

A-1 Comprehensive Observation and Analysis of Variability of the Ozone Layer

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Record low ozone values have been observed over Antarctica and in the zonal mean throughout mid-latitudes of both hemispheres during 1992-1993 and during winter 1995. The ozone depletion observed during winter 1995 can not be attributed to the effects of Pinatubo volcanic aerosols. Even though chlorine and bromine are primarily responsible for these ozone depletion, details of the processes are not completely understood. This study has been developing instruments for systematic observations and has been carrying out process studies and modeling to detect and understand the ozone depletion in the mid-latitude region.

In this three years, following studies have been carried out.

1. Ground-based remote sensing instruments, being deployed within the Network for the Detection of Stratospheric Change (NDSC), such as ozone lidars, millimeterwave radiometers, infrared heterodyne spectrometers, visible spectrometers are developed for measurement of trace species (O_3 , ClO, N_2O , CH_4 , HNO_3 , NO_2 , NO_3).
2. An FTIR spectrometer with resolution of 0.02 cm^{-1} was used to measure solar spectra during the aircraft experiments through a ZnSe window. A curve fitting software with a least square method for solar- and synthetic spectra has been developed. Measurement of tropospheric background HCl was also carried out at the summit of Mt. Fuji. Aircraft measurements were carried out in FY 1993 and 1995.
3. Observation of aerosols and ozone in the stratosphere with lidars, aerosol sondes and ozone sondes were carried out at Spitzbergen, Alaska, Hokkaido and Tsukuba in the frame work of SESAME. Laboratory experiments on the radical-radical reactions, radical-liquid interactions, PSCs formation/extinction and heterogeneous reactions were carried out. The effects of volcanic aerosols were estimated on the stratospheric ozone and temperature were estimated.
4. Ozone sondes measurements at Moshiri were carried out during winter 1996 as a part of campaign measurements. Spectral analyses were made on the development of the Antarctic Ozone Hole from 1989 to 1995 and on ozone depletion in the winter Northern Hemisphere. A numerical model was developed to simulate the breakdown of polar vortex.