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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Validation of MIPAS-ENVISAT NO_2 operational data" *by* G. Wetzel et al.

Anonymous Referee #1

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The manuscript of G. Wetzel presents a very detailed validation study of the operational NO2 product retrieved from MIPAS-E spectra. The authors compare MIPAS NO2 to NO2 measured from several other platforms in a consistent way and they relate the observed differences in NO2 to combined random and systematic errors of MIPAS and the validation instrument. Overall, they find a good agreement between MIPAS and other instruments and the inferred differences in NO2 rarely exceeds the combined error limit. The presented study is clearly structured and well written and will be of large interest to all potential users of MIPAS-E NO2. I recommend publishing this manuscript in ACP after addressing the comments below.

Major comments:

An important element of the presented validation study is the comparison of observed differences in NO2 to combined errors from both instruments; in particular they take into account systematic errors. However, for this to be useful, it is essential to provide the readership with a discussion of the considered systematic errors (which systematic errors are taken into account and what is their magnitude). This discussion will also have to include the validation instruments, since their systematic errors are used as well to calculate the combined error.

The authors compare NO2 columns inferred from MIPAS-E to those from ground-based FTIR and DOAS UV/vis instruments. To take into account the low vertical resolution of the ground-based instruments, the authors smooth the MIPAS NO2 profile with the averaging kernels of the ground-based instruments. However, this is only valid if the MIPAS profile represents the 'true' atmospheric profile. For profiles with a significant dependency on the a priori constraint and a limited vertical resolution, such as the MIPAS-E NO2 profile, this is not valid and may introduce additional errors. I would like to recommend including a discussion of these potential errors. Otherwise, these problems could be avoided by using the method developed by Rodgers and Connors [2003].

Minor comments:

p. 3344 Fig. 7 shows that there is in general a good agreement for the nighttime comparisons Ĕ

Does nighttime refer to the MIPAS-E measurement only? Are these measurements related to daytime SAOZ observations with trajectories and photochem. Modeling?

p. 3347 no correction of variations of the solar zenith angle along the line of sight of SAGE II were performed.

Payan et al. [1999] showed that this effect is smaller than 6%.

p. 3348 Comparison to POAM III for July to September in SH:

ACPD

7, S1202–S1204, 2007

Is there a reason why the combined errors are an order of magnitude larger (˜600%) than for all other cases?

p. 3360 Some systematic deviations could also be related to spectroscopyĚ

Spectroscopic uncertainties are a major source systematic errors and I am somewhat surprised that they seem not to be included in the combined systematic errors.

Technical comments:

p. 3356 It would be better to finish the discussion of figure 18 before the discussion of Figure 19.

p. 3382 Fig.6: Figure is of poor quality. Also, units (ppbv) are missing in the figure caption.

p. 3391 Fig 15: Figures are wrongly labeled (you use a), a), c))

p. 3394 Fig 18: figure is far too small. Overall, I find the figure confusing. The upper and lower panel (ie. different locations) shows different things. Do I have to compare MIPAS (day) and UV-vis column in the lower panel?

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 3333, 2007.