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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-term analysis of carbon dioxide and methane column-averaged mole fractions retrieved from SCIAMACHY" *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.

Specific Comments

page 27488, Section 4.1: I suggest further subheadings to make this section more readable: e.g growth rate, seasonal cycle, and boreal carbon uptake.

Further subheadings will be included in the revised version.

Page 27489, lines 19-25: Give errors on growth rates. Are the differences significant?

The errors on the growth rates will be added mentioning that they agree within the error bars instead of saying that the retrieved annual mean increase is somewhat smaller than in the model simulations.

Page 27489, paragraph 2: What is the effect of using modified 2008 CarbonTracker values for 2009 in the growth rate? Is CarbonTracker's 2003-2008 growth rate different from 2003-2009?

The approach of using modified 2008 CarbonTracker values for 2009 forces the growth rate for 2009 to a specific value motivated by surface measurements as described in the text. Due to the fact that the 2009 growth rate is smaller than in the years before the resulting CarbonTracker 2003-2009 growth rate is slightly smaller than the 2003-2008 growth rate.

page 27490, lines 24-29: Give errors on seasonal cycle amplitudes and discuss the significance of the differences between SCIAMACHY and CarbonTracker.

The errors and a reference to Table 1 will be added showing that the differences are significant. A corresponding sentence will be included in the revised version.

Page 27492, lines 17-20: Do the positive longitudinal gradients in Russia in 2003-2004 (Figure 7c) invalidate this thesis? Further discussion of these positive values would be appreciated.

As mentioned in the text deviations from the prevailing wind direction are influencing the gradients. Taking the error bars into account the only significant positive longitudinal gradient occurs 2003 in Russia. Interestingly, this is true for SCIAMACHY and CarbonTracker indicating that there actually might have been something special in this region in this year. This could be potentially linked to the special meteorological situation during 2003 with one of the hottest summers on record in Europe. In any case, we

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think that one exception does not invalidate the thesis.

Page 27493, line 4: In the Russian section, the longitudinal gradients don't agree within the error bars given in Table 2.

This is true and will be changed in the revised version.

Page 27493, paragraph 1 and Figure 6: Do these whole-time-series gradients really mean anything? One could imagine a year-to-year variation in the uptake that would make the gradient over the whole time period zero (as may be the case in the Russian region for 2003-2007, from Figure 7), but this wouldn't imply there was no uptake by the region. I think it would be better to calculate yearly gradients and take the mean.

The whole-time-series gradients should be interpreted as annual mean uptake. The example that the gradient over the whole time period can become zero due to year-to-year variation would occur likewise when averaging the yearly gradients in the alternative calculation method. Actually, both methods give similar results. The advantage of the whole-time-series approach is that the estimated errors are smaller because the scatter is reduced when more measurements are available in the linear fit procedure.

page 27494, line 10: Give r or r2 for the correlation.

Will be given.

Page 27494, lines 22-28: Can it be confirmed that changing the pixel mask affects regional biases by analyzing (a subset of) pre-2005 data using the post-2005 pixel mask?

The introduction of regional biases with the pixel mask alteration is supported by the following analysis: When comparing monthly latitudinal averages for November one gets systematic differences for 2003/2004 and 2005/2006 with lower tropical methane for 2005 and 2006. Reprocessing the data of November 2004 with the 200511+ pixel mask provides a similar latitudinal behaviour to November 2005 and 2006 indicating that the retrieved amount of tropical methane enhancement depends on the pixel mask

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used. This will be included in the revised version.

Page 27497, paragraph 2: You might mention that this is consistent with Dlugokencky et al., 2009.

This will be mentioned in the revised version.

Table and Figure Comments

Table 1: Give global values as well – I believe these are the ones discussed in the text.

Global values will be given in the revised version.

Table 3: Can you split NH and SH tropics? The NH amplitude is larger than 30-90N and 30S-30N, implying that 0-30N has a larger amplitude than 30-90N.

For 0-30N we obtain an amplitude of 17.2 ± 2.0 which is actually larger than for 30-90N but not significantly. For 0-30S we obtain 6.2 ± 2.6.

Figure 2 and 10: Is the black line in the global mean growth bar charts necessary? I don't think it's needed to show the trends, and it isn't discussed in the captions or in the text. In the case of methane I think it obscures the pre-2007 trend.

The black line will be removed in the revised version.

Figure 3, 4, 11, and 12: Cut 2010 from these figures.

2010 will be cut in the revised version.

Figure 3: Can you plot the difference between SCIAMACHY and CarbonTracker? It's hard to make out differences with the thickness of the lines. I also suggest putting 2009 CarbonTracker in a different colour/shade to highlight that it is really 2008 with a constant offset.

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A plot of the differences will be shown in the supplementary material. 2009 CarbonTracker will be shown in a slightly lighter shade.

Figure 4: Show CarbonTracker without the scaling as well.

Will be done.

Figure 9: The dotted pale lines are very hard for me to see.

The dotted pale lines will be substituted by thicker dash dotted lines.

Technical Corrections

All technical corrections will be considered in the revised version of the manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 27479, 2010.