

Interactive comment on “Global satellite validation of SCIAMACHY O₃ columns with GOME WFDOAS” by A. Bracher et al.

Anonymous Referee #2

Received and published: 29 March 2005

The continuation of ozone columns retrieved from satellite data is essential for monitoring the atmospheric state in future or for studying trends. For a coherent time series of ozone data, it is highly important to compare the ozone columns derived from GOME directly to its successor SCIAMACHY for the months of simultaneous measurements as done by Bracher et al. However, the current study suffers from two major shortcomings as explicated below. I recommend publication on ACP after major revisions.

1.) Ozone columns derived from DIFFERENT INSTRUMENTS retrieved with DIFFERENT ALGORITHMS are compared. Hence the detected distinctions may be either due to instrumental features or due to the retrieval, and the discussion is rather speculative. It is not definitely clear that (and how far) the observed differences are due to the

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

SCIAMACHY V5.01/5.04 algorithm.

To overcome this problem, similar retrievals must be used! As the authors state in the last paragraph, they plan the adaptation of WFDOAS to SCIAMACHY. This would be the best solution for the current study! Then it would be free from comparing algorithm performance what is done elsewhere (Coldewey-Egbers et al., 2004), but instead compares GOME to SCIAMACHY directly, and we could learn something about instrumental features (or possibly also other factors like different viewing time etc.). If the reprocessing of the whole SCIAMACHY dataset would take too long, it could be at least done for e.g. a week of data. If the implementation of the WFDOAS algorithm for SCIAMACHY cannot be realized within the next months (but I would really favour this solution!), the authors should at least compare SCIAMACHY 5.01/5.04 to GOME GDP 2.4 for a data subset!

2. A second aspect is the comparison method using 2.5° bins and afterwards calculating means for bands of constant latitude. With this method, the data is averaged twice before comparison! Longitudinal variations (arctic vortex!) are not resolved any more. And within 2.5° North-South there are several (~6-8) GOME/SCIAMACHY observations! The calculated variances are difficult to interpret as the input data itself are averaged values.

It is essential to correlate directly collocated GOME and SCIAMACHY measurements to quantify not only deviations of the means but also learn about actual fluctuations for single measurements. As both datasets have the same total cross track width (960 km), the higher resolved SCIAMACHY data (16 pixels of 60 km cross track) can easily be reduced to GOME resolution (3 pixels of 320 km cross track). For the scans along track one GOME scan (40 km) usually covers two or three SCIAMACHY scans (30 km). These SCIAMACHY pixels could be averaged (for instance weighted by the area of overlap) to match the GOME pixel.

The authors state that a direct comparison took 3 days. It is hard for me to understand

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

this, as one GOME orbit consist of ~ 1000 pixels, i.e. ~ 15000 pixels per day, and half of them drop out as no SCIAMACHY measurements exist (limb mode gaps). I cannot believe that it takes half a minute to find the SCIAMACHY pixels covering a given GOME pixel. The authors should think of possible optimizations and in any case explain in detail how they collocate GOME and SCIAMACHY observations. At least for one day, it is essential to study the correlation of SCIAMACHY and GOME results directly without gridding or taking zonal averages!

For the whole dataset, however, binning is probably needed. To illustrate the binning effect, Fig. 2 should rather compare the correlation of GOME and SCIAMACHY observations for the binned and the unbinned case instead of taking zonal means!

I recommend to reduce the grid resolution in North-South; in any case the authors should motivate their choice of 2.5° and explain their gridding procedure: E.g. are observations taken if their center is inside the grid cell, or any part of the GOME/SCIAMACHY pixel, etc.

This aspect is related to Fig. 1: SCIAMACHY and GOME have the same cross-track width, but the SCIAMACHY orbits are wider than the GOME orbits in Fig. 1! Furthermore, the gaps during the SCIAMACHY limb observations are partly filled up. On the other hand, the GOME orbits show strange white spots for $\text{abs}(\text{latitude}) > 30^\circ$. (These white spots are also in contradiction to the statement p.798, line 22 that “at latitude higher than 65° complete coverage is provided daily”). So it looks to me that the gridding procedure was different for SCIAMACHY and GOME.

The discussion of differences is rather speculative as far as aspects 1 & 2 are not resolved. I recommend to use SCIAMACHY O3 columns with WDOAS for this comparison study and analyze the direct correlation of GOME and SCIAMACHY data without binning/averaging for one week or at least one day. The methods (collocating SCIAMACHY and GOME pixels, gridding etc.) have to be explained sufficiently. The direction of paragraphs 4 and 5 depends on the results of the revised comparison.

[Full Screen / Esc](#)[Print Version](#)[Interactive Discussion](#)[Discussion Paper](#)

Specific comments:

- The GOME and SCIAMACHY measurements are not taken synchronous, but with 30 minutes shift. You should at least discuss how far this could cause differences in the observed ozone columns. I expect an effect at least for wintertime measurements of high latitude, i.e. shortly after sunrise.
- Page 800 line 20: Please motivate why you choose the maximum SZA different for GOME and SCIAMACHY.

Technical corrections / minor remarks / suggestions:

- Abstract first line : SCIAMACHY “measures” spectra rather than ozone columns.
- Page 796 end of line 9: “times” or “x” instead of “and”.
- Page 797 line 4: Do satellites “die”?
- Page 797 line 11: Please add a reference for SCIAMACHY.
- Page 797 line 19 ff: sentence sounds strange; grammar correct?
- Page 797 line 24: Please give a reference for the statement that GDP 4 is comparable to WFDOAS 1.0.
- Page 799 line 2: “since” could be mistaken as “because”; the sentence could be reorganized.
- Page 799 line 8: Add “also” after “SCIAMACHY”.
- Page 800 line 17: correct grammar? Two times “available”.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 795, 2005.

[Full Screen / Esc](#)[Print Version](#)[Interactive Discussion](#)[Discussion Paper](#)