Home
Online Library ACP
- Recent Final Revised Papers
- Volumes and Issues
- Special Issues
- Library Search
- Title and Author Search

Online Library ACPD
Alerts & RSS Feeds
General Information
Submission
Review
Production
Subscription
Comment on a Paper

Volumes and Issues | Contents of Issue 3

Atmos. Chem. Phys., 7, 575-586, 2007
www.atmos-chem-phys.net/7/575/2007/

On the variability of the Ring effect in the near ultraviolet: understanding the role of aerosols and multiple scattering

A. O. Langford[1], R. Schofield[1,3,*], J. S. Daniel[1], R. W. Portmann[1], M. L. Melamed[1,3], H. L. Miller[1,3], E. G. Dutton[2], and S. Solomon[1]

[1]NOAA Earth System Research Laboratory/Chemical Sciences Division, Boulder, Colorado

[2]NOAA Earth System Research Laboratory/Global Monitoring Division, Boulder, Colorado

[3]CIRES, University of Colorado, Boulder, Colorado

[*]now at: Alfred-Wegener-Institute for Polar and Marine Research, Research Department Potsdam, Potsdam, Germany

Abstract. The "filling-in" (FI) of Fraunhofer lines, often referred to as the Ring effect, was examined using measurements of near ultraviolet sunlight scattered from the zenith sky above Boulder, Colorado during July and August 2005. The FI of the 344.1 nm Fe I line was directly determined by comparing direct sun and cloud-free zenith sky spectra recorded on the same day. The results, obtained over solar zenith angles (SZA) from 20° to 70°, are compared to the predictions of a simple rotational Raman Scattering (RRS) spectral model. The measured FI was found to be up to 70% greater than that predicted by first-order molecular scattering with a much stronger SZA dependence. Simultaneously measured aerosol optical depths and Monte Carlo calculations show that the combination of aerosol scattering and second-order molecular scattering can account for these differences, and potentially explain the contradictory SZA dependences in previously published measurements of FI. These two scattering processes also introduce a wavelength dependence to FI that complicates the fitting of diffuse sunlight observations in differential optical absorption spectroscopy (DOAS). A simple correction to improve DOAS retrievals by removing this wavelength dependence is described.

Final Revised Paper (PDF, 3736 KB) | Discussion Paper (ACPD)

Citation: Langford, A. O., Schofield, R., Daniel, J. S., Portmann, R. W., Melamed, M. L., Miller, H. L., Dutton, E. G., and Solomon, S.: On the variability of the Ring effect in the near ultraviolet: understanding the role of aerosols and multiple scattering, Atmos. Chem. Phys., 7, 575-586, 2007. Bibtex | EndNote | Reference Manager

News
- Sister Journals AMT & GMD
- Financial Support for Authors
- Journal Impact Factor
- Public Relations & Background Information

Recent Papers

01 | ACP, 01 Dec 2008: New constraints on terrestrial and oceanic sources of atmospheric methanol

02 | ACP, 01 Dec 2008: Evaluation of tropospheric and stratospheric ozone trends over Western Europe from ground-based FTIR network observations

03 | ACPD, 28 Nov 2008: Atmospheric oxygen and carbon dioxide observations from two European coastal stations 2000–2005: continental influence, trend changes and APO climatology