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Comparison of In Situ Aerosol Measurements with SAGE II and SAM II Aerosol Measurements during the Airborne Antarctic Ozone Experiment

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Models indicate that stratospheric aerosols play a major role in the destruction of ozone during the Austral winter. Although many in situ measurements of stratospheric aerosols were made during the Airborne Antarctic Ozone Experiment, changes of aerosol concentration and size distributions across the polar vortex are important to understanding changes of chemical species taking place during this time. Therefore comparison the in situ measurements with measurements made by satellites scanning wider areas are will give a clearer picture of the possible role played by aerosols during this period.

The SAM II instrument consists of a single-channel sun photometer designed to measure atmospheric extinction at a wavelength of 1 micrometer (McCormick et al.,1979) during local satellite sunrise and sunset. At this wavelength the attenuation of sunlight by gaseous absorption is negligible, and the extinction due to molecular scattering can be removed so that the measured irradiance data can be reduced and inverted to give an aerosol extinction profile with a 1-km vertical resolution (Chu and McCormick, 1979).

The SAGE II instrument is a seven-channel sun photometer similiar to SAM II (Mauldin, et al., 1985). SAGE II provides verticle profiles of ozone, NO2, water vaper and aerosol extinctions at 1.02, 0.525, 0.453, and 0.385 micrometer wavelengths. In general, the lower altitude limit for the aerosol extintion at 1.02 micrometers is the cloud top (as is SAM II), the lower altitude limit for the aerosol extinction at 0.525, 0.453, and 0.385 micrometers are 6.5 km, 10.5 km, and 14.5 km altitudes, respectively, if they are above the cloud top.

SAM II measurements are all made at polar latitudes of 64 to 80 S and 64 to 80 N. SAGE II coverage is from 80 S to 80 N latitudes varying with season.

In situ measurements were made by Particle Measuring Systems ASAS-X and FSSP particle spectrometers, and by NASA-Ames Research Center's Wire Impactor. The ASAS-X aerosol spectrometer sizes aerosol particles from 0.1 to 3.0 micrometers diameter. The FSSP aerosol spectrometer sizes particles from 1.0 to 8.0 micrometers. The wire impactor collects particles on 500 micrometer diameter wires and then sizes them using scanning electron microscope images.

The wire impactor size distributions are compared to those from the aerosol spectrometers and a best fit size distribution determined. Aerosol extinctions are calculated from the in situ measurements and compared to the extinctions measured by the satellites. Five comparisons are made with SAGE II and four with SAM II. Extinctions agree as close as a factor of two.

C - 2