BALLOON MEASUREMENTS OF AEROSOL IN THE ANTARCTIC STRATOSPHERE (Abstract)

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Balloon measurements of aerosol in the lower stratosphere were made in 1983 to investigate the behavior of the polar stratospheric aerosols. Three aerosol soundings were conducted from Syowa Station, Antarctica. Number concentration and the size distribution of Mie particle (aerosol particles with diameter greater than 0.3 μm) were measured by using a light-scattering aerosol particle counter. The counter is made to be suitable for the balloon measurements in the Antarctic stratosphere. The counter has two pulse height discriminators to differentiate the size of the particles having the diameter $\geqq$0.3 and $\geqq$0.5 μm, respectively, for the refractive index of 1.40. Thus a rough indication of the size distribution is obtained.

Though three aerosol soundings were carried out, the present discussion concerns the last two flights (June 3 and October 16), because the result on April 1 is limited in the troposphere. High aerosol concentration was obtained during the flight on October 16 in the stratosphere. Compared with the number concentration obtained from the measurements during a period of low volcanic activity, the concentration was about 3 times higher than that of the low volcanic period. The high concentration could be attributed to the effect of the eruption of El Chichón in April 1982. Very high concentration was obtained from the first successful aerosol balloon sounding in the winter Antarctic stratosphere on June 3. The aerosol concentration was about 10–15 times higher than that of the low volcanic period. Though the effect of El Chichón may be partly responsible for the enhanced aerosols, this result gives a direct evidence of "winter increase of the aerosol concentration in the Antarctic stratosphere". The profile of aerosol count ratio suggests that the particle size in the enhanced aerosol concentration region seems to be similar to that normally appearing in the mid-latitude stratosphere.

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BALLOON MEASUREMENT OF THE STRATOSPHERIC NO_2 BY THE 23RD JAPANESE ANTARCTIC RESEARCH EXPEDITION (Abstract)

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The stratospheric NO_2 over Antarctica was measured with a spectrophotometer on board the balloon B5.JA21 launched from Syowa Station (69°S, 40°E) on November 24, 1982. The principle of the measurement is solar absorption spec-

troscopy in the visible region. To NO_2 profiles between the altitudes 21 and 35 km were deduced from the data obtained during sunset and sunrise. These profiles resemble each other, representing a peak at 26 km a valley at 23 km, and the mean densities at 21, 23, 26, 30, and 35 km are 5×10^9, 3×10^9, 4.5×10^9, 3×10^9 and 1.5×10^9 cm^{-3}, respectively. The profile above the peak is similar to other NO_2 profiles obtained at middle latitudes in the past, but that below the peak differs from them. The wind data at Syowa Station show that there were a strong equatorward wind below an altitude of 25 km and a weak poleward wind above 25 km on the day of the experiment. The peculiar shape of the lower part of the profile seems to be due to the air mass transported from higher latitudes, since there was a sunlit condition around the pole and the stratosphere must have been rich in NO_2.

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GROUND-BASED OBSERVATION OF THE ATMOSPHERIC NO_2 ABUNDANCE AT SYOWA STATION (Abstract)

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The atmospheric NO_2 abundance was measured by ground-based solar visible absorption spectroscopy using the sun and the moon as a light source from Syowa Station, Antarctica (69.0°S, 39.6°E). The observation covered the period from March 1983 to January 1984. The tropospheric component in the measured atmospheric NO_2 abundance was found to be negligible in comparison with the stratospheric one by analyzing the data obtained at solar zenith angle of about 90°. Seasonal variation is clearly seen in the daytime vertical column abundance of the stratospheric NO_2; a summer maximum of about 7×10^{15} cm^{-2} and a winter minimum of $<1\times10^{15}$ cm^{-2}. This seasonal behavior agrees well with that obtained in the Arctic region (71°N). Although in general the nighttime decay of NO_2 is recognized in the data during the autumn and the winter, diurnal variations in NO_2 are smaller than those at mid-latitudes. As for the spring and the summer data, diurnal variations in NO_2 could not be observed, because only sunrise or sunset observations could be made during those periods. There exist large day-to-day variations in the vertical column abundance of NO_2. This fact implies that horizontal transport of airmass plays an important role in the polar stratosphere. The nighttime abundance of the stratospheric NO_2 seems to show a similar variation to the daytime one, but only a few measurements were made in the night and further studies will be needed.

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