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Comment

***Interactive comment on “Tropospheric NO<sub>2</sub> column densities deduced from zenith-sky DOAS measurements in Shanghai, China, and their application to satellite validation” by D. Chen et al.***

**Anonymous Referee #2**

Received and published: 22 October 2008

A:

General Comments:

The manuscript describes in details a method to extract tropospheric NO<sub>2</sub> vertical columns from a zenith sky DOAS instrument and present some comparisons with long path DOAS and satellite measurements. The paper is well organized and within the scope of ACP. However the various descriptions and discussions on error budgets need to be revised.

B:

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Specific comments:

1. Abstract: <zenith sky measurements are more suitable for satellite data validation than the in-situ measurements> What do you mean by in-situ? The term <in-situ> is inappropriate. I suppose that you refer to long path DOAS which are not in-situ but averaged surface concentration measurements on a 507m path. In-situ is generally used for <local> measurements. Same remark on page 16716 line 5.

2. <The offset was removed automatically> Page 16717 line 25. What is the offset? Where is it coming from? It seems not to be the dark current of the CCD? Is-it appropriate?

3. Cross sections at 223K and 293K Page 16718 line 18 What does orthogonalized mean? Are-you analysing with both cross sections separately or simultaneously? How is the partitioning between warm (tropo) and cold (strato) taken into account? Is the orthogonalization useful for ozone? Does-it interfere with NO<sub>2</sub> measurement?

4. SCD strato Page 16722 line 15 To reduce the uncertainty caused by stratospheric column the authors use various pairs of am and pm values. As it corresponds to an averaged value used during a three to four months period, I think that it is not reasonable to have two digits for these columns. (for ex: use 5.9 instead of 5.93). What is the error bar on each measurement?

5. Determination of NO<sub>2</sub> SCD in reference spectrum There is no indication of the relative values of SCDstrato\_ref and SCD tropo\_ref What is the error on these SCD in reference spectrum? An indication of the relative values here will help also understanding the discussion in section 4.1.2.

6. 3.1.4 Error estimation This section is supposed to provide a summary of the error. But it is not clear how the respective error have been estimated.

For example: page 16725 line 20, the error on stratospheric slant column is estimated to be about 10% for SZA <85°.

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For example: page 16726 line 5. the error caused by tropospheric AMF are  $<15\%$  for most cases.

I think that the evaluation of the errors should be discussed in each paragraph separately.. Then, a summary of the error estimates can be summarised in 3.1.4.

Again same remarks on error evaluation in section 3.2. There is no indication of how the error have been evaluated. A 40% value is suggested on page 16728 line 29. Where is-it coming from?

The error discussion should be completely rewritten as it is an important aspect to be convinced by the section: results and discussion.

7. page 16733 line 26 error estimate ?

8. discussion on page 16735 line 25 and after. It is not obvious looking at figure 8 that the PBL over Shanghai is relatively stable at the satellite overpass time. It seems that the PBL is changing rapidly around 10:30.

9. page 16735 line 16 ratio between Sciamachy and GB data: I think that two digits for the ratio 1.73 suggests that this value is very accurate. I suggest to write  $1.7 + 0.7$ . Same remark on page 16739 line 12.

10. page 16737 line 23 and figure 14 (figure caption) I was lost by the term  $<\text{light pollution around Shanghai}>$ . At first I thought that it was concerning light (limited, small) pollution. It would be better to use:  $<\text{nighttimes light pollution}>$

D:

Technical corrections:

1. Page 16725 line 1 Display the same variation, suppress  $<\text{trend}>$

2. figure 10 in the text page 16730, line 12. replace  $<\text{the aerosol layer extends lower (case 1 and 2) and higher (case 3 and 4)}>$  by  $<\text{the aerosol layer extends lower (case$

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1 and 4) and higher (case 2 and 3)>

3. page 16732 line 8 typing error: pollution in lower atmosphere is < light> not <slight>

4. page 16736 line 12 : satellite observations are more <strongly> affected not <stronger>

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 16713, 2008.

**ACPD**

8, S8441–S8444, 2008

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