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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.

**G. Wetzel et al.**

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First of all we thank the reviewer for his effort to carefully reading the large manuscript and for all comments.

Major comments:

Of course, the reviewer is right that the characterization of systematic errors is an important issue during the validation process. Characterizing such errors is a difficult task and is quite often based on assumptions. A detailed discussion of such error components is beyond the scope of this paper. This has been carried out comprehensively in the paper by Raspollini et al. (2006) belonging to the same MIPAS validation special issue. In this paper, also the magnitude of the errors is being discussed. Anyway, following the reviewer's suggestion, we added some additional sentences near the end



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of section 2 and in section 3 (top of p. 3340) giving information on the systematic error sources taken into account. For instance, spectroscopic data errors have been considered for the intercomparison. For validation instruments, not all of these systematic error components could have been characterized.

In principle the reviewer is right that the Rodgers and Connors (2003) method also takes into account averaging kernel and a priori information of the instrument with better vertical resolution. On the other hand, the Rodgers and Connors (2003) paper describes a comparison of two instruments both with very limited vertical resolution such as MOPITT and ground-based FTIR. In our case, however, one of the instruments (MIPAS-E) provides a much better vertical resolution. Furthermore, there exists no dependency on any a priori constraint, since a standard global fit approach has been used (without regularization or optimal estimation) for the operational data analysis because the inversion process turned out to be sufficiently well conditioned and regularization and a priori information are not necessary for a stable retrieval (see Raspollini et al., 2006, as cited in the text).

Minor comments:

p. 3344: Nighttime measurements refer only to MIPAS-E observations. The UV-vis SAOZ measurements were carried out during sunrise and sunset as described in section 3.1 on p. 3344, l. 4. A direct distance criterion (without trajectories) has been applied to look for MIPAS matches. The chosen distance (coincidence) criterion is listed in Table 1 (the text has been slightly changed to give the reader a hint that the criterion is listed in Table 1). A photochemical correction of the data to account for mismatches in time has been applied.

p. 3347: We changed the text accordingly to mention the corresponding study carried out by Payan et al. (1999).

p. 3348: Very large deviations between MIPAS and POAM III (SH, July to September) might be connected to observations near and across the vortex edge and/or connected



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limitations of the correction with the photochemical model. This is written in the text in section 3.2.3 (bottom of p. 3348 and top of p. 3349). Furthermore, we mention that one reason could be effects of strong horizontal gradients in temperature and NO2 along the line of sight which are not included in the NO2 data retrievals.

p. 3360: Spectroscopic data errors actually are included in the combined error bars. Anyhow, spectroscopic data errors are sometimes underestimated. Furthermore, different spectral regions were used to derive NO2 data from observations of different instruments. This may result in systematic VMR differences (not necessarily significant with respect to the combined errors).

Technical comments:

p. 3356: As suggested by the reviewer, we moved the last part of the discussion of Fig. 18 directly before the discussion of Fig. 19.

p. 3382: We will improve the quality of Fig. 6 during the next publication step.

p. 3391: We will correct the labelling.

p. 3394: We will enlarge Fig. 18. The figure caption has been changed to make the description more clearly.

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



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