ATMOSPHERIC NITROGEN DIOXIDE IN ANTARCTICA (ABSTRACT)

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Seasonal behavior of stratospheric NO_2 content was determined for the period of March 1983 to January 1984 from ground-based spectroscopic measurements at Syowa Station. The winter minimum of about 1×10^{15} cm^{-2} and the summer maximum of about 7×10^{15} cm^{-2} were observed. This seasonal behavior compares well with those observed at northern high latitudes. A rapid increase in column density started at the end of September before the minimum of total ozone in mid-October. This increase in column density seems to correlate with an increase in sunlit time in the stratosphere. Our results imply that both dynamical and photochemical processes may be involved in the Antarctic ozone depletion. The first balloon observation of stratospheric NO_2 profile in Antarctica was made on November 24, 1982 and two observations on November 12 and 20, 1983 at Syowa Station. All observations were concentrated in November, early summer in Antarctica. Two vertical profiles, sunset and sunrise ones, could be deduced in series from one balloon flight. They should be virtually the same rather than corresponding to different profiles for the evening and morning, because, in this season of year, the sunlit condition lasted all day long at the balloon altitude. No quantitative change can be seen in profiles between 1982 and 1983. Above 25 km altitude, three profiles are basically identical to those observed at middle and high latitudes in the northern hemisphere.

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DYNAMICAL FACTORS AFFECTING OZONE MIXING RATIOS IN THE ANTARCTIC LOWER STRATOSPHERE (ABSTRACT)

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This study shows the climatology and interannual variability of dynamical quantities and ozone mixing ratios during the southern hemisphere spring. Analyses are made mainly for six years, from 1979 to 1984, September through December, using the temperature and geopotential height data provided by the National Meteorological Center (NMC) and the ozone mixing ratio data derived from the solar backscatter ultraviolet (SBUV) instrument on board the Nimbus 7.

The zonal mean climatology shows that the coldest temperatures and zonal winds move poleward and downward from September through November, probably in response to wave forcing. A steep decrease in zonal mean ozone mixing ratios is observed around 60°S toward the south pole in September. With time, this high latitude ozone minimum (or "ozone hole") gets shallower in association with minor warmings and a final warming. Climatological synoptic charts in the lower stratosphere show the circumpolar circulation in the geopotential height field and a prominent planetary wave 1 in the temperature and ozone fields. The phases of the temperature and ozone waves in the lower stratosphere are very similar.

The year-to-year variation of the ozone mixing ratio at high latitudes is related to that of the wave activity during the winter and spring. When the wave activity is vigorous, there are weaker