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Ozone observations by the Gas and Aerosol Measurement Sensor during SOLVE II

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Abstract. The Gas and Aerosol Measurement Sensor (GAMS) was deployed aboard the NASA DC-8 aircraft during the second SAGE III Ozone Loss and Validation Experiment (SOLVE II). GAMS acquired line-of-sight (LOS) direct solar irradiance spectra during the sunlit portions of ten science flights of the DC-8 between 12 January and 4 February 2003. Differential line-of-sight (DLOS) optical depth spectra are produced from the GAMS raw solar irradiance spectra. Then, DLOS ozone number densities are retrieved from the GAMS spectra using a multiple linear regression spectral fitting technique. Both the DLOS optical depth spectra and retrieved ozone data are compared with coincident measurements from two other solar instruments aboard the DC-8 platform to demonstrate the robustness and stability of the GAMS data. The GAMS ozone measurements are then utilized to evaluate the quality of the Wulf band ozone cross sections, a critical component of the SAGE III aerosol, water vapor, and temperature/pressure retrievals. Results suggest the ozone cross section compilation of Shettle and Anderson currently used operationally in SAGE III data processing may be in error by as much as 10–20% in the Wulf bands, and their lack of reported temperature dependence is a significant deficiency. A second, more recent, cross section database compiled for the SCIAMACHY satellite mission appears to be of much better quality in the Wulf bands, but still may have errors as large as 5% near the Wulf band absorption peaks, which is slightly larger than their stated uncertainty. Additional laboratory measurements of the Wulf band cross sections should be pursued to further reduce their uncertainty and better quantify their temperature dependence.

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