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GROUND BASED MEASUREMENTS OF COLUMN AMOUNTS OF NO_2 OVER SYOWA STATION, ANTARCTICA (ABSTRACT)

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Column amounts of NO_2 have been measured using visible spectroscopy at Syowa Station (69°S) from March 1990. The NO_2 slant column amount at a solar zenith angle (SZA) of 90° exhibits a large seasonal variation, reaching a minimum of 1×10^{16} cm^{-2} or less in midwinter, and increases to a maximum of 17×10^{16} cm^{-2} in midsummer. The recovery of NO_2 in spring is 2–3 times slower than the fall decay. The observed temperature indicates that PSCs are expected to form from midwinter to early spring. A decrease in ozone was observed from early August and continued to the end of September, consistent with the observed depletion in NO_2 during the same period. A chemical box model has been used to quantitatively interpret these observed results. The observed NO_2 values in fall are in agreement with the box model including only gas phase chemistry or with heterogeneous chemistry on background sulfuric acid aerosols. In addition, the very low NO_2 amounts and slow rate of increase observed from midwinter to early spring agree well with the model results assuming heterogeneous chemistry of PSCs. From the late spring of 1991, the NO_2 amounts are lower by more than 30%, presumably due to the increased rate of conversion of NO_x into HNO_3 via N_2O_5 on the enhanced amount of sulfuric acid aerosols resulting from the Pinatubo eruption. The reduction of NO_2 in midsummer of 1991 and 1992 below that of midsummer in 1990 is probably due to the transport of air from lower latitudes, where NO_2 is already reduced by the volcanic aerosols. NO_2 and O_3 values in October 1992 were much reduced as compared with those for 1990 and 1991, reflecting the difference in the location of the vortex boundary relative to Syowa Station.

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