Atmos. Meas. Tech. Discuss., 1, S130–S133, 2009
www.atmos-meas-tech-discuss.net/1/S130/2009/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Six years of total ozone column measurements from SCIAMACHY nadir observations" *by* C. Lerot et al.

M. Weber (Referee)

weber@uni-bremen.de

Received and published: 2 February 2009

This paper reports on SCIAMACHY total ozone from the years 2002-2008 using the SDOAS scientific algorithm from BIRA and European Space Agency's (ESA) operational ground processing algorithm (SGP) from DLR. The ESA algorithm uses the SDOAS retrieval in the processing chain. In the first part of the paper the SDOAS algorithm is described and used for some sensitivity studies to identify the most suitable choice of ozone cross-section including scaling and wavelength shift in such a way that SCIAMACHY total ozone becomes consistent with the GOME retrieval that uses the GOME flight model (GFM) ozone cross-section. Wavelength shifts are critical since fairly small changes can lead to significant errors as stated here.

In the second part of the paper the data retrieved with the ESA algorithm is compared

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

to other satellite data (GOME, OMI), results from other algorithms (than BIRA's and ESA's) and selected ground data, showing good agreement, but a downward trend of about 0.4%/decade is persistent in the SCIAMACHY data. They show that the downward trend is not caused by the algorithm but believed to be related to SCIAMACHY calibration issues. Overall the paper is well written, however, there are some major issues (that could possibly fairly quickly resolved) that need to be adressed before acceptance. In particular the optimized wavelength shifts for the cross-sections appears somewhat inconclusive and there are some inconsistencies as discussed below.

Major issues

Section 3.2, p. 258: This section on the appropriate wavelength shift and scaling of ozone cross-sections is inconsistent in terms of appropriate shifts for the GFM and SFM cross-sections. If the wavelength calibration of the solar reference spectrum is adjusted using the Fraunhofer line atlas, the optimized fitted shift values for the SFM and GFM cross-sections in the DOAS window 325-335 nm are cited as +0.020 and +0.028 nm, respectively. The recommended shift value of 0.02 nm for the SFM cross-section is used in the ESA retrieval (see Conclusion). Later the authors mention that the ESA retrieval for GOME uses a shift value of +0.016 nm for the GFM cross-sections (p. 259, line 15) and not the +0.028 nm as recommended here. Given a 2.5% error in retrieved columns per 0.01 nm shift, as the authors state, the GOME and SCIAMACHY results using the ESA retrievals should show a bias. This needs to be explained. The difference in shifts between SFM and GFM cross-sections of 0.008 nm found here is in agreement with results from Weber et al. (2007) from a direct comparison of the cross-section data including slit function adjustments.

Figure 2: The authors do not discuss the red and green symbols in this figure. The red symbols are probably the shifts after Fraunhofer wavelength calibration (please state so in Figure caption), but the green symbols are neither explained in the figure caption nor discussed in the main text. Please do so. The shift values of around 0.008 nm indicated by the green symbols is consistent with the shift value for the GFM cross-

AMTD

1, S130–S133, 2009

sections in the ESA GOME retrieval (+0.016 nm), see discussion earlier.

p. 259, line 20-28. Here the authors show that after proper scaling and shifting of the SCIAMACHY ozone cross-section, an unexplained bias of 2% in the differences between SCIAMACHY and GOME remains. This is confirmed by using the same ozone cross-sections, here Bass-Paur (after convolution with instrument slit function of GOME and SCIAMACHY, respectively). Possible explanations are radiance calibration issues, but authors claim that exact causes are not known. In Weber et al. (2007), Figure 7, it was shown that the upgrade from V5 to V6 in the level-0-1 processing indeed causes such a 2% negative bias in retrieved total ozone. Also the fit rms increased with V6.

Section 4: This section describes the hardware implementation of the SGP 3 operational algorithm. It is far too technical and inappropriate here. This section should be shortened and mainly highlight differences in the settings of the SGP algorithm to that described for SDOAS in Section 2, if any, and briefly describe the calibration and retrieval steps.

Minor issues

p. 250, line 18: one should mention here why an ozone recovery is expected (decline in stratospheric chlorine as a consequence of the Montreal Protocol and Amendments phasing out ozone depleting substances).

p. 253, line 15: at this place it is not clear if the effective temperature is directly fitted (via cross-sections) or as is described later (p. 259) by using two ozone cross-sections at different temperatures. It is suggested to add here that the effective temperature is derived from the two O3 cross-section fit.

p. 256, line 25, add a peer-review paper as a reference for the SACURA cloud algorithm: Kokhanovsky et al., 2005.

p. 258, line 14: applied calibration –> applied wavelength calibration

p. 261, line 7: Remove italics of "global"

AMTD

1, S130–S133, 2009

Interactive Comment

p. 262, line 17: "algorithm approach", change either to "algorithm" (without appoach) or "algorithm approach"

p. 263, line 18: change to "the trend ... is related to ... but not to the retrieval algorithm." (change "a" to "the" and omit "issue")

p. 264, line 23: "product" –> "data"

at several places in the main text as well as in the legend of Fig. 2 the French(?) word "adjustement" was used, please correct to "adjustment"

References

Kokhanovsky, A. A., V. V. Rozanov, J. P. Burrows, K-U. Eichmann, W. Lotz, M. Vountas, The SCIAMACHY cloud products: algorithms and examples from ENVISAT, Adv. Space Res., 36, 789-799, 2005.

M. Weber, L.N. Lamsal, and J.P. Burrows, Improved SCIAMACHY WFDOAS total ozone retrieval: Steps towards homogenising long-term total ozone datasets from GOME, SCIAMACHY, and GOME2, Proc. 'Envisat Symposium 2007', Montreux, Switzerland, 23-27 April 2007, ESA SP-636, July 2007, see www.iup.uni-bremen.de/UVSAT_material/papers/weber_envsymp2007.pdf

---

Interactive comment on Atmos. Meas. Tech. Discuss., 1, 249, 2008.