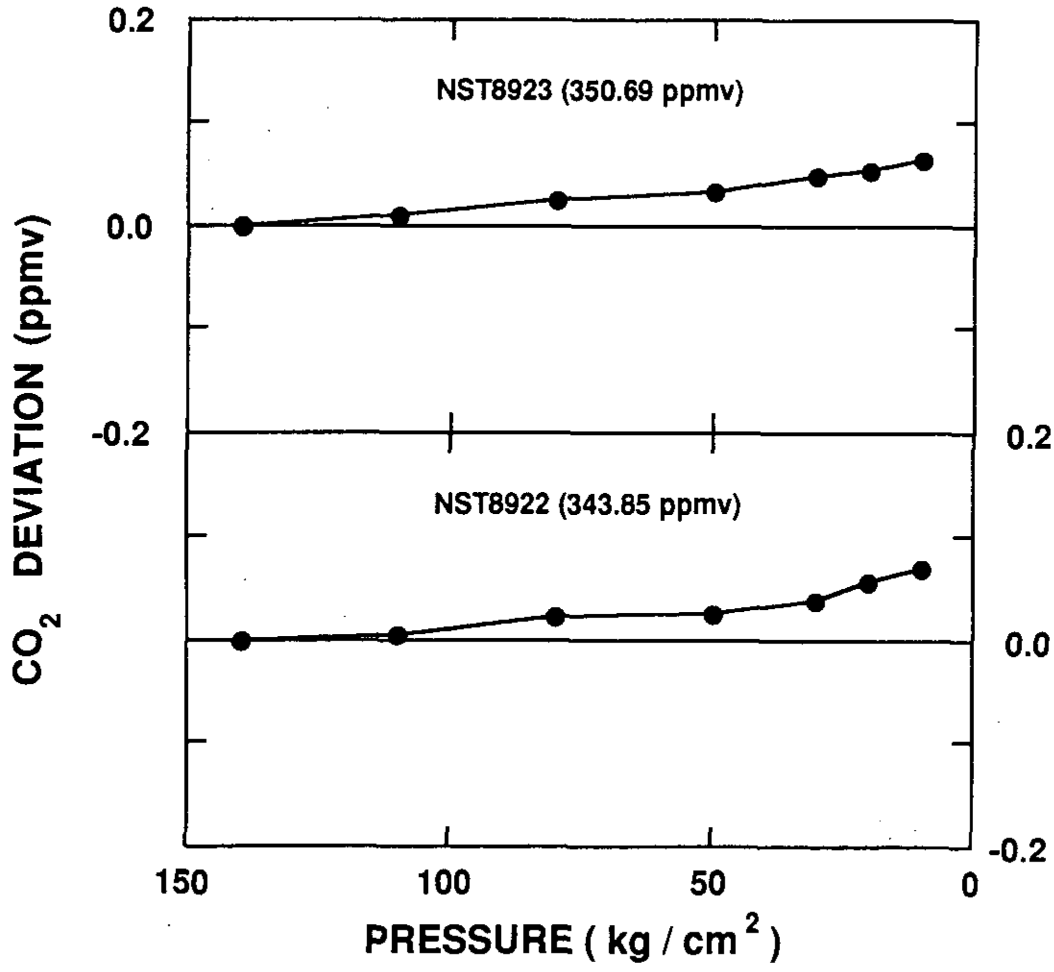

0.2
NST8923 (350.69 ppmv)
0.0
-0.2
0.2
NST8922 (343.85 ppmv)
0.0
-0.2
CO_2 DEVIATION (ppmv)
150
100
50
0
PRESSURE (kg / cm^2)

Fig. 3

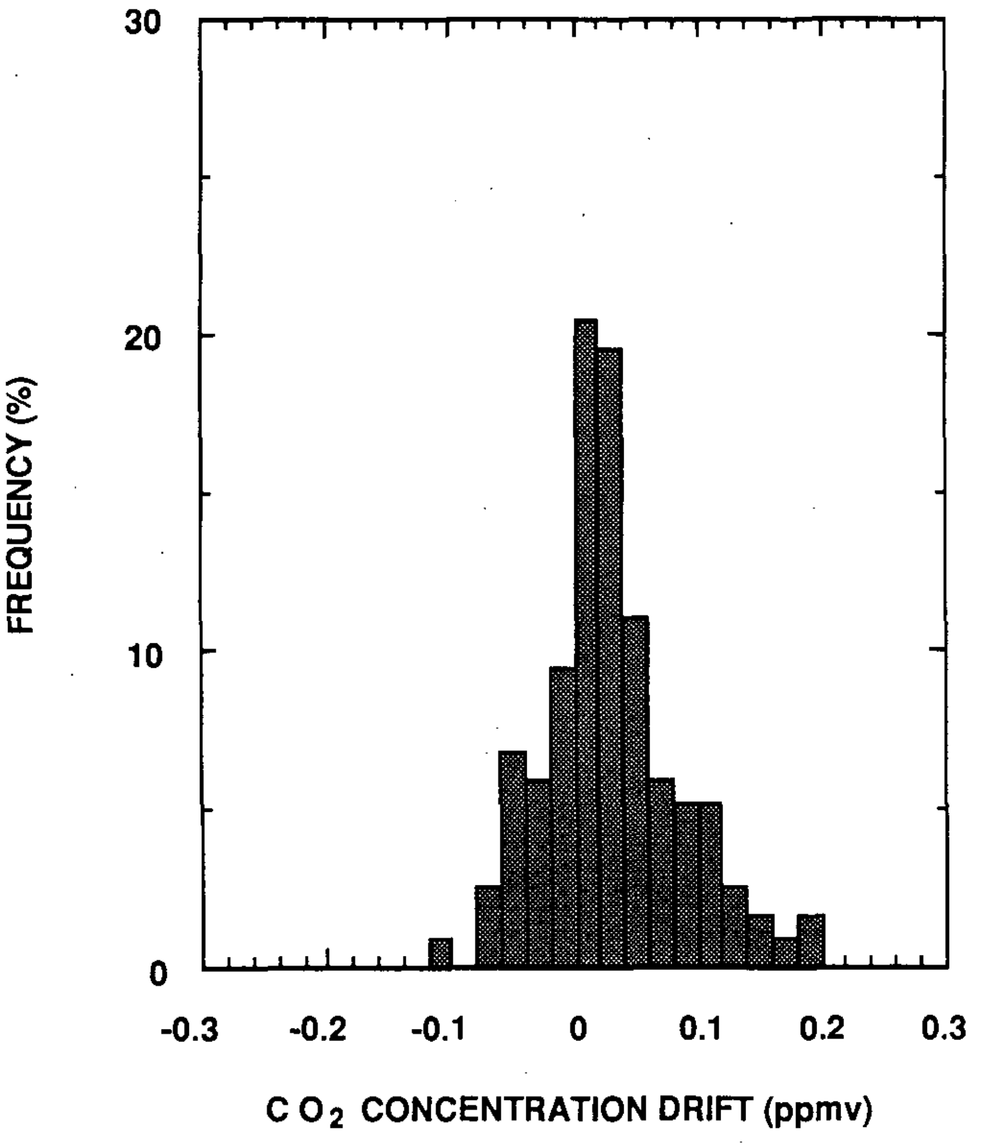
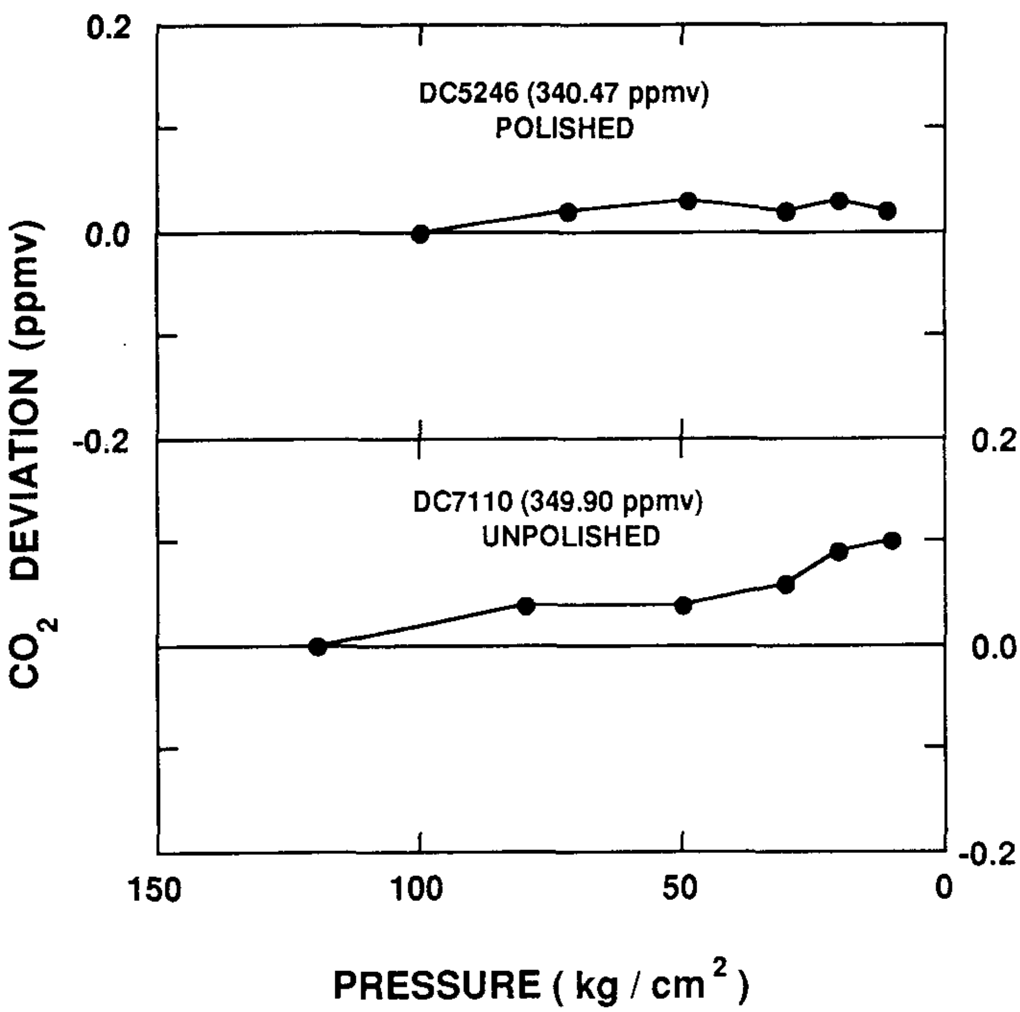

30
20
10
0
FREQUENCY (%)
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
C O2 CONCENTRATION DRIFT (ppmv)

Fig 4.

10L Al Cylinder



Intercalibration

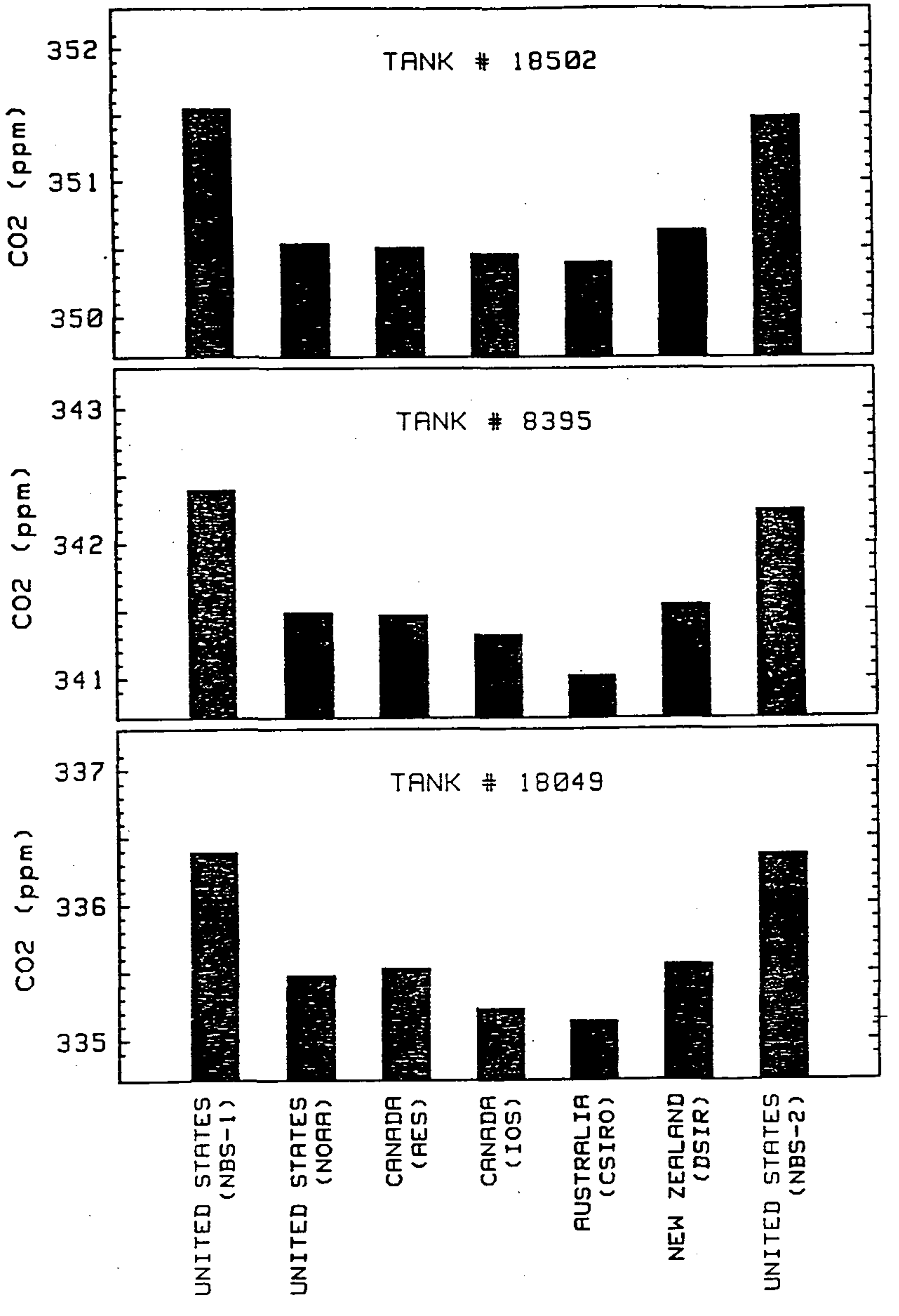
R. Francey

Division of Atmospheric Research

CSIRO

WMO No 51 Dec 1987

FRANCEY



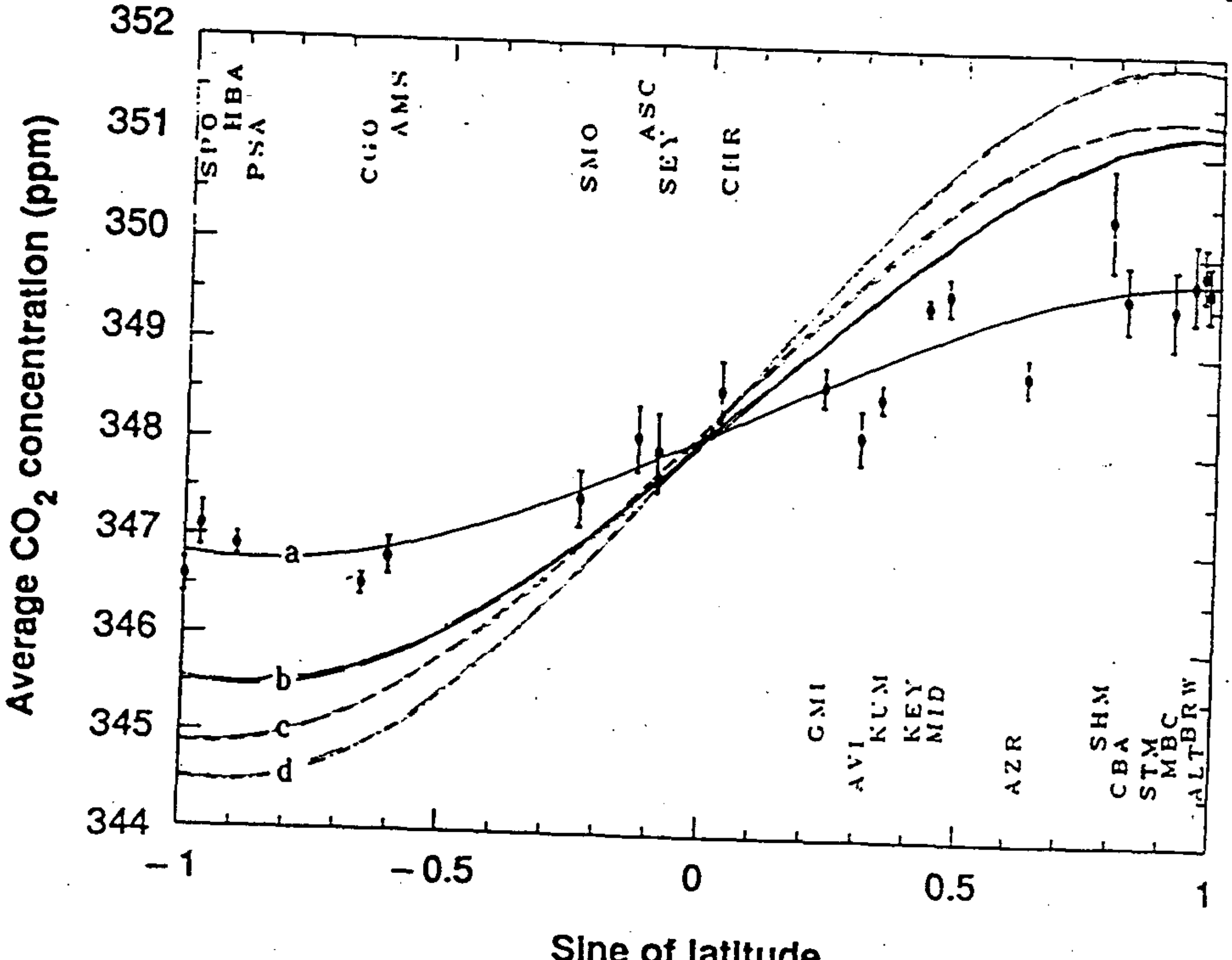
WMC No. 51 Dec 87

Reported Values of WMO CO_2 Tanks

Institution	Analysis Date (mo/yr)	Tank #18049	Tank #8395	Tank #18502	
United States NBS-1	4-6/86	336.39±.01	342.40±.03	351.55±.03	
United States GMCC	6-7/86	335.48±.02	341.49±.06	350.54±.03	
Canada AES	8/86	335.53±.01	341.47±.10	350.51±.02	
Canada IOS	9/86	335.23±.06	341.32±.06	350.46±.04	
Australia CSIRO	11/86	335.14±.03 335.60±.02	341.02±.04 341.54±.04	350.40±.06 350.94±.04	P+B
New Zealand DSIR	12/86	335.56±.02	341.55±.02	350.64±.02	
United States NBS-2	1-2/87	336.37±.02	342.25±.03	351.49±.01	
5-Laboratory Average		335.39±.19	341.37±.21	350.51±.09	
5-Laboratory Range		335.14-.56	341.02-.55	350.40-.64	
	Δ	.42	.53	.24	
		335.48±.15	341.47±.09	350.61±.19	
		335.23-.60	341.32-.55	350.46-.94	
	Δ	.37	.23	.48	

DSIR − CSIRO = $\begin{cases} 0.40 \\ -0.26 \end{cases}$ ppm

Tans, Fung + Takahashi (1990)



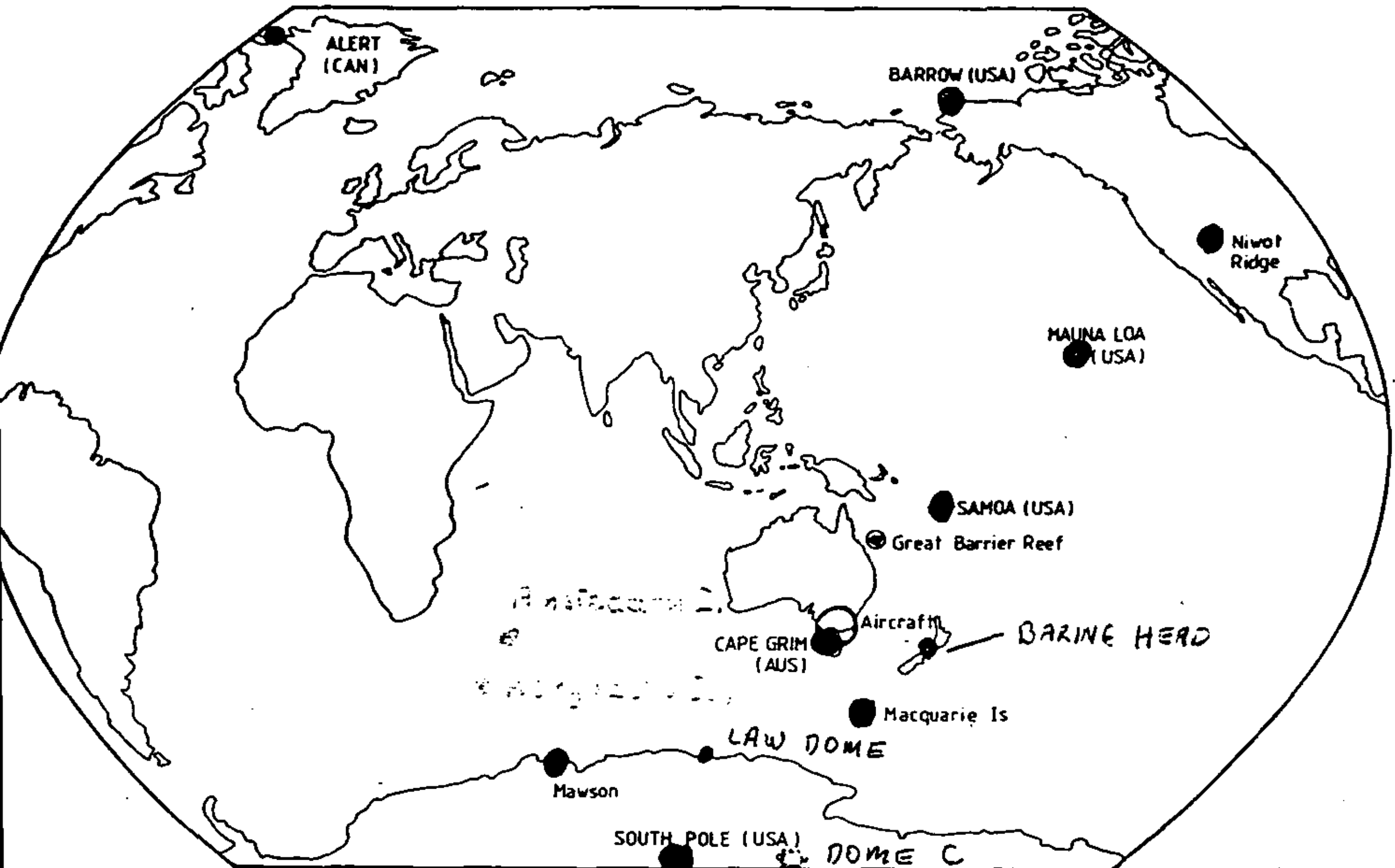
a: — Data

b,c,d: — NASA/GISS GCM Transport fields, 5.3 GtC/y Fossil Fuel, 0.3 GtC/y tropical deforestation.

b: — ΔpCO_2 measurements, Liss-Merlivat air-sea exchange (requires extra 0.8 GtC/y sink).

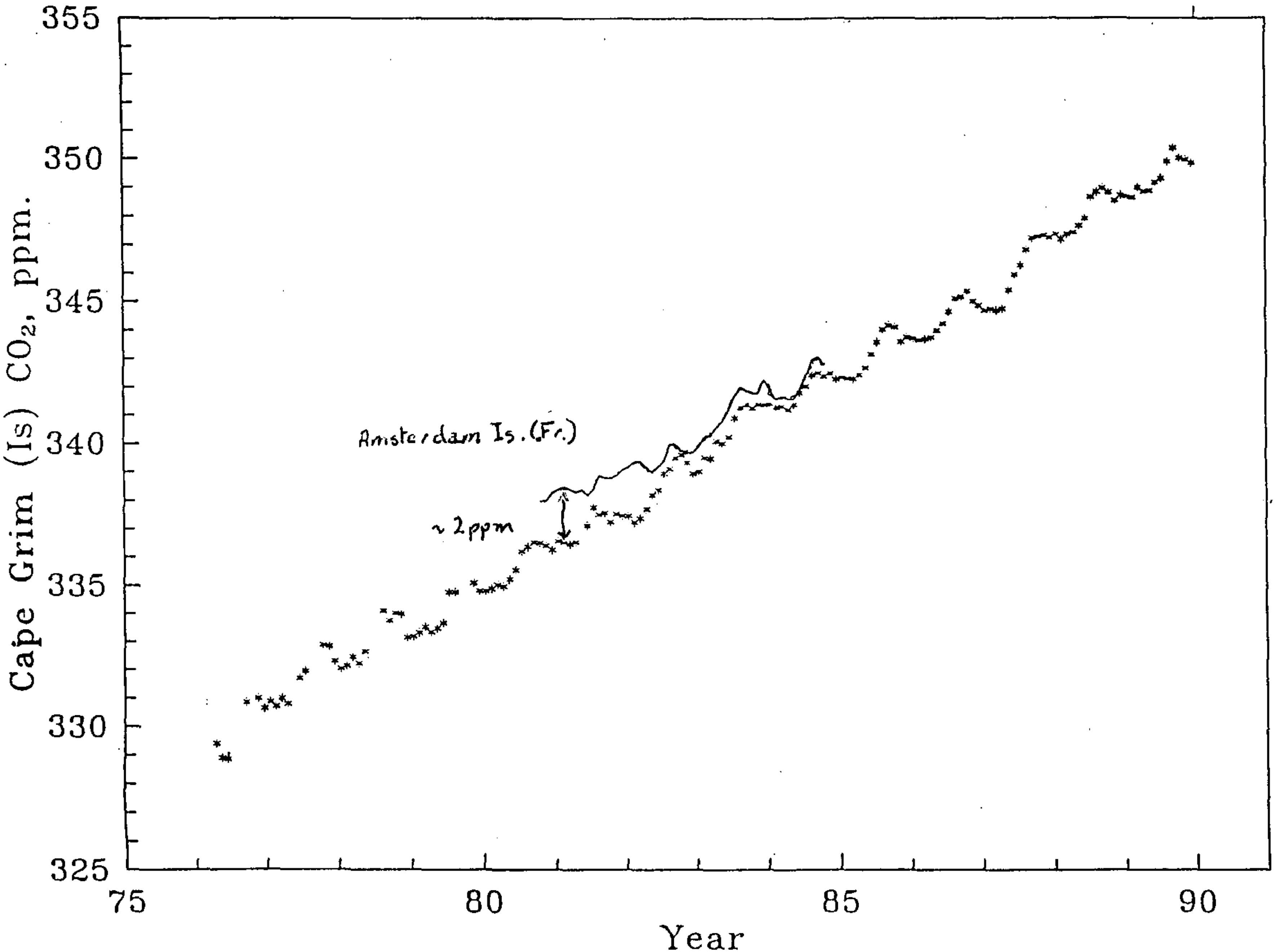
c: — ΔpCO_2 measurements, "bomb ^{14}C" air-sea exchange (requires extra 1.5 GtC/y sink).

d: — Balanced budget with 2.6 GtC/y ocean sink.



MONTHLY AIR SAMPLES
RETURNED TO
ASPENDALE

- CNRS / CFR
- ICE CORES CNRS/LGGE



Cape Grim (Is) CO_2, ppm.
355
350
345
340
335
330
325
75
80
85
90
Year
Amsterdam Is. (Fr.)
~2ppm

An intercalibration of CO_2 measurements between France, Australia and New-Zealand
Report to the WMO Meeting of Experts on CO_2 measurements, Lake Arrowhead, October 1990.

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Date	Cylinder	ALU 7	ALU 9	ALU 6	ALU 8	ALU 2	ALU 5	ALU 4	ALU 1	ALU 3
Jun. 90	Number of determinations	[15]	[15]	[15]	[15]	[15]	[15]	[15]	[15]	[15]
Jun. 90	Pressure (bar)	115	103	115	100	98	90	110	105	100
Jun. 90	Conc. (ppmv)	325.86	341.93	347.95	351.80	354.39	358.52	363.23	363.53	372.85
Jun. 90	Std Dev (ppmv)	0.02	0.04	0.03	0.03	0.01	0.03	0.03	0.02	0.01
Dec. 90	Number of determinations		[12]	[14]	[18]	[12]	[12]	[12]	[12]	[12]
Dec. 90	Pressure (bar)		60	56	75	72	72	72	85	76
Dec. 90	Conc. (ppmv)		341.85	347.88	351.82	354.47	358.45	363.22	363.46	372.91
Dec. 90	Std Dev (ppmv)		0.04	0.03	0.04	0.05	0.04	0.03	0.03	0.03
Mean	CFR conc.	325.86	341.89	347.92	351.81	354.43	358.49	363.23	363.49	372.88
Mean	Std Dev	0.02	0.05	0.05	0.03	0.05	0.05	0.03	0.04	0.04

FR/NZ/AUS 1990

FIGURE 4

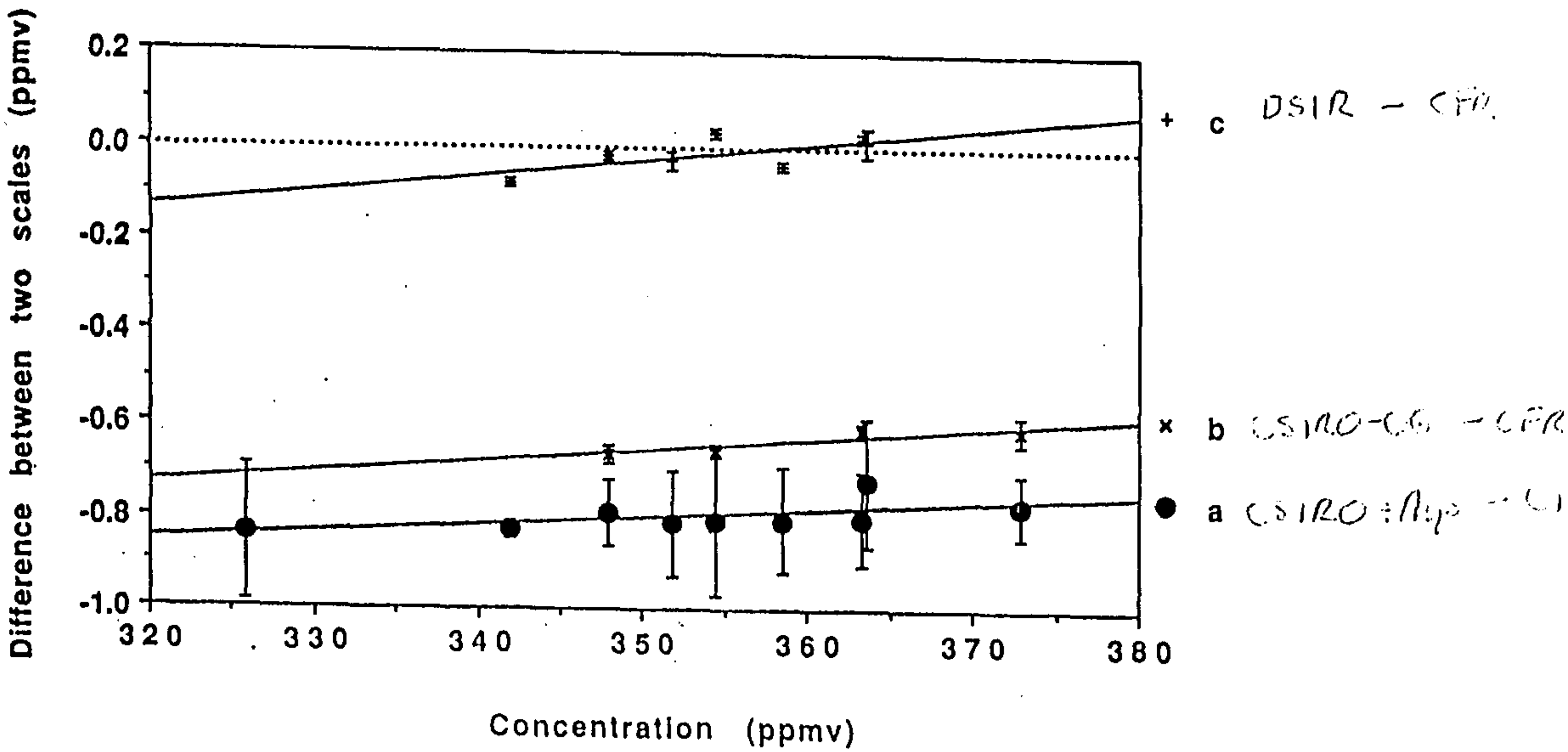
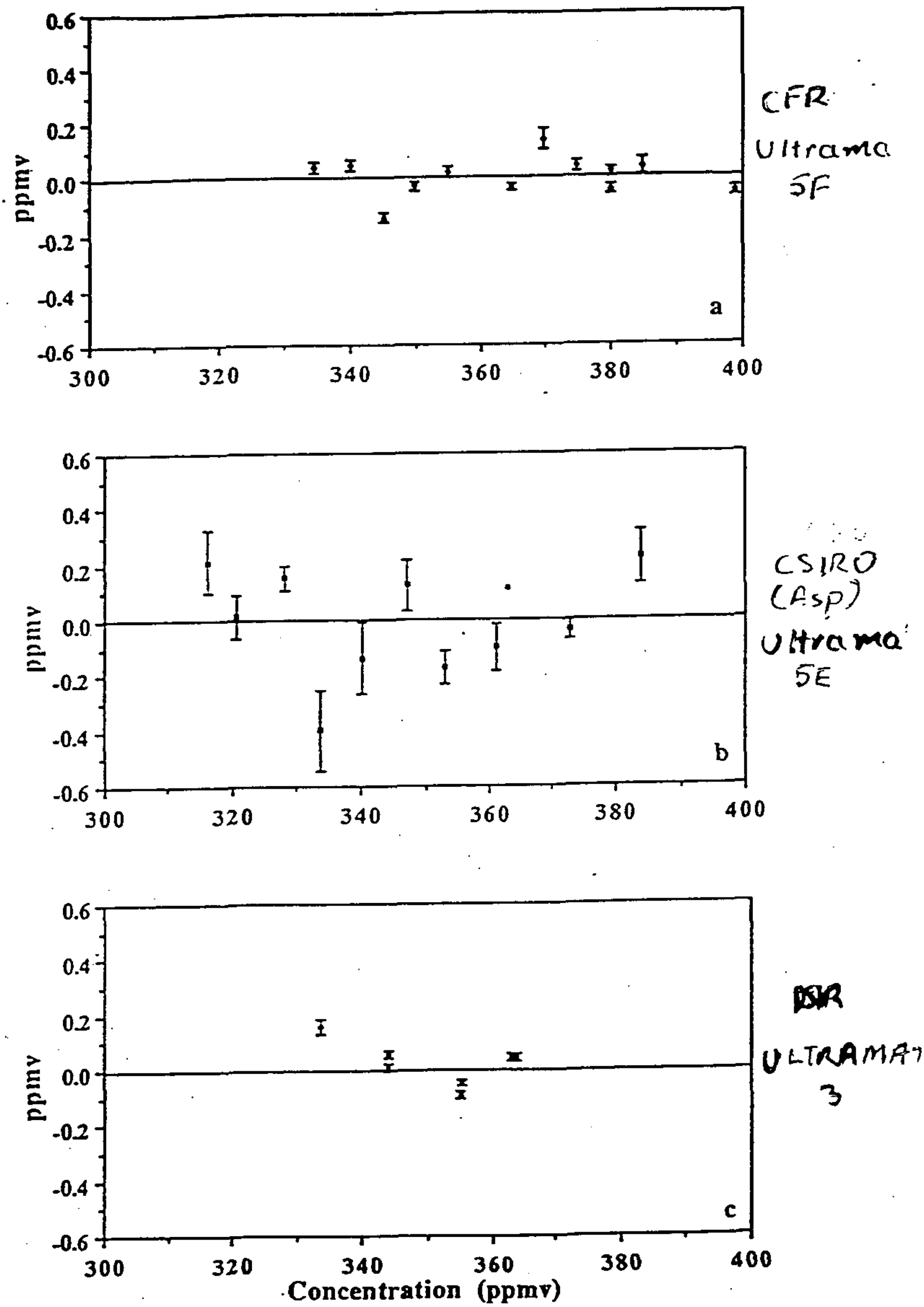
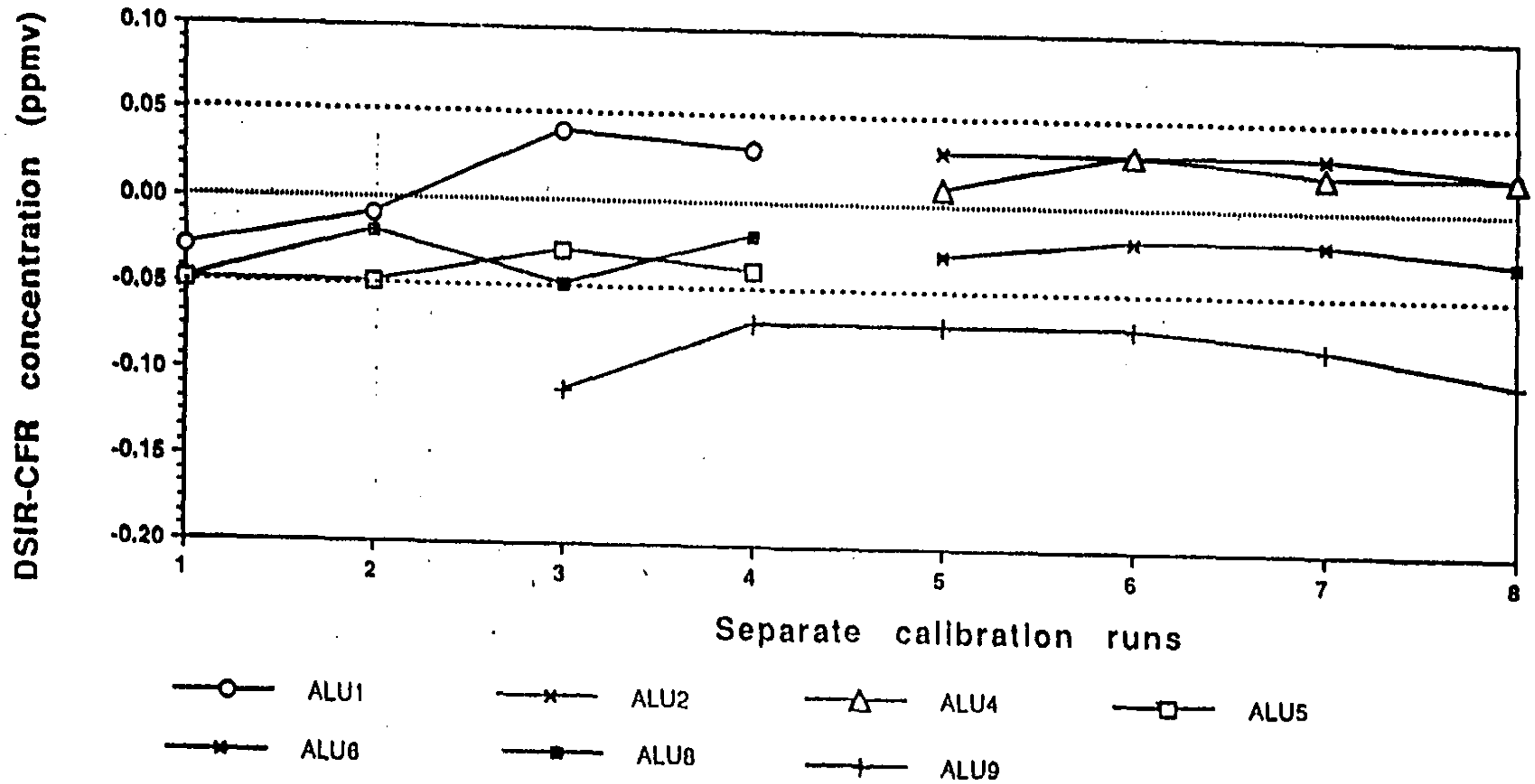


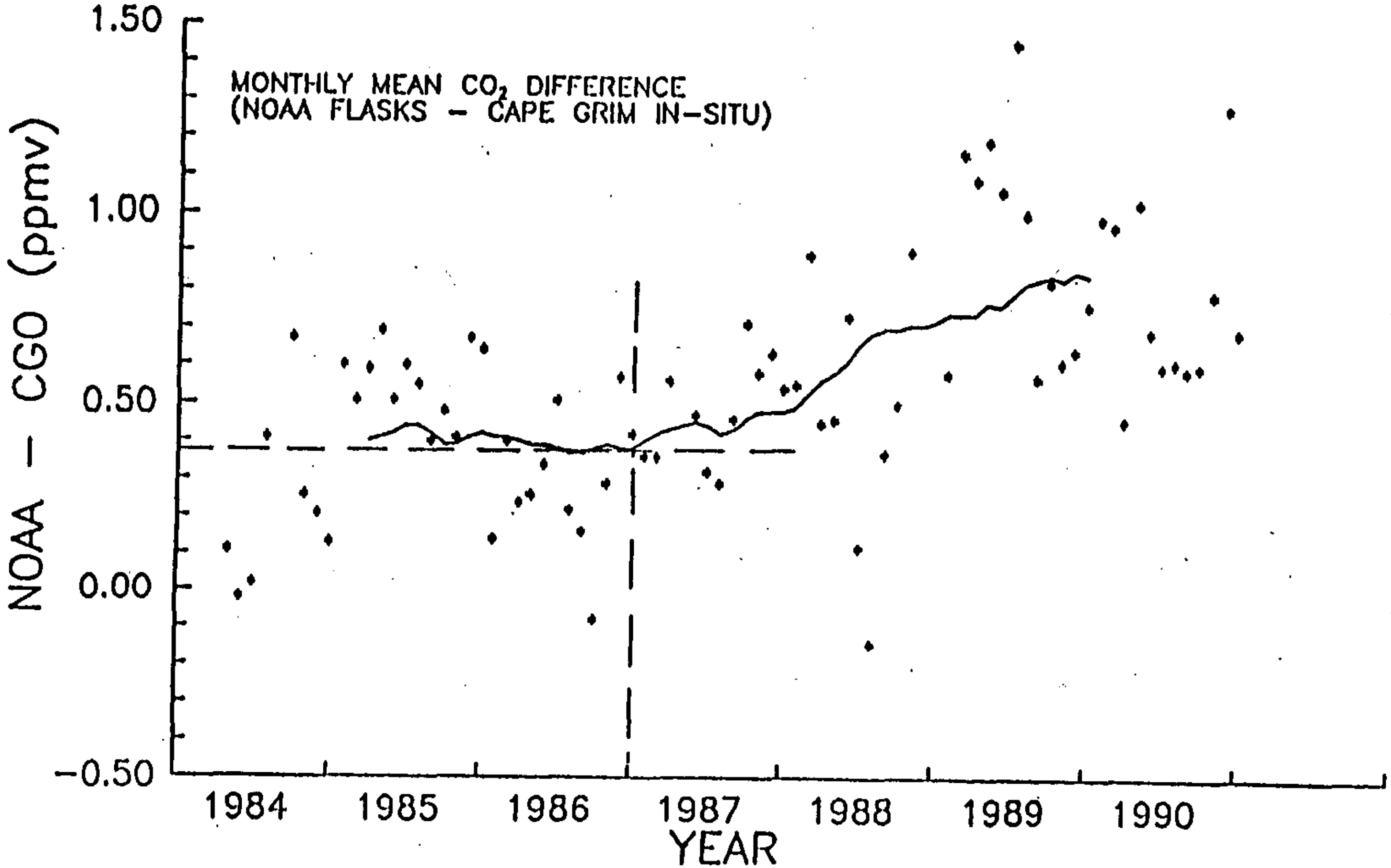
FIGURE 3

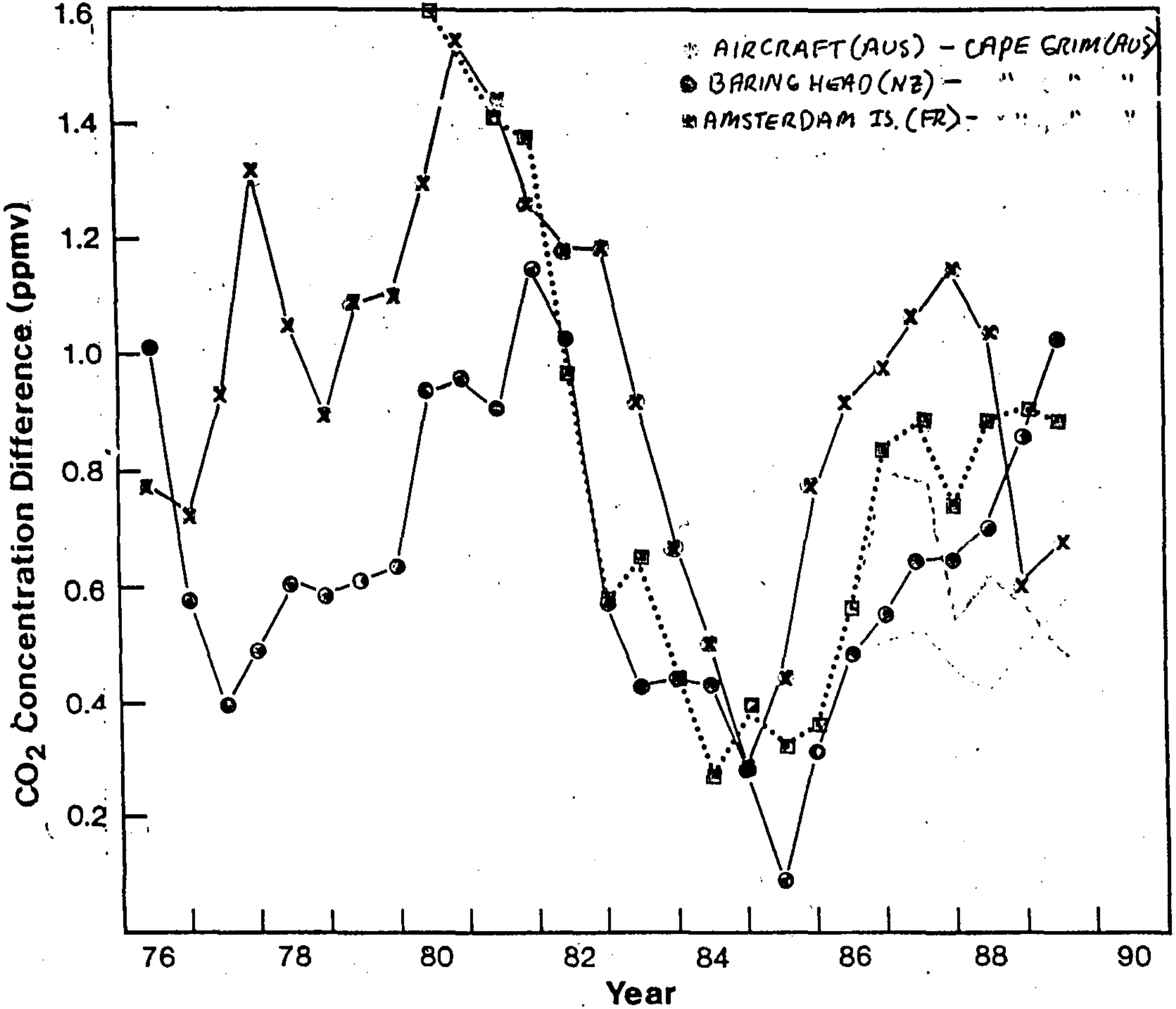

0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
ppmv
300
320
340
360
380
400
a
CFR
Ultrama
5F
b
CSIRO
(Asp)
Ultrama
5E
c
ULTRAMAT
3
Concentration (ppmv)

FR / NZ / AUS 1990

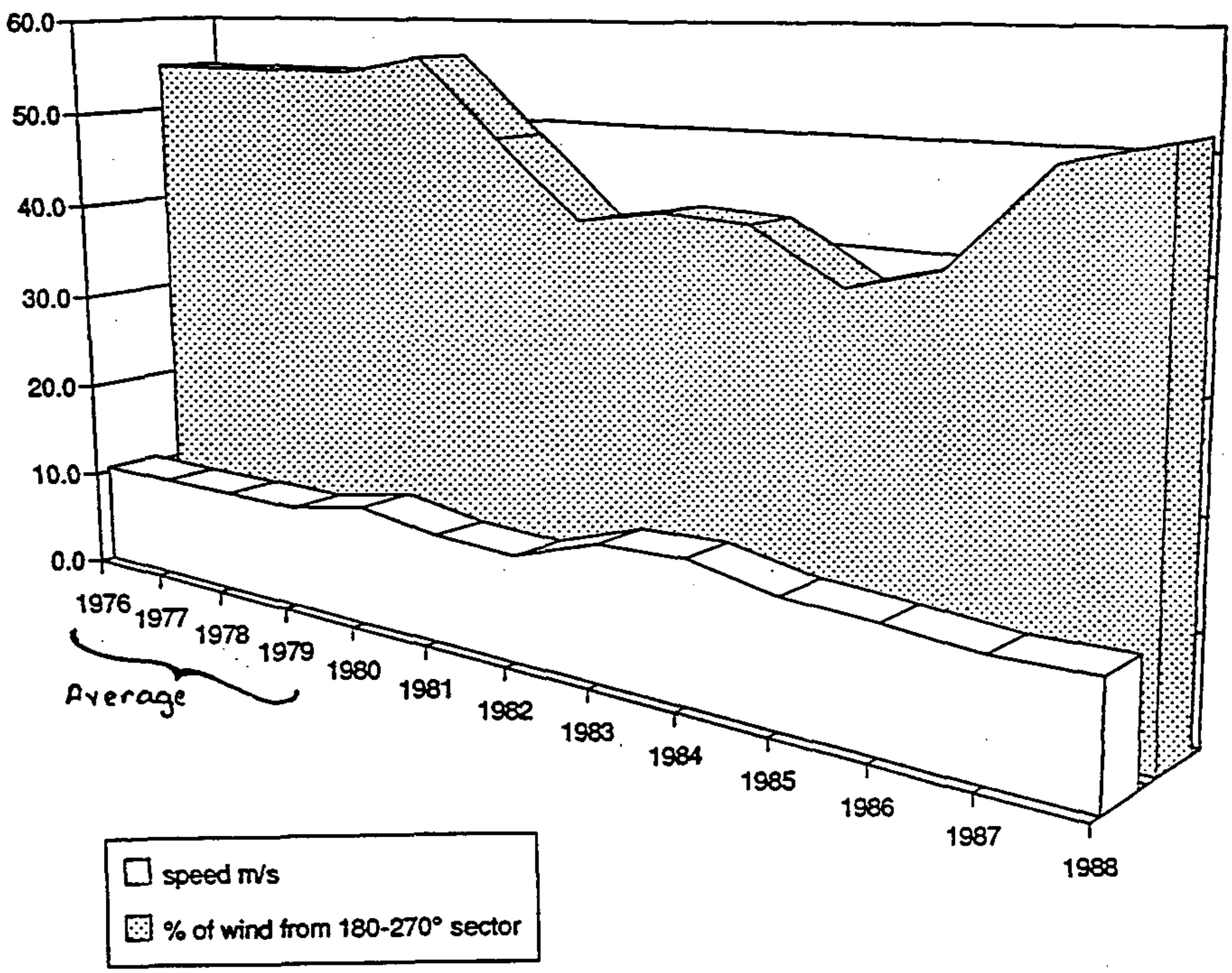
Figure 5




MONTHLY MEAN CO_2 DIFFERENCE
(NOAA FLASKS - CAPE GRIM IN-SITU)
NOAA - CGO (ppmv)
1.50
1.00
0.50
0.00
-0.50
1984
1985
1986
1987
1988
1989
1990
YEAR


AIRCRAFT (AUS) - CAPE GRIM (AUS)
BARING HEAD (NZ) - " " "
AMSTERDAM IS. (FR) - " " "
CO_2 Concentration Difference (ppmv)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
76
78
80
82
84
86
88
90
Year

CAPE GRIM ANNUAL AVERAGE WIND



WMO 1992.

Table 2. Summary of results of WMO CO2 intercomparison performed at B.A.P.S., Cape Grim. Feb. 1992.
All concentrations are in 1989 Australian Interim CO2 Scale.

DATE	TIME FROM	TIME TO	NO. OF MEASUREMENTS	ONE DAY CONC'N (ppmv)	ST. DEV. (ppmv)
Cylinder S/No. AAL11413					
05 Feb	2230				
06 Feb		0600	15	340.88	0.03
06 Feb	1630	2100	9	340.89	0.03
Average of one-day means			340.88 ppmv		
St. Dev. of one-day means			0.01 ppmv		
Cylinder S/No. AAL13763					
05 Feb	1900	2230	6	346.70	0.08
06 Feb	1300	1630	7	346.75	0.02
Average of one-day means			346.72 ppmv		
St. Dev. of one-day means			0.04 ppmv		
Cylinder S/No. AAL11051					
05 Feb	1600	1900	6	374.12	0.05
06 Feb	0900	1300	8	374.18	0.06
Average of one-day means			374.15 ppmv		
St. Dev. of one-day means			0.04 ppmv		

WMO 1992.

Table 1. Summary of ~~results~~ of WMO CO_2 intercomparison performed at C.S.I.R.O. (DAR), Aspendale. Jan/Feb. 1992.
All concentrations ~~are~~ in 1989 Australian Interim CO_2 Scale

DATE	REF. GASES CYL. S/NO.	REF. GASES CONC'N (ppmv)	NO. OF MEASUREMENTS	ONE DAY CONC'N (ppmv)	ST. DEV. (ppmv)
Cylinder S/No. AAL11413					
16 Jan	DL13589	361.16	8	340.82	0.02
	DL10950	331.15			
23 Jan	ALVT077	358.17	8	340.79	0.06
	DL13512	334.93			
24 Jan	DL13525	353.18	6	340.66	0.03
	ALVW891	328.52			
18 Feb	DL13589	361.16	8	340.85	0.03
	DL10950	331.15			

Average of one-day means 340.78 ppmv
St. Dev. of one-day means 0.08 ppmv

DATE	REF. GASES CYL. S/NO.	REF. GASES CONC'N (ppmv)	NO. OF MEASUREMENTS	ONE DAY CONC'N (ppmv)	ST. DEV. (ppmv)
Cylinder S/No. AAL13763					
16 Jan	DL13589	361.16	8	346.80	0.01
	DL10950	331.15			
23 Jan	ALVC676	382.79	8	346.73	0.07
	ALVW465	341.12			
24 Jan	DL13525	353.18	8	346.68	0.02
	ALVW891	328.52			
18 Feb	DL13589	361.16	8	346.73	0.04
	DL10950	331.15			

Average of one-day means ~~346.74 ppmv~~
St. Dev. of one-day means 0.05 ppmv

DATE	REF. GASES CYL. S/NO.	REF. GASES CONC'N (ppmv)	NO. OF MEASUREMENTS	ONE DAY CONC'N (ppmv)	ST. DEV. (ppmv)
Cylinder S/No. AAL11051					
16 Jan	DL39488	372.89	8	374.56	0.03
	ALVM066	361.27			
23 Jan	ALVC676	382.79	8	374.49	0.05
	ALVW465	341.12			
24 Jan	ALVC676	382.79	8	374.34	0.04
	ALVK731	348.92			
18 Feb	DL39488	372.89	8	374.47	0.02
	ALVM066	361.27			

Average of one-day means ~~374.46 ppmv~~
St. Dev. of one-day means 0.09 ppmv

GASLAB STANDARDS 14/11/91

Results of discussions between LPS, DJB, GIP and RJF

GAS CHROMATOGRAPH STANDARDS:

	CO_2	CH_4	CO
10 tanks:	200-370 ppmv*	300-2000 ppbv	20-200 ppbv

Scott Marrin Speciality Gases, cost, delivery to CMDL	US$ 4K
NOAA Calibration, 10 x CO_2, 2 x CO, CH_4	US$ 5.5K
Delivery to Melbourne	US$ 2K
	A$ 14.4K

(* CO_2: 200 290 300 310 320 330 340 350 360 370)

Status: Order to be placed November 1991, on receipt of final quote (imminent). Initial expenditure US$4K, calibration and final freight costs may carry over into 1992/1993. ~A$10K was budgeted for in 1991/1992.

SCRIPPS STANDARDS (CCL)

Cost per cylinder:

cylinder	$US 484
valve	30
filling on Scripps pier	300
	814
Calibration	2000
Transport of 10 cylinders to Australia	2000

Recommended CO_2 values:

270 310 330 345 350 355 360 365 375 395 ppmv

Status: LPS will clarify details on cylinder preparation, obtain fax details of cylinder supplier to permit direct purchase and avoid Scripps overheads, and obtain final quote. $10K from CGBAPS and $10K appropriation was budgeted for Scripps tanks in 1991/1992. Estimated expenditure for 1991/1992 is A$10.5K (US$8140); the balance in 1991/1992 will be carried over and supplemented for completion of purchase in 1992/1993.

GrEenhouse gas Intercalibration for the Southern Hemisphere Atmosphere (**GEISHA**)

Participating Laboratories and Principal Investigators (PI's please circulate within your group):

CFR/CNRS, Gif sur Yvette, FRANCE (Patrick Monfray)

DAR/CSIRO, Aspendale, AUSTRALIA (Roger Francey)

INS/DSIR, Lower Hutt, NEW ZEALAND (Martin Manning)

CMDL/NOAA, Boulder, USA (Pieter Tans)

	GRANDE GEISHA	PETITE GEISHA
Cylinder Size	50 litre	5 litre
Cylinders	5 x Air Liquide 2 x CIG SpectraSeal	5 x Air Liqide
Contents	(a) CO_2 - synthetic air 344, 351, 358, 365 372 ppmv (b) CO_2 - Cape Grim air 2 x 355 ppmv isotopes, CO_2, CH_4, etc.	CO_2 - Cape Grim air CO2 355 ppmv isotopes, CO_2, CH_4, etc.
Rotation	2 years	6 months
Aliquot	100 litres NTP	20 litres NTP