Atmos. Chem. Phys. Discuss., 11, C7450–C7452, 2011
www.atmos-chem-phys-discuss.net/11/C7450/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Absolute ozone absorption cross section in the Huggins Chappuis minimum (350–470 nm) at 296 K" *by* J. L. Axson et al.

Anonymous Referee #1

Received and published: 5 August 2011

General comments:

The paper by Axson et al. describes an interesting application of the incoherent broadband cavity enhanced absorption spectroscopy (IBBCEAS) method to the study of a region of very weak absorption in the ozone spectrum in the near UV and visible regions between the Huggins and Chappuis bands. IBBCEAS, as with other CEAS techniques, requires careful calibration of mirror reflectivities for the high finesse cavity across the wavelength range of the desired spectrum if absolute absorption cross sections are to be determined from absorption by a known number density of the sample gas. This is achieved here using Rayleigh scattering from He and N2 samples. The determination

of the ozone absorption cross sections is clearly described, with careful consideration of uncertainties, optimum spectrum accumulation periods for best signal-to-noise levels, and possible interferences (which are argued to be negligible). Overall, the methodology is convincing and elegant, and the analysis presented lends confidence to the quality of the reported cross section data.

Specific comments:

I did not find the rationale for the study, as presented in the introduction and briefly summarized in the conclusions, to be especially compelling. Perhaps the authors can provide a more complete discussion of why further measurements are needed to improve on the existing literature. I concede that there are discrepancies in the published absorption cross sections for ozone in this region, but are the discrepancies at a level that matters for atmospheric applications in a region of such weak absorption? The introductory paragraph mentions that weak UV absorption features can matter for tropospheric radical production, but the latest JPL-NASA tables [1] do not consider O(1D) quantum yields from ozone photolysis at wavelengths longer than 328 nm, and it seems unlikely that O(1D) formation will extend as far as 360 nm with any significant quantum yield. Are the cross sections in the region studied in this paper used in any satellite retrievals of ozone profiles? If so, the measurement of the temperature dependence of the absorption cross sections would appear to be an important next step in this study, as is hinted in the conclusions.

Technical corrections and questions:

The reference on page 21659 to "effective path lengths (i.e. e-1)" may be cryptic to those not familiar with CEAS spectroscopy methods and could be spelled out more clearly.

I did not follow the exact meaning of the discussion on page 21665 of the comparison between spectra from the 405-nm cavity: specifically, what is meant by "the two wavelengths were interpolated"?

How significant was the difference between the spectra obtained from 380-427.9 nm and 427.9-441.3 nm that was used as a correction to the latter (page 21665)?

In figure 4, there appears to be a small wavelength offset between the structured features reported in the Brion (1998) and the current spectra. Can the authors comment further on the accuracy of the wavelength scales for the two studies?

[1] Sander, S. P., J. Abbatt, J. R. Barker, J. B. Burkholder, R. R. Friedl, D. M. Golden, R. E. Huie, C. E. Kolb, M. J. Kurylo, G. K. Moortgat, V. L. Orkin and P. H. Wine "Chemical Kinetics and Photochemical Data for Use in Atmospheric Studies, Evaluation No. 17," JPL Publication 10-6, Jet Propulsion Laboratory, Pasadena, 2011 http://jpldataeval.jpl.nasa.gov.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 21655, 2011.