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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Retrieval of global upper tropospheric and stratospheric formaldehyde(H_2CO) distributions from high-resolution MIPAS-Envisat spectra" *by* T. Steck et al.

T. Steck et al.

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Final author comment by T. von Clarmann on behalf of all co-authors

We thank referee 1 for his/her helpful and comprehensive comments. With respect to his/her suggestions we will perform the following changes (for convenience, the review is inserted in *italics*:

General Comments

no action required.

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Specific Comments

Section 2, Line 17: How do the so-called new spectroscopic data of Perrin et al. (2003) and Sharpe et al., (2004) compare to the HITRAN2004 data?

There is no H_2CO data in the 1750 $cm^{8722;1}$ region in HITRAN or GEISA.

Are these new spectroscopic data already available in the HITRAN updates?

These new parameters are not yet available in the recent HITRAN updates.

Section 5.1, pg. 13635, line 3: why does the breakup of the southern polar vortex induce larger concentrations of formaldehyde in the southern hemisphere, compared to the northern hemisphere? Some more explanation is desirable.

We have no specific explanation to offer. Since the role of the breakup of the polar vortex is highly speculative, we will not mention this in the revised version any more, because this may raise more questions than it solves. We will try to explain the differences mentioned by different illumination conditions and different availability of OH.

Section 5.2 lines 15-16: again, it would be good to clarify the explanation for the higher nighttime values of formaldehyde in the southern polar vortex.

Again, we have no conclusive explanation to offer. We will clearly state that this still is an open issue.

Section 5.2, line 13: If I understand the authors correctly, they recognize themselves that the zonal mean day- plus nighttime values presented in Figure 7 are slightly shifted towards daytime values because these are more abundant in the ensemble of data. Why then not eliminate some daytime observations from the ensemble (where nighttime measurements are missing) in order to have a balanced presentation of the mean?

We are reluctant to eliminate data from the ensemble to get a balanced representation of the mean, because for some regions we have mainly daytime measurements, while

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for others we have mainly nighttime measurements. Instead, we will calculate the new mean as the arithmetic average of the mean daytime and the mean nighttime values. This kind of mean value is a balanced representation but does not require arbitrary elimination of measurements.

Section 6: I am not convinced about the interest of Section 6 as it is presented here for three reasons: (1) the comparisons relate to different time periods and geographical areas of observations, and (2), the cited values are never accompanied by their uncertainties so any agreement / disagreement is difficult to judge, (3) the tables present comparisons at different altitudes, even if we know that the vertical resolution of the observations is too low to distinguish these altitudes. In particular: Where was the ACE-FTS biomass burning plume of October 8, 2005 located? Table 2: why not compare the partial column values in the range 10 to 21 km altitude which corresponds to 1 DOF for the MIPAS retrieval?

The reason why we have included this comparison is that we should put our work into the context of pre-existing published work. The following actions will be taken to allow a more meaningful comparison: The MIPAS-ACE comparison will be based on partial vertical columns as suggested by the reviewer. For the MIPAS column, the standard error of the mean will be calculated. This is the best we can do on the basis of published ACE data (for which no error estimates have been published).

Table 3: (1) Similar remark as to vertical resolution as made with Table 2. (2) Was it not possible to find data for Odin-SMR and REPROBUS in similar periods as for the MIPAS data set?

Since the scope of this section is to put our results into the context of pre-existing work published in the literature, we prefer to use published results only. For the revised version we will base the comparison on partial column amounts, and we will use the MIPAS standard error of the mean to get an idea of the significance of the differences.

(3) What can we learn from Table 3 if the compared periods (seasons, years) are

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different and if we have no idea about the interannual variability (at least the interannual variability should be discussed).

Agreed, some discussion will be added.

Also, to interpret the significance of the differences, one should know what the estimated uncertainties on the data are. The averaging that has been performed on the MIPAS data for the period Sept. 2003 to Dec. 1, 2003 and for the latitudinal bands given in Table 3 has reduced the noise error seriously (by a factor of more than 30) which means, looking at figure 4, that the spectroscopic error is becoming the dominant (systematic) error source; the dominant random error sources are LOS and shift. So we are talking about errors of the order of 5 to more than 20 ppptv? Can you discuss somewhat better the significance and interpretation of the values found in Tables 2 and 3?

We will better discuss the comparison, and will include the standard error of the mean values. We do not agree that LOS and shift become dominating error sources because these error average out as does the noise. All this will be discussed in more detail in the revised version.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 13627, 2007.