Proc. NIPR Symp. Polar Meteorol. Glaciol., **10**, 159, 1996

OBSERVATION OF STRATOSPHERIC NO_2 AT SYOWA STATION, ANTARCTICA (ABSTRACT)

Akane KAWAGUCHI[1], Yutaka KONDO[1], Makoto KOIKE[1], Hideaki NAKAJIMA[1], Shuhji AOKI[2], Takashi YAMANOUCHI[3], Michihiro KOIDE[2], Ippei NAGAO[4] and Kunimoto IWAI[5]

[1]*Solar Terrestrial Environment Laboratory, Nagoya University, Toyokawa 442*
[2]*Faculty of Science, Tohoku University, Aoba-ku, Sendai 980-77*
[3]*National Institute of Polar Research, 9–10, Kaga 1-chome, Itabashi-ku, Tokyo 173*
[4]*Institute for Hydrospheric-Atmospheric Sciences, Nagoya University, Nagoya 464-01*
[5]*Faculty of Education, Shinsyu University, Matsumoto 390*

Ground based observations of NO_2 and O_3 using visible spectrometers have been made at Syowa Station (69°S) since March 1990. The NO_2 slant column amounts observed at the solar zenith angle of 90° (sunrise and sunset) exhibit a large seasonal variation, decreasing with shortening daylight hours in fall, reaching a minimum of about 1×10^{16}cm^{-2} in midwinter and increasing to a maximum of about 16×10^{16}cm^{-2} in midsummer. The recovery of NO_2 in spring is 2–3 times slower than the fall decay, because the heterogeneous chemistry on PSCs, the conversion of NO_x into HNO_3, is effective from midwinter to early spring, and NO_y is removed from the stratosphere through gravitational sedimentation of PSCs particles. In late spring the PSCs decrease and NO_2 increases because of the transport of air from lower latitudes. Following the eruption of Mt. Pinatubo (15°N) in June 1991, the NO_2 amounts in midsummer of 1991 were lower by 20–30% than those in 1990. The NO_2 amount in midsummer increased year after year and recovered to the 1990 level by 1994. The NO_2 amount in fall also recovered since 1992; however, the rate of recovery is smaller than in summer. The NO_2 level in fall of 1993 was as low as those in 1992. On the other hand, the rate of recovery in the box model using the observed aerosol surface areas by SAGE (S. SOLOMON *et al.*, J. Geophys. Res., **99**, 3509, 1994) is larger than that observed at McMurdo and Syowa Stations. This may suggest that another factor delays the NO_2 recovery in fall. NO_2 levels in winter have a positive correlation with temperature at 20 and 70 hPa (about 25 and 18 km, respectively). In colder winters such as 1990 and 1993, the NO_2 levels were lower than those in other years. This may be due to the difference in the location of the polar vortex boundary relative to Syowa Station. The NO_2 amount and the temperature are considered to be lower deep inside the vortex as compared to near the boundary. In spring, the NO_2 and O_3 amounts and the temperature largely change when the vortex boundary crosses over Syowa Station. The vortex boundary can be clearly seen in the total O_3 maps obtained by TOMS. The monthly mean O_3 values suggest that Syowa Station was located deep inside of the vortex in October 1992 when the NO_2 level was lower than in other years. In contrast, Syowa Station was located near the edge of the vortex in October 1991 when the NO_2 level was much higher.

(Received November 1, 1995; Revised manuscript accepted May 10, 1996)