

Interactive comment on “Measurements of tropospheric NO₂ with an airborne multi-axis DOAS instrument” by P. Wang et al.

P. Wang et al.

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- In the abstract, line 8: it is mentioned that vertical columns of 5.7E16 molec/cm² observed close to Frankfurt are in good agreement with surface measurements of 16.4 ppb. This sentence is a little bit unfortunate since, obviously, vertical columns cannot be directly compared with surface mixing ratios. One possible way to overcome the problem, could be to modify the sentence in a way like this: 'Vertical columns of up to . . . were observed close to Frankfurt, with a distribution peaking in the boundary layer and in good agreement with surface measurements. . . '

We agree with the reviewers comment and changed the text as suggested

- Page 7549, line 14: you might wish to add a reference explaining why AMFs can be

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calculated by the product of weighting function and concentration profiles.

This approach to calculating air mass factors has been used in several previous studies and is often also called 'block air mass factors'. We have added the following reference to the text:

* Martin et al, 2002. * Hendrik Nuess, 2005

- Page 7547, section 3, line 15: As I understand, the stratospheric content is not only assumed to be constant in time but also over the full horizontal extension of the flight. You might comment on the typical latitudinal gradient of the stratospheric NO₂ in the 50-60° N belt, in order to convince the reader that this is negligible in the present context.

The reviewer is right that we assumed the stratospheric NO₂ to be constant during flight. According to GOME measurements, the typical latitudinal gradient of the stratospheric NO₂ between 50-60°N was about 1E15 mol/cm² in mid of March 2003 over the Atlantic, and we assume that a similar gradient was present in the stratospheric NO₂ over the continent. This adds as a small error to the tropospheric NO₂ retrieved in the polluted area. We have added this point to the discussion in the paper.

- . . . and of course the reader is anxious to know how well the AMAXDOAS results compare with SCIAMACHY measurements. Will this appear soon in a follow-on paper?

Unfortunately, there are no SCIAMACHY measurements on March 19th, 2003 so it is not possible to compare the measurement on this day. A first comparison of AMAXDOAS and SCIAMACHY tropospheric NO₂ columns is presented in the paper of Heue et al., 2004, and stratospheric NO₂ and O₃ have also been compared (see proceedings of the Envisat symposium, 2004 (Wang et al., 2004)).

references

Heue, K.-P., Richter, A., Wagner, T., Bruns, M., Burrows, J.P., Friedeburg, C.V., Lee, W.-D., Platt, U., Pundt, I., and Wang, P.: Validation of SCIAMACHY tropospheric NO₂-

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columns with AMAXDOAS measurements, Atmos. Chem. Phys. Discuss., 4, 7513-7540, 2004 .

Nuess, J. H., An improved tropospheric NO₂ retrieval from GOME and SCIAMACHY measurements, PhD thesis, University of Bremen, Germany, in German, 2005.

Martin, R.V., Chance, K., Jacob, D.J., et al.: An Improved Retrieval of Tropospheric Nitrogen Dioxide from GOME, J. Geophys. Res., 107(D20), 4437.4457, 2002, doi:10.1029/2001JD001027.

Wang, P., Richter, A., Bruns, M., Burrows, J. P., Heue, K.-P., Wagner, T., Pundt, I., Platt, U.: SCIAMACHY validation with AMAXDOAS NO₂ and O₃ measurements, Proceedings of the 2004 ENVISAT Symposium, in Salzburg, Austria, 6 - 10 September 2004.

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