A-3 **Verification on utilization of satellite remote sensors data of the atmosphere**

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Total Budget for FY1998-2000 197,113,000Yen (FY2000; 75,162,000Yen)

Key Words ozone layer, greenhouse gases, satellite sensor, lidar, cloud, aerosol

Sensitivity and error analyses were done by numerical simulation for Improved Limb Atmospheric Spectrometer (ILAS)-II and Solar Occultation FTS for Inclined-orbit Satellite (SOFIS) with an emphasis on measurements of greenhouse gases. It was revealed that they can provide mixing ratios of carbon dioxide and other gases in the upper troposphere with reasonable precisions and no biases as long as pressure and temperature are correctly introduced into the retrieval procedure.

Data reduction algorithms were studied for future space-borne lidar to observe global distributions of clouds and aerosols, by means of computer simulation. The algorithm was applied to the data from the LITE, the ground-based and ship-borne lidars. Model simulations were conducted in order to assess the influence of multiple scattering on signals. Applications of lidar data to climate model validation were also investigated.

Laboratory experiments were carried out to determine the accurate absorption line parameters, such as the line position, the line strength, and the half-width, which are required in the data analysis of ILAS-II. The absorption spectra of CH_4, N_2O, and CO_2 were measured with a high-resolution Fourier transform spectrometer at room temperature. The measurements were compared with the existing database such as HITRAN, resulting in generally good agreement between them.

Polar Stratospheric Clouds (PSCs) were studied using data obtained with the ground-based lidars located at Hokkaido, Eureka, and Dome F, together with the data from the balloon-borne particles counters and the satellite sensor ILAS. Comparisons of the observational data with theoretically predicted values reveal that the particles were Super-cooled Ternary Solutions (STS) in some cases. A three-dimensional model of the stratospheric chemistry was applied to analyze the observations of the ILAS. In particular, vertical profiles of nitric acid (HNO_3) were compared to coincident model calculations in order to derive information on the composition of PSCs and their impact on the vertical distribution of nitrogen species. A fast and simple method was developed to identify possible PSC candidates from ILAS visible channel transmittance data of the visible channel.

Satellite observational data on atmospheric parameters, such as mixing ratio of minor species or temperature and pressure, must be validated before scientific usages. ILAS Version 5.20 data products of O_3, NO_2, and HNO_3 were validated using ozonesonde, balloon, aircraft, and other satellite data. Scientific analyses using satellite data were promoted in various topics, such as the Arctic chemical ozone loss estimation using ILAS data, a year-to-year variation of air mass decent rates inside the Antarctic polar vortex using the HALOE CH_4 data, and relationship between planetary wave activity and total ozone amount. Global distribution and seasonal characteristics of gravity waves were also investigated using the GPS/MET data.