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Dear Dr. Lacis Andrew!

Thank you for your abstract submission !

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ABSTRACT

Direct beam spectral extinction measurements of solar radiation contain important information on atmospheric composition in a form that is essentially free from multiple scattering contributions that otherwise tend to complicate the data analysis and information retrieval. Such direct beam extinction measurements are available from the solar occultation satellite-based measurements made by the Stratospheric and Aerosol Gas Experiment (SAGE II) instrument and by ground-based Multi-Filter Shadowband Radiometers (MFRSRs). The SAGE II data provide cross-sectional slices of the atmosphere twice per orbit at seven wavelengths between 385 and 1020 nm with approximately 1 km vertical resolution, while the MFRSR data provide atmospheric column measurements at six wavelengths between 415 and 940 nm but at one minute time intervals. We apply the same retrieval technique of simultaneous least-squares fit to the observed spectral extinctions to retrieve aerosol optical depth, effective radius and variance, and ozone, nitrogen dioxide, and water vapor amounts from the SAGE II and MFRSR measurements. The retrieval technique utilizes a physical model approach based on laboratory measurements of ozone and nitrogen dioxide extinction, line-by-line and numerical k-distribution calculations for water vapor absorption, and Mie scattering constraints on aerosol spectral extinction properties. The SAGE II measurements have the advantage of being self-calibrating in that deep space provides an effective zero point for the relative spectral extinctions. The MFRSR measurements require periodic clear-day Langley regression calibration events to maintain accurate knowledge of instrument calibration.