**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.

Anonymous Referee #2

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General Comments

This paper uses the seven-year XCO2 and XCH4 SCIAMACHY dataset to investigate trends, seasonal cycles, and boreal forest carbon uptake, with the help of assimilated and model datasets. The paper is in general well-written and the analysis presented clearly. I recommend publication after the following minor comments are addressed.

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.

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

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?

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

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.

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

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.

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

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?

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

Table and Figure Comments

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

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.

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.

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

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.

Figure 4: Show CarbonTracker without the scaling as well.

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

Technical Comments

page 27480, lines 3-6 and page 27482, lines 8-10: The phrasing "SCIAMACHY together with TANSO ... is the only" is very odd. I suggest replacing with something along the lines of "SCIAMACHY was the first and, with TANSO ..., is one of only two satellite instruments..."

page 27480, lines 8-10: XCO2 and XCH4 are dry-air column-averaged mole fractions.

Page 27481, line 11: While carbon dioxide... (remove "the")

page 27482, line 24: Replace "afore existing" with "pre-existing".

Page 27483, line 9: Replace "contiguously" with "consecutively" or "in six adjacent channels".

Page 27484, line 20: WFM-DOAS was defined in the introduction.

page 27484, Section 3, lines 26-27: If M-factors are only used in the CO2 analysis,

perhaps the discussion here and at the top of page 27485 should be moved to Section 3.1

page 27489, line 11: to compensate FOR a small systematic ... (add "for")

page 27490, lines 10-14: I'm not sure that I understand this run-on sentence. Please re-word.

Page 27492, line 11, page 27492, line 27, and captions for Figures 7-9: during THE growing season (replace "plant's" with "the".)

page 27497, line 1: Cut "perspicuously".

Page 27498, line 11: CarbonTracker isn't strictly data – it's a reanalysis product.