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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric greenhouse gases retrieved from SCIAMACHY: comparison to ground-based FTS measurements and model results" *by* O. Schneising et al.

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First of all, we would like to thank the reviewer for the helpful comments. Below we give answers and clarifications to all comments made by the referee. Please note that some numbers in the Tables have slightly changed in the revised version due to an update of the TCCON data.

Specific Comments

Page 28715 Abstract The abstract may be read without benefit of the full text and should be as self-contained as possible. Thus: Line 12 CarbonTracker should be defined or referenced at its first occurrence Lines 22,23 Terms like "regional relative precision" and "relative accuracy", which seem to have been created by the authors later in the manuscript will not be recognized by readers of the abstract. Line 26 Is it true that SCIAMACHY CH4 accuracy is determined by comparing observations to a computer model simulation?

To obtain a self-contained abstract CarbonTracker is introduced as an assimilation system and the terms "regional relative precision" and "relative accuracy" are briefly explained. We get similar estimates when comparing to TCCON and the model, respectively. However, the estimates relative to TCCON prior to November 2005 are based on two stations only because most TCCON sites were established later as explained in the main text. To avoid misunderstandings the clause "with respect to model simulations" is removed.

Page 28717 Line 6 "near- infrared/ shortwave-infrared" these terms are not well defined and can change with the user. It would be clearer to include numbers defining the spectral regions.

Done.

Page 28718 Line 2 Include a reference for CarbonTracker

Done.

Page 28719 Line 28 "In November 2005, the impact of solar protons..." Was this a temporary condition or did this event result in a permanent change to SCIAMACHY?

To emphasise the permanence the sentence is modified in the following way: "...the impact of solar protons resulted in persistent random telegraph noise.."

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Page 28720 Line 8 Define near-infrared. Line 10 "proving" = "providing"

Done.

Page 28723 Line 8 The xCH4 averaging kernels range between .5 and 1.3, is this close enough to 1 to be ignored? Line 12 At the end of this section it would help the reader understand the magnitude of this adjustment to include a statement such as "A typical adjustment of the satellite column is xx% for xCO2 and yy% for xCH4."

A statement concerning the magnitude of the adjustment for the satellite data is added: "A typical adjustment of the satellite monthly means is 0.15% for XCO2 and 0.40% for XCH4." The XCH4 averaging kernel for the median SZA ($\sim$55°) is almost identical to 1 for all pressures (Figure 4 of Wunch et al., 2011). Typical SZAs range between 40° and 65° and corresponding averaging kernels range between about 0.8 and 1.2 which is quite close to 1. As a consequence, the FTS XCH4 adjustment would be about 2–3 times smaller than the SCIAMACHY adjustment (verified on a subset of the data) and can be neglected compared to the estimated errors of the satellite data.

Page 28725 Line 19 "is only few" = "are limited"

Done.

Page 28729 Line 12 "proceeding" = "previous"

Done.

My only concern with the paper is the impression that when some feature of the data arises, that might tend to diminish the intercomparison, that data is excluded from the analysis, such as: Page 28719, Line 14 Page 28723, Line 11 Page 28724, Line 27 Page 28725, Line 27 Page 28726, Line 17

Page 28719, Line 14: The scan angle correction does not exclude data. Moreover, the validation is also performed without this correction. Table 1 shows that the correction has typically only a small effect on the validation results based on monthly data.

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Page 28723, Line 11: As in the previous case the adjustment described in Equation 2 does not exclude data.

Page 28724, Line 27: To get reliable validation results at least three coincident data points are necessary. For example, for time series with only one coincident month (as in the case of Orleans for the SCIAMACHY-FTS comparison) the correlation coefficient r and the standard deviation of the differences s are not defined.

Page 28725, Line 27: We think that it is reasonable to additionally discuss the restriction to 2006-2009 in the case of Darwin because the FTS period is shorter than the SCIAMACHY and CarbonTracker time series and the CO2 growth rates vary significantly from year to year: It has to be excluded that differences in the obtained growth rates are only due to different analysed time periods. Nevertheless, the values without temporal restriction are also shown. For the other sites, there is either no estimate of the FTS annual increase or the analysed time periods are consistent from the start (Park Falls).

28726, Line 17: Darwin has already been identified beforehand as a region where the satellite seasonal cycle seems to be affected by artefacts. Without the exclusion this known issue would dominate the comparison of the mean seasonal cycle amplitudes.

References

Wunch, D., Toon, G. C., Blavier, J.-F. L., Washenfelder, R. A., Notholt, J., Connor, B. J., Griffith, D. W. T., Sherlock, V., and Wennberg, P. O.: The Total Carbon Column Observing Network, Phil. Trans. R. Soc. A, 369, 2087–2112, doi:10.1098/rsta.2010.0240, 2011.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 28713, 2011.

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Interactive Comment