# YEAR-TO-YEAR CHANGES OF THE TROPOPAUSE HEIGHT AT SYOWA, ANTARCTICA—A POSSIBLE RELATION TO THE OZONE HOLE—(ABSTRACT)

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The tropopause height is sensitive to the temperature change in the troposphere, which is controlled by moist convection and heat flux by baroclinic waves, and also to the temperature changes in the lower stratosphere which are controlled by radiative and chemical heating and heat flux by planetary waves. Since the ozone hole has occurred in the Antarctic lower stratosphere, the changes of tropopause height at Syowa possibly provide evidence of circulation changes relating to ozone depletion.

Long-term mean seasonal changes of tropopause height at Syowa, which were observed during 21 years from 1966 to 1987, are that the maximum height appeared in winter and spring, and the minimum, in summer; the height is negatively correlated with temperature in the lower stratosphere. Furthermore, year-to-year changes of the October total ozone correlate well negatively with the rise of the tropopause height. These results are considered to show that the tropopause height can be an index of changes related to ozone depletion.

From comparison of the year-to-year variation of the tropopause height, it is found that the height of 1987 is higher than that of 1975 during all seasons; the most remarkable changes are seen in spring. These remarkable changes are mainly due to temperature decline in the lower stratosphere above 300 mb relating to the ozone depletion, and slightly due to temperature rise in the troposphere: these characteristics are obtained from comparison of the vertical profiles of temperature. The results suggest that temperature changes in the troposphere and lower stratosphere in all seasons could contribute to the ozone depletion condition.

More detailed analysis of the tropopause height could elucidate the circulation changes relating to the ozone hole.

(*Received January 27, 1990; Revised manuscript received March 5, 1990*)

# MEASUREMENTS OF THE NUMBER CONCENTRATION OF AEROSOL PARTICLES IN NORTHERN NORWAY (ABSTRACT)

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The number concentrations of aerosol particles in five size ranges were measured continuously using a particle counter (Rion, KC-01B) in Arctic Norway for one month in midwinter in 1987/1988. Samples of aerosol particles were collected on filter paper, and the chemical composition

of each particle was analyzed with a scanning electron microscope and an energy dispersive X-ray microanalyzer.

In order to estimate the origin of aerosol particles, back trajectories of air parcels which arrived at the observation site were determined on 850 mb charts. They were well correlated with the time changes of the number concentration of aerosol particles and also with the chemical composition of each particle.

In the cases when the aerosol particles seemed from trajectories to travel around with a slowly moving low pressure over the Norwegian Sea, the number concentration indicated low values for several days, and the chemical constituents of most particles were of marine origin, namely Na and Cl.

Around the observation site the prevailing wind direction was from the southwest. The number concentrations for these cases indicated medium values with slight variation. The aerosol particles contained some soil elements although the primary elements were of marine origin.

On some days, aerosol particles derived from trajectories which passed over industrial areas in Europe arrived at the observation site. In this case the number concentration indicated high values, and the anthropogenic elements such as sulphate were detected frequently in aerosol particles.

*(Received October 30, 1989)*

# CONCENTRATION OF ATMOSPHERIC CARBON DIOXIDE AT THE JAPANESE ANTARCTIC STATION, SYOWA (ABSTRACT)

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Continuous measurement of the atmospheric $CO_2$ concentration was initiated at Syowa Station in February 1984. Variation of $CO_2$ concentration at this station can be divided into three components such as secular trend, seasonal cycle and irregular variation after removing contaminated data. The secular trend was variable with time. The increase rate of $CO_2$ concentration was low from 1984 to 1986, but it became very high in 1987 and 1988. This change may be related to the 1987 ENSO event. The average rate of annual $CO_2$ increase over the 5 years was about 1.6 ppmv $yr^{-1}$.

The average seasonal $CO_2$ cycle showed minimum and maximum concentrations in mid-April and early in October and its peak-to-peak amplitude was about 1.1 ppmv. The seasonal cycle including irregular parts was variable from year to year, but there was no indication of long-term expansion of the amplitude.