

## ***Interactive comment on “Atmospheric methane and carbon dioxide from SCIAMACHY satellite data: initial comparison with chemistry and transport models” by M. Buchwitz et al.***

### **Anonymous Referee #4**

Received and published: 8 December 2004

General comments: The issue of the detection of variations in long-lived greenhouse gases such as CO<sub>2</sub> and CH<sub>4</sub> at a sufficient level to improve our understanding of sources and sinks is extremely topical. This paper attempts to interpret SCIAMACHY data on these gases to determine what (if anything) can be deduced from the data in its present form.

This is a very exciting topic and if the changes in CO<sub>2</sub> reported in this paper hold up to further scrutiny, this will be a very important step forward.

Overall there was little discussion of the validation of the SCIAMACHY data except for

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the single ship-board dataset. It is extremely important that these data be validated to the level necessary to support the conclusions given, because only then can full confidence be had in the results.

The paper is well-written and I recommend publication. However, I believe that the authors should respond to the points below:

Specific Comments:

Page 7223: The discussion of pre-processing is somewhat confusing to me. There are references to “improved dark current measurements” but no specific explanation of how they are improved. Similarly the “dead pixels mask” is extended to reject pixels inducing strong spikes - how strong? A great deal of information is inaccessible to the casual reader. This would not be significant, but the paper’s conclusions depend upon the precise interpretation of the data at around the 1% level and there these issues are significant.

Page 7226 line 8: The systematic errors are “typically less than a few percent”. However some of the variations discussed are of exactly that order and so a more comprehensive understanding of the errors and their influence on the result is warranted.

Page 7230: The cloud identification is described in fair detail, but there is no indication of the influence of a particular threshold in the cloud detection on the results. A reasonable test would be to ensure that the conclusions are robust to small variations in the threshold. Another possibility would be to verify that the algorithm produces statistics that are comparable (not exactly, but in a statistical sense) with other cloud mask products, e.g. MODIS. It seems that the cloud-clearing might have a significant biasing effect on the conclusions.

Page 7232 Line 1: The use of scaling factors is disturbing - it implies that the physics is not perfectly understood. There is an implicit assumption that the scaling factors are constant in space and time which might not be the case, particularly at the 1% level.

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The scaling factor of Yang is only 5.8% whereas the scalings here are a total of 49% for XCO<sub>2</sub> which is quite large. The comment is made that the absolute value is only of minor importance which is true, but the constancy of the scaling factor is important when considering variations.

Page 7240 lines 12-24: There seems to be some confusion in my mind between the measurements of CO<sub>2</sub> (total column in mol cm<sup>-2</sup>) and XCO<sub>2</sub> (equivalent ppmv). I think that at the end of this paragraph the authors are discussing XCO<sub>2</sub> and therefore any errors in the O<sub>2</sub> measurement are included.

Page 7244 line 3: The conclusion that “the CO<sub>2</sub> measurements also agree with the model data” is only justified if the scaling factors on the CO<sub>2</sub> and O<sub>2</sub> results are correct and time and spatially independent. This is an important restriction on the conclusion.

Stylistic Issues;

There are too many figures. Figures 7, 10, 2 of 11-13 at a minimum could be removed without significant impact.

Page 7225 line 5: An additional fit parameter also used . . . is the

Page 7237 line 2: Overall, the patterns agree . . .

Page 7237 line 23: . . . model is similar to those from . . .

Page 7237 line 29 . . . hot spots associated with vegetation . . .

Page 7237 line 29: . . . for three other days of the year . . .

Table 2 Caption: . . . the position of the inner . . .

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Interactive comment on Atmos. Chem. Phys. Discuss., 4, 7217, 2004.

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