DETERMINATION OF ATMOSPHERIC CONCENTRATIONS OF HALOCARBONS AND METHANE IN THE ANTARCTIC (Abstract)

Yoshihiro MAKIDE, Akihito YOKOHATA and Takeshi TOMINAGA

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

The background atmospheric concentrations of halocarbons (CCl_2F_2, CCl_3F, CH_3CCl_3, etc.) and methane (CH_4) in the Antarctic were measured and compared with those observed in the Northern Hemisphere (N.H.) in order to clarify behaviors and lifetimes of these compounds in the atmosphere. Sampling canisters used in the Antarctic are made of stainless steel vessels in extremely clean conditions and equipped with stainless steel bellows valves. The inner surface of canisters was silanized to prevent adsorption of trace constituents during the long-period storage. Inactivation of the surface was also attempted by introducing water vapor into the canister. All the antarctic samples collected in 1981–1984 at 500–1000 m NE (upwind direction) of Syowa Station were analyzed after 3–15 months at the University of Tokyo by ECD gas chromatography (for halocarbons) and by FID gas chromatography (for methane). The primary calibration standards were carefully prepared with a newly developed technique and the values of concentration of the halocarbons and methane were accurately determined.

The concentrations of CCl_2F_2 and CCl_3F observed in the Antarctic in January–February 1983 (330.8 and 176.6 pptv (pptv$=10^{-12}$ v/v), respectively) were about 10% lower than those observed in the N.H. in accordance with their predominant emissions in the N.H., their extremely long lifetimes exceeding 50 years, and the delayed diffusion into the Southern Hemisphere (S.H.) due to the exsistence of Intertropical Convergence Zone between the hemispheres. The atmospheric concentrations in both hemispheres tend to increase steadily at rates of 18–19 pptv/year (CCl_2F_2) and 8–9 pptv/year (CCl_3F) corresponding to the unchanged worldwide uses and releases of these compounds in large amounts. The concentration of CH_3CCl_3 in the Antarctic was 81.5 pptv in January 1983 and about 30% lower than in the N.H. in accordance with its relatively short atmospheric lifetime (*i.e.*, 6–7 years due to the reaction with OH radicals in the troposphere). The methane concentration in the Antarctic (1.56 ppmv) was slightly increasing with small seasonal variations.

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DECOMPOSITION OF CARBON DIOXIDE IN THE LOWER STRATOSPHERE DUE TO AURORAL X-RAYS (Abstract)

Kyo SEKIHARA

2179-3, Daitakubo, Urawa 336

It is pointed out that the circumpolar stratospheric measurement by a commercial airliner reported by PRATT and FALCONER (J. Geophys. Res., **84**, 7876, 1979) was by chance undertaken after a strong geomagnetic storm.

Thus the result showed specific maxima of CO concentrations accompanied by simultaneous minima of temperature.

Based on the supposition that it might be caused by the decomposition of atmospheric CO_2 in the process of degradation of photoelectrons of auroral X-rays, a quantitative explanation of the observed amount of CO increase was attempted by means of the currently existing theory of electron and photon transportation.

In the course of calculation it was shown that the slow electron near the dissociation threshold (5.45 eV) was playing a role of predominant importance because of the resonance effect and also its characteristic transparency to air molecules.

It suggests the importance of the direct effect of auroral electrons to dissociate CO_2 in the middle atmosphere.

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EXTRACTION OF CLOUDS FROM SATELLITE IMAGERY IN THE ANTARCTIC (Abstract)

Kazuya SUZUKI[1], Takeo YOSHINO[1], Takashi YAMANOUCHI[2], Sadao KAWAGUCHI[2] and Shinya TANAKA[3]

[1]*University of Electro-Communications, 5–1, Chofugaoka 1-chome, Chofu-shi, Tokyo 182*

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

[3]*Fujitsu Ltd., 17–25, Shinkamata 1-chome, Ota-ku, Tokyo 144*

Extraction of clouds from satellite imagery (NOAA-7 AVHRR) in the Antarctic is attempted. In the place where the surface is covered with snow or sea-ice, like the Antarctic, discrimination of cloud and snow or sea-ice is difficult. However, extraction of clouds from the satellite imagery is in urgent need for the study of cloud climatology in the Antarctic. It is already known that the cloud extraction under the sunlight is possible by calculating the difference in the brightness temperature between channel 3 (3.7 μm) and channel 4 (11 μm) (or channel 5 (12 μm)) owing to the difference in albedo. If the brightness temperature of channel 3 is extremely larger than that of channel 4, the field of view (FOV) is occupied by cloud. In this study, some techniques for the extraction of clouds are proposed using the brightness temperature T_{B_3}, T_{B_4} and T_{B_5} for channels 3, 4 and 5, respectively. 1) Even without sunlight, if T_{B_3} is larger than T_{B_4} (or T_{B_5}), the FOV is occupied by cloud. 2) The thin cloud extraction is possible by calculating the difference between T_{B_4} and T_{B_5}. If T_{B_4} minus T_{B_5} is larger than 1.8 K, the FOV is occupied by thin cloud. 3) The cloud extraction over the sea is easily made by calculating the ratio in albedo between channel 1 (visible) and channel 2 (near-infrared). If the ratio is nearly equal to unity, the FOV is occupied by cloud. These are explained by radiative properties of clouds; the relation of cloud emittances ε_3, ε_4 and ε_5 for channels 3, 4 and 5, respectively, is expressed as $\varepsilon_5 > \varepsilon_4 > \varepsilon_3$, and relation of cloud reflectances ρ_1 and ρ_2 for channels 1 and 2 is $\rho_1 \approx \rho_2$.

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