

Interactive comment on “NO₂ Profile Retrieval using airborne multi axis UV-visible skylight absorption measurements over central Europe” by M. Bruns et al.

M. Bruns et al.

Received and published: 14 April 2006

We would like to thank the reviewer for his encouraging response and the constructive criticism. In our opinion it is much better paper now. Below one can find the detailed responses to the individual issues.

Special Comments:

(1) A paragraph was added after I. 6 on p. 502 discussing in detail the advantages and disadvantages of three LOS setups (4 LOS @ 500nm, 4 LOS @ three wavelength regions, and 18 LOS @ 500nm) and explaining why the 4-3 setup was chosen. A figure showing the averaging kernels for these setups was also added.

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

(2) Three sentences have been removed from section 5: p. 504, l. 16-19; p. 505, l. 15-16; p. 506, l. 15-17. We don't agree that the comparison of one SCIAMACHY and one AMAXDOAS measurement will be presented better in a table. In our opinion a table only makes sense when comparing several SCIAMACHY and AMAXDOAS measurements. In our opinion it also makes sense to dwell on the point of the different sizes of the SCIAMACHY and AMAXDOAS footprints, since not all readers might be aware of it. A clean profile is now presented in Figure 5 (see (3)).

(3) Two profiles (d and e) shown in Figure 5 have been replaced by a profile with much less tropospheric NO₂ and a clean air profile acquired over the Mediterranean Sea. In our opinion the measurements are suggesting that the NO₂ VMR is similar in the specific Alpine valley and over Bologna, but one has to consider that it is no rural Alpine valley. The valley contains the most important route to cross the Alps. This suggests a very high volume of traffic. In this case we don't think it is unlikely to find as high NO₂ concentrations locally as in a city (see Pundt et al., 2005: they show very enhanced NO₂ values of up to 60 ppbv on highly frequented highways). Using ground based in-situ measurements for comparison might be interesting, but in view of the large horizontal inhomogeneity and the difference in quantity measured (mixing ratio in the lowest retrieval layer vs. mixing ratio at the surface), large uncertainties will remain.

Minor and typographical comments:

- a) 'affecting' was replaced by 'effecting'
- b) 'being' was removed.
- c) The sentence was changed to 'This new setup demonstrates significant improvements even compared to some setups using ten LOS...'
- d) Sentence changed to 'A different method to derive vertical distributions for trace gases from AMAXDOAS data was used by Wang (2004).'
- e) a comma was inserted after 'spectrometers'.

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

- f) The authors prefer US spelling.
- g) Part of the sentence was changed to 'The AMAXDOAS instrument simultaneously measures...'.
h) 'wellknown' was changed to 'well known'.
- i) Part of the sentence was changed to 'both campaigns were chosen to cover latitudes from the Arctic to the tropics'.
- j) Part of the sentence was changed to 'sensitivity of ... y to the variation ... x'.
- k) 'SCIATRAN is actually calculating' was replaced by 'SCIATRAN actually calculates'.
- l) Paragraph removed starting l. 20 p. 498.
- m) 'correlations length' was replaced by 'correlation length'.
- n) Figure 2 plot a was reproduced in color and plot b was moved to the newly inserted Figure 2.
- o) 'in 9 km altitude' was replaced by 'at 9 km altitude'.
- p) The sentence was replaced by 'The averaging kernel demonstrates how much of a change in the true profile is detected by the retrieval algorithm in the retrieved profiles. For example the 9 km averaging kernel shows that the retrieval algorithm is able to detect close to 100% of the change in the true profile.'
- q) P503, L10-23: This part has been rewritten: 'Two physical effects provide vertical information from the measurements: By using measurements taken simultaneously in different lines of sight, different paths through the atmosphere are probed with varying vertical sensitivity. In particular, the measurements pointing close to the horizon have a long light path near the altitude of the aircraft and therefore are very sensitive to absorptions at this height. The second source of profile information is the wavelength dependence of the signal. As result of increased Rayleigh scattering in the UV, the sen-

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

sensitivity to layers close to the surface is reduced compared to measurements at visible wavelengths. By combining retrievals at different wavelengths, some vertical resolution can be obtained even for one viewing direction (see Wang et al., 2004).'

r) 'still' was removed.

s) 'Highways' was changed to 'highways' and 'Highway' was changed to 'highway'.

t) 'is coinciding' was replaced by 'coincides'.

u) One reference to Pundt et al. was removed.

v) 'sensitivity study' was replaced by 'theoretical study'.

w) The last sentence was changed to 'Results are presented in this paper from the section of track between the black dots.'

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 493, 2006.

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