

controlling the flux of water vapor into the stratosphere. Because of the high tropopause temperatures in the western Pacific the temperature of air entering the stratosphere would be warmer and moister than normal, thus counterbalancing the expected QBO effect on stratospheric water vapor over Boulder.

HALOCARBONS AND NITROUS OXIDE

Pair flask air samples continued to be collected weekly at BRW, NWR, MLO, and SMO, during 1984; and biweekly at SPO during January, November and December 1984. Sample analyses, for CCl_3F , CCl_2F_2 , and N_2O concentrations continued to be made on a gas chromatograph in Boulder. From 1 January through 15 October 1984, a Shimadzu mini-2E gas chromatograph was operated at SPO, with CCl_3F , CCl_2F_2 and N_2O analyses made twice weekly. During October, calibration gas in cylinder 3081 was inadvertently lost, so that measurements could not continue. A new reference gas tank (No. 3083) was sent to SPO in early November, but did not arrive there until late December.

An additional Shimadzu mini-2E gas chromatograph was procured and set-up in Boulder for training and as a spare instrument. A power supply, temperature controller, and electrometer assembly were also procured and sent to SPO as spare parts.

With the eruption of Mauna Loa volcano and the subsequent loss of power at MLO, the sample collection location was transferred to Mauna Kea observatory during April 1984.

CCl_3F , CCl_2F_2 , and N_2O data for 1973 to 1979 were archived in 1984 at the National Climate Data Center in Ashville, NC. A NOAA Technical Report (Thompson et al., 1985) describes in detail the sampling and analysis program since its inception in 1973, and presents all as well as selected data.

Selected CCl_3F , CCl_2F_2 , and N_2O data for 1977 through 1 September 1984, for the NOAA/GMCC baseline stations and Niwot Ridge (NWR), Colorado, are shown in Figs. 6, 7 and 8. Solid lines fitted to the data are least squares linear regressions. Errors associated with indicated growth rates are 95% confidence intervals. All concentrations shown are expressed in the Oregon Graduate Center CCl_3F , CCl_2F_2 , and N_2O calibration scales (Rasmussen, 1983). Results for N_2O are tentative, since analyses of the air samples for N_2O may have been adversely influenced by atmospheric CO_2 . The extent of the CO_2 interference has yet to be determined.

January 1 CCl_3F and CCl_2F_2 concentrations for 1978 through 1984, derived from the linear regression analyses, are shown in Table 6. Because the growth rates of these two trace gases has remained nearly constant in recent years, the Northern Hemisphere/Southern Hemisphere annual concentration differences for CCl_3F and CCl_2F_2 have decreased by about a factor of 2 during 1978 to 1984.

Preliminary analysis of the data have yielded a best estimate atmospheric life-time for CCl_3F to be 79.9 year, and that for CCl_2F_2 94.8 years. Taking into account systematic errors in estimates of release rates of these halocarbons, and systematic and random concentration measurement errors, the atmospheric lifetimes for CCl_3F and CCl_2F_2 are calculated to range from a minimum of 35 years to a maximum of ∞ years.

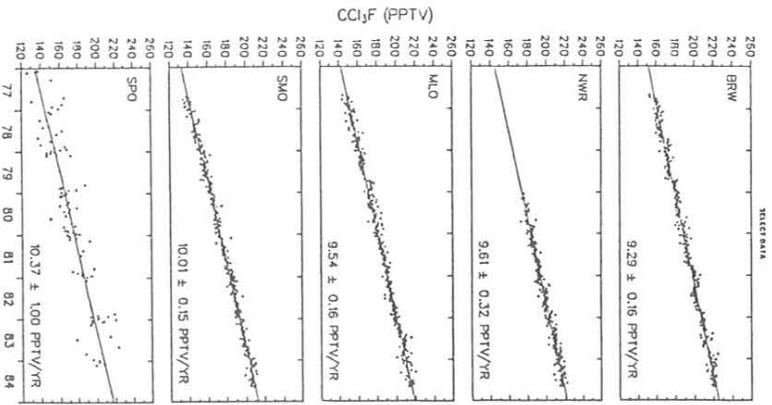


Figure 6.--Selected CCl_3F data obtained from chromatographic analyses of pressurized air samples collected in pair flasks.

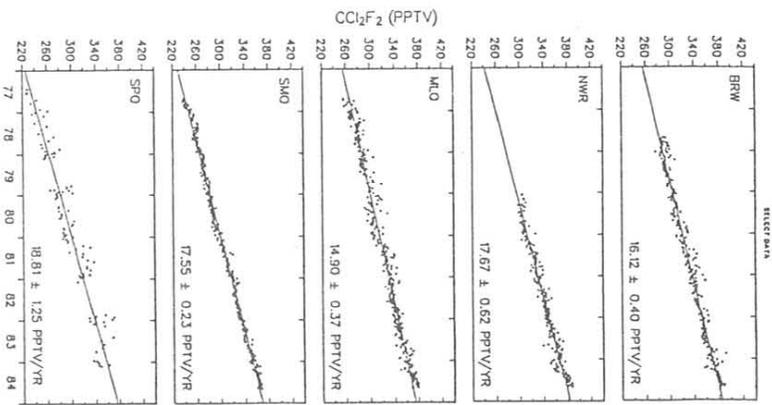


Figure 7.--Selected CCl_2F_2 data obtained from chromatographic analyses of pressurized air samples collected in pair flasks.

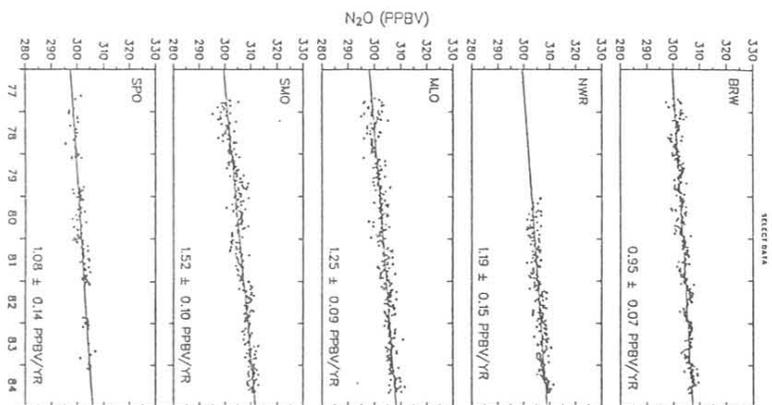


Figure 8.--Tentative, selected N_2O data obtained from chromatographic analyses of pressurized air samples collected in pair flasks.

Table 6.--CCl₃F and CCl₂F₂ Northern Hemisphere, Southern Hemisphere, and Global concentrations* in PPTV

	Year	N.H.	S.H.	Globe	% Diff: NH-SH
CCl ₃ F	1979	281.5 ± 1.1	264.5 ± (6.1)	273.0 ± (3.6)	6.2
	1980	297.4 ± 1.0	282.3 ± (5.2)	289.8 ± (3.1)	5.2
	1981	313.4 ± 0.9	300.0 ± (4.2)	306.7 ± (2.6)	4.4
	1982	330.1 ± 1.0	317.2 ± (3.3)	323.7 ± (2.2)	4.0
	1983	346.2 ± 1.1	335.0 ± (2.5)	340.6 ± (1.8)	3.3
	1984	362.9 ± 1.2	352.3 ± 1.8	357.6 ± 1.5	3.0
CCl ₂ F ₂	1978	154.2 ± 0.8	145.0 ± 1.0	149.6 ± 0.9	6.2
	1979	163.6 ± 0.7	155.0 ± 0.9	159.3 ± 0.8	5.4
	1980	173.4 ± 0.6	165.0 ± 0.8	169.2 ± 0.7	4.9
	1981	182.6 ± 0.5	175.0 ± 0.8	178.8 ± 0.7	4.3
	1982	192.2 ± 0.4	184.9 ± 0.7	188.6 ± 0.6	3.9
	1983	201.8 ± 0.5	194.9 ± 0.9	198.3 ± 0.7	3.5
	1984	211.0 ± 0.6	205.0 ± 1.5	208.0 ± 1.1	2.9

*Concentrations are given for 01 January of each year, derived from least squares linear regression fits to the data. Indicated uncertainties are 95% confidence interval measurement errors.

5.2 References

- Harris, J. M., and E. C. Nickerson (eds), 1984. Geophysical monitoring for climatic change, No. 12: Summary Report, 1983. NOAA Environmental Research Laboratories, Boulder, CO, 184 pp.
- Hilsenrath, E., J. Ainsworth, A. Holland, J. Mentall, A. Torres, W. Attmannspacher, A. Bass, W. Evans, W. Komhyr, K. Mauersberger, A. J. Miller, M. Proffitt, D. Robbins, S. Taylor, and E. Weinstock, 1985. Results from the balloon ozone intercomparison campaign (BOIC). In Atmospheric Ozone, Proceedings of the Quadrennial Ozone Symposium held in Halkidiki, Greece, 3-7 September 1984, D. Reidell, Dordrecht, Holland, 454-459.
- Komhyr, W. D., R. D. Grass, R. D. Evans, R. K. Leonard, and G. H. Semeniuk, 1985. Umkehr observations with automated Dobson spectrophotometers. In Atmospheric Ozone, Proceedings of the Quadrennial Ozone Symposium held in Halkidiki, Greece, 3-7 September 1984, D. Reidel, Dordrecht, Holland, 371-375.
- Komhyr, W. D., 1969. Electrochemical concentration cells for gas analysis. Annales de Geophysique 25(1):203-219.
- Levy II, H., J. D. Mahlman, W. J. Maxim, and S. C. Liu, 1985. Tropospheric ozone: the role of transport. Journal of Geophysical Research 90:3753-3772.