Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comparisons between SCIAMACHY and ground-based FTIR data for total columns of CO, CH$_4$, CO$_2$ and N$_2$O" by B. Dils et al.
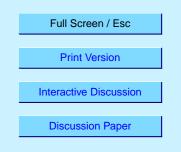
Anonymous Referee #2

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General Comments

Validation of satellite retrievals such as those from SCIAMACHY needs to be performed with all available independent data to determine the accuracy of the retrievals and determine their limitation. The ground-based FTIR measurements used in this paper can provide a useful validation data set, but I have significant concerns about the method in which it was used.

For CO in particular, I do not think the polynomial fit to the FTIR data is a valid extrapolation technique as CO can vary significantly on very short timescales due to the heterogeneity of sources and rapid transport times. This fitting and extrapolation is

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probably ok for the longer lived species. An example of the polynomial fit and the original data is only given for CH4 at one site. I would need to see several examples of CO time series with fit to accept that this technique is valid. I think a better approach would be to use the individual FTIR measurements and explore the dependence of the bias on the distance and time from coincidence. For example, try using a criteria of 100 km distance and 12 hours in time, then expand that to 200 km and/or 24 hours, etc.

From the current analysis I find it difficult to determine on what scale the SCIAMACHY retrievals can be used. If the retrievals are used as monthly averages, would the scatter be reduced and the accuracy improved? Or, is gridded data on some scale (e.g., 5deg x 5deg) better? Would this improve the CH4 comparisons?

Also, an assessment of the different retrieval methods would be valuable. Fig. 7 gives some indication of the differences resulting from them, but a discussion of why they are so different, particularly the trend in bias with concentration, would be useful.

Specific Comments

p.2680, l.6-8: The 1996 reference doesn't seem appropriate for the current state of MOPITT retrievals - perhaps getting a few words from the MOPITT PIs and citing them as personal communication would be more informative. Or leave out the comment about MOPITT CH4.

Figure 1: This figure is redundant since the locations of all the sites are listed in Table 1.

p. 2682, l.4: It would be nice to include some mention of the cause of the seasonal cycle in CO (and also l.13-15 in the discussion of CH4), i.e., that it is a result of the lower OH concentrations in winter than in summer.

Figure 2: It is extremely difficult to see much in these figures - the data should be averaged or grouped to make the desired point. Just plotting monthly means for each station would help a lot. If the focus is the latitude gradient then some sort of plot

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versus latitude would be better.

p. 2683, l.16: I was confused here by the statement that there were few coincidences near the poles, since there is a high density of satellite tracks there. It is explained below, but a statement here explaining why there are limited satellite retrievals available in polar regions would help.

p. 2687, l.10-15: Why not use distance in km to determine collocation, instead of degrees? This would take care of the changes in distance with latitude.

Figure 6: I'm not sure what the point of this plot is. If it is really worth showing the seasonal variation in bias, then perhaps that could be shown in a series of plots similar to Fig. 5, with a bias vs latitude plot for each season (DJF, MAM, JJA, SON). Or just show a few pertinent sites for one retrieval algorithm. Or if the only point is that the bias is a function of column amount, then this figure could be skipped, since that is shown in Figure 7.

Figures 9 and 10 also seem like just a catalog of the results. I find Figure 8 much easier to interpret.

Technical Corrections

p. 2683, l.12: 'the dark period of local winter' could be replaced with 'polar night'

p. 2683, l. 25: 'some percent' -> 'a few percent'

p. 2687, l. 6: do you mean 'possess' instead of 'dispose of'?

Tables 1 and 3: replace 'g-b' with 'ground-based'

Tables 5,6,7: replace 'A','B','C' with more descriptive names, like 'Bias', 'N', '(scat'. And explain 'R' and 'P'.

Figure 5: No need to be in 3-D.

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