

## ***Interactive comment on “Measurements of tropospheric NO<sub>2</sub> with an airborne multi-axis DOAS instrument” by P. Wang et al.***

**Anonymous Referee #2**

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### **General comments**

Nitrogen dioxide is a key trace species for the study of the polluted troposphere and therefore its monitoring has received much attention over the last few years, particularly since the possibility to measure it from space was demonstrated with the GOME instrument. Space mapping of tropospheric NO<sub>2</sub> fields is now possible and several studies have shown the great potential of such observations both for global and regional studies. However current data sets are still largely unvalidated. In addition the interpretation of the measurements is to some extent hampered by the lack of information on the vertical distribution of the observed NO<sub>2</sub> plumes. In this very interesting paper, a new method is presented that allow to infer accurate tropospheric NO<sub>2</sub> columns from

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airborne DOAS measurements, over both clear-sky and cloudy scenes. In addition, useful information on the bulk location of the measured  $\text{NO}_2$  can be retrieved. The actual information content of the technique is clearly and convincingly illustrated based on a sensitivity study that focuses on the interpretation of actual measurements during one flight above Europe. Results are further validated by comparison with in-situ measurements.

The paper is very well organized and clearly written in a good English (as far as I can judge). Proper credit is made to existing literature and figures are clearly drawn and commented. Overall this paper is excellent and could simply be published as it is. Nevertheless I have a few minor suggestions, which might be considered by the authors before final edition.

### Specific comments

- In the abstract, line 8: it is mentioned that vertical columns of  $5.7 \times 10^{16}$  molec/cm<sup>2</sup> 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. . ."

- Page 7549, line 14: you might wish to add a reference explaining why AMFs can be calculated by the product of weighting function and concentration profiles.

- 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  $\text{NO}_2$  in the 50–60° N belt, in order to convince the reader that this is negligible in the present context.

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- ... 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?

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Interactive comment on Atmos. Chem. Phys. Discuss., 4, 7541, 2004.

**ACPD**

4, S3361–S3363, 2004

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