tude of this seasonal variation was less than ±10% of the average. The average of N_2O columnar density was 5.9×10^{18} molecule/cm^2 corresponding to 300 ppbv for tropospheric mixing ratio.

A more detailed analysis is under way using the whole spectral information on the absorption band to estimate more accurately the zero-absorption spectrum.

(Received April 4, 1986)

VARIATIONS OF ATMOSPHERIC CARBON DIOXIDE CONCENTRATION AT SYOWA STATION (69°00'S, 39°35'E), ANTARCTICA (ABSTRACT)

Masayuki TANAKA[1], Takakiyo NAKAZAWA[1], Masataka SHIOBARA[1*], Hiroyuki OHSHIMA[1**], Shuji AOKI[1***], Sadao KAWAGUCHI[2], Takashi YAMANOUCHI[2], Yukio MAKINO[3] and Haruta MURAYAMA[4]

[1]*Upper Atmosphere Research Laboratory, Faculty of Science, Tohoku University, Aramaki Aoba, Sendai 980*

[2]*National Institute of Polar Research, 9–10, Kaga 1-chome, Itabashi-ku, Tokyo 173*

[3]*Meteorological Research Institute, 1–1, Nagamine, Yatabe-machi, Tsukuba-gun, Ibaraki 305*

[4]*Faculty of Education, Yokohama National University, Tokiwadai, Hodogaya-ku, Yokohama 240*

Precise measurements of the atmospheric CO_2 concentration were initiated at Syowa Station, Antarctica in 1983. Preliminary inspection of the data obtained up to the present showed that; (1) a regular diurnal variation is not observable, (2) irregular variations are sometimes observed with extremely small amplitude of 0.2 ppmv at most, (3) a seasonal variation with the minimum concentration in mid-April and the maximum concentration in mid-Octoder and peak-to-peak amplitude of about 1.2 ppmv is detected, and (4) annual mean values of the CO_2 concentration are 341.2 and 342.6 ppmv for 1983 and 1984, respectively.

(Received April 30, 1986)

Present affiliation: *Meteorological Research Institute, **International Meteorological & Oceanographic Consultant, 14–7, Shintomi 2-chome, Chuo-ku, Tokyo 104, ***National Institute of Polar Research.

INCREASING ATMOSPHERIC CONCENTRATIONS OF HALOCARBONS AND METHANE IN ANTARCTICA (ABSTRACT)

Yoshihiro MAKIDE, Yuji KUBO, Akihito YOKOHATA and Takeshi TOMINAGA

Department of Chemistry, Faculty of Science, University of Tokyo, 3–1, Hongo 7-chome, Bunkyo-ku, Tokyo 113

We have been measuring the atmospheric concentrations of halocarbons (CCl_2F_2, CCl_3F, CH_3CCl_3, etc.) and methane (CH_4) in Antarctica as well as in the Northern Hemisphere (N.H.) in order to clarify behaviors and lifetimes of these compounds in the atmosphere and to estimate their effects on the earth's environment.

All-stainless steel sample canisters equipped with SS bellows valves were prepared in extremely clean conditions, and evacuated for grab-sampling in the fields. The inner surface of the canisters was deactivated by either silanization or water-vapor treatment to prevent adsorption of trace constituents during the long-period storage. All the Antarctic samples collected at 500–1000 m NE of Syowa Station were analyzed after 3–15 months at The University of Tokyo.

The concentrations of CCl_2F_2 observed in Antarctica in January–February 1982, 1983 and 1985 were 312, 331 and 359 pptv (pptv $=10^{-12}$ v/v), respectively, and those of CCl_3F were 169, 177 and 194 pptv, respectively. These concentrations observed in Antarctica were 8–10% lower than those observed in the mid-latitude N.H. (Hokkaido, 40°–45°N) in accordance with the predominant emission of these halocarbons in the N.H. (>90%) and their delayed diffusion into the Southern Hemisphere across the Intertropical Convergence Zone. The concentration of CH_3CCl_3 was about 30% lower in Antarctica (90 pptv in 1985) in accordance with its relatively short atmospheric lifetime due to the reaction with tropospheric OH radicals.

The global concentrations of CCl_2F_2 and CCl_3F have increased steadily by 4–5% every year corresponding to their unchanged large amount world-wide releases (total >700 kilotons/year) and their extremely long lifetimes in the atmosphere exceeding 70 years (probably 80–150 years). Their global concentrations by computer simulation will exceed 1500 pptv (CCl_2F_2) and 500 pptv (CCl_3F) in 50 years, and will exceed 3000 pptv and 1000 pptv, respectively, in the steady state even with their current release rates. If the release rates continue to increase as the recent statistics indicates, their atmospheric concentrations will become inevitably higher than those values.

The total Cl-concentration in the troposphere controls the amount of Cl introduced into the stratosphere. The Cl-concentration is estimated to be about 600 pptv in 1900 only due to natural CH_3Cl and may have increased to 1000 pptv in the 1960's and to 1500 pptv in the 1970's according to the increasing release of anthropogenic halocarbons such as CCl_4, CCl_3F, CCl_2F_2, CH_3CCl_3, and others. The present Cl-concentration in the atmosphere is calculated to be 3000–3500 pptv with 1000–1500 pptv increase per decade. The Cl-concentration will gradually approach 10000 pptv with current emission rates, or 20000 pptv with increasing emission rates. Under these situations, substantial depletion of stratospheric ozone and greenhouse effect are anticipated. The increment of methane concentration as observed in the both hemispheres will also cause greenhouse effect and depletion of tropospheric OH radicals.

(Received May 26, 1986)

DECOMPOSITION OF POLYATOMIC MOLECULES DUE TO AURORAL X-RAYS (ABSTRACT)

Kyo SEKIHARA

2179–3, Daitakubo, Urawa 336

The concentration of carbon monoxide in the Arctic stratosphere measured by a commercial airliner and reported by R. PRATT and P. FALCONER (J. Geophys. Res., **84**, 7876, 1979) showed a specific interesting feature which showed an upward increasing trend together with that of ozone. The feature was not observed in the Antarctic measurement that followed two days later. More interestingly the fine structure of the Arctic measurement showed a feature of sudden tempera-