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Column ozone and aerosol optical properties retrieved from direct solar irradiance measurements during SOLVE II

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Abstract. Direct observation of the Sun at large solar zenith angles during the second SAGE III Ozone Loss and Validation Experiment (SOLVE II)/Validation of International Satellites and study of Ozone Loss (VINTERSOL) campaign by several instruments provided a rich dataset for the retrieval and analysis of line-of-sight column composition, intercomparison, and measurement validation. A flexible, multi-species spectral fitting technique is presented and applied to spectral solar irradiance measurements made by the NCAR Direct beam Irradiance Atmospheric Spectrometer (DIAS) on-board the NASA DC-8. The approach allows for the independent retrieval of O₃, O₂·O₂, and aerosol optical properties, by constraining Rayleigh extinction. We examine the 19 January 2003 and 6 February 2003 flights and find very good agreement of O₃ and O₂·O₂ retrievals with forward-modeling calculations, even at large solar zenith angles, where refraction is important. Intercomparisons of retrieved ozone and aerosol optical thickness with results from the Ames Airborne Tracking Sunphotometer (AATS-14) are summarized.

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