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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effects of column density on I_2 spectroscopy and a determination of I_2 absorption cross section at 500 nm" *by* P. Spietz et al.

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Spectroscopy of I2 is receiving new attention since molecular iodine has been recently observed in the marine boundary layer by the spectroscopic DOAS technique (Saiz-Lopez and Plane, Geophys. Res. Lett., 31, L04112, doi:10.1029/2003GL019215, 2004). In a recent paper in this journal a newly measured I2 absorption cross section was reported for the temperature and pressure conditions in the lower troposphere at a spectral resolution suitable for corresponding DOAS measurements (Saiz-Lopez et al., Atmos. Chem. Phys., 4, 1443-1450, 2004, SRef-ID: 1680-7324/acp/2004-4-

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1443). The present paper by Spietz et al. is a very useful extension of the subject as it confirms previously measured cross section data and highlights the difficulty of obtaining accurate atmospheric column densities of I2 from DOAS spectra that do not resolve the fine structure of the rovibronic I2 spectrum at wavelengths longer than 500nm. One main conclusion of the paper is that in order to avoid a systematic overestimation of the retrieved I2 column density, the reference spectrum of I2 used for the evaluation of the atmospheric DOAS spectra must be recorded at a similar spectral resolution and similar column density of I2 as in the field measurement. While this is an important insight, at this point I am missing a discussion of how a suitable reference spectrum can be practically chosen if no a-priori knowledge exists about the I2 column density that is to be expected in the atmosphere.

Specific comments

The paper is in principle suitable for publication in ACP, however I strongly recommend to tighten the length of the manuscript for better readability and clarity. As already mentioned by Reviewer #2, a clear use of technical terms and their definition is required. Besides avoiding the use of too many different meanings of "optical density" (equivalent, apparent, normalized etc.), I recommend to clarify also the meaning of the term "spectroscopic conditions" (is it spectral resolution, total pressure, temperature?) when used at different places in the text. Furthermore, I wonder about the meaning of a "1200 grooves mm-1 grating spectrum" (Caption of Fig. 2). Here and at other places in the manuscript, it would be more appropriate to specify only the relevant spectral resolution (FWHM) of the spectrum (other details like the grating type can be easily looked up in Table 1).

The unit of column density is "cm-2" ("molec" should not be used). Likewise, the unit of a cross section is "cm2".

Page 5186, line 20: please mention briefly the main result of the work by Saiz-Lopez et al. (2004) and Bauer et al. (2004).

ACPD

5, S3897–S3900, 2005

Page 5188, line 12: a reference should be given for the specified value (0.3 cm-1) of the pressure broadening.

Page 5200, line 9: the spectral resolution of the spectrometer should be mentioned.

Page 5201, line 23: replace "... be corrected to an irregular scatter in the averaged optical densities..." by "...be corrected except for statistical noise in the averaged optical densities..."

Page 5201, line 26: what is meant by "coloured structures" ?

Page 5204, line 4: "...as well as of optical density in the spectroscopic measurement." At which wavelength was this measured?

Page 5204, line 7: "...on the windows which was spectroscopically observed." At which wavelength was this measured?

Page 5204, line 7-18: I do not understand this piece of text. Can you put it into a few simple sentences?

Page 5205, line 18: is the specified error estimated from error propagation of the uncertainties of the measured x- and y-data of the regression, or is it derived from the residual scatter of the data points around the regression line ?

Page 5206, line 6: here and elsewhere in the text, I suggest to present the cross section data with no more than two decimals places.

Table 1: the caption is quite long and should be shortened. Discussion of the table belongs into the main text. Relevant explanations may be presented in footnotes.

Figure captions: some figure captions are unnecessarily lengthy and repeat informations that belong into the main text (e.g., Fig.3, second half of the caption).

Figure 1: the inset is difficult to read and should be presented as a separate figure.

Figure 8: please add units at both axes.

ACPD

5, S3897–S3900, 2005

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 5183, 2005.