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Comment

Interactive comment on “Application of

SCIAMACHY and MOPITT CO total column measurements to evaluate model results over biomass burning regions and Eastern China” by C. Liu et al.

Anonymous Referee #1

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The manuscript of Liu et al., ACPD, 2011, covers an interesting topic appropriate for ACP. However I share most of the concerns as detailed in the interactive comment of J. de Laat, from 1 March 2011. Detailed answers to the issues raised by de Laat have already been provided by corresponding author T. Wagner on 6 March 2011. Therefore, I do not repeat these issues here but list a number of additional items which need to be considered by the authors before the manuscript can be published by ACP.

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Introduction, various places:

Please cite also: Tangborn, A., Stajner, I., Buchwitz, M., Khlystova, I., Pawson, S., Burrows, J., Hudman, R., and Nedelec, P., Assimilation of SCIAMACHY CO observations: Global and regional analysis of data impact, *J. Geophys. Res.*, 114, D07307, 1-11, doi:10.1029/2008JD010781, 2009. Here SCIAMACHY CO retrievals have been used for model comparisons and to get information on emissions.

Please site also the following publications where SCIAMACHY CO retrievals have been validated by comparison with ground-based observations:

Dils, B., De Maziere, M., Blumenstock, T., Hase, F., Kramer, I., Mahieu, E., Demoulin, P., Duchatelet, P., Mellqvist, J., Strandberg, A., Buchwitz, M., Khlystova, I., Schneising, O., Velazco, V., Notholt, J., Sussmann, R., and Stremme, W., Validation of WFM-DOAS v0.6 CO and v1.0 CH₄ scientific products using European ground-based FTIR measurements, proceedings of the Third Workshop on the Atmospheric Chemistry Validation of ENVISAT (ACVE-3), 4-7 Dec. 2006, ESA/ESRIN, Frascati, Italy, ESA Publications Division Special Publication SP-642 (CD), 2006.

Dils, B., M. De Maziere, J. F. Müller, T. Blumenstock, M. Buchwitz, R. de Beek, P. Demoulin, P. Duchatelet, H. Fast, C. Frankenberg, A. Gloudemans, D. Griffith, N. Jones, T. Kerzenmacher, I. Kramer, E. Mahieu, J. Mellqvist, R. L. Mittermeier, J. Notholt, C. P. Rinsland, H. Schrijver, D. Smale, A. Strandberg, A. G. Straume, W. Stremme, K. Strong, R. Sussmann, J. Taylor, M. van den Broek, V. Velazco, T. Wagner, T. Warneke, A. Wiacek, and S. Wood, Comparison between SCIAMACHY and ground-based FTIR data for total columns of CO, CH₄, CO₂, and N₂O, *Atmos. Chem. Phys.*, 6, 1953-1976, 2006.

Introduction, page 1269, line 24 following:

The authors say that previous studies "suffer from two general problems": Under (a) it is stated that "Many of the comparisons were qualitative" but under (b) it is shown

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that "some comparison studies were performed in a more qualitative way". Sorry, but (b) shows that (a) is hardly a general problem! Please add Tangborn et al and Dils et al to the papers cited under (b). In all these publications quantitative comparisons are shown! I strongly recommend to replace the statement "in a more quantitative way" by "in a quantitative way". As a consequence one of the two general problems "disappears". Under (b) the authors refer to biases of the SCIAMACHY CO retrievals of the other algorithms and "missing cloud correction". Under (a) they say that the effect of clouds "was not adequately corrected". If adequate or not, there is no "missing cloud correction". All previous algorithms deal with clouds one way or the other. For example, Buchwitz et al., 2007, correct for clouds using simultaneously retrieved methane. It is interesting to investigate if this is adequate or not, but the authors merely present statement rather than detailed comparisons and analysis where they show that their approach is in fact superior. Instead they argue rather "qualitative". For example, they draw a red circle around the Sichuan province region in their Fig. 7 and write in the caption that "other SCIAMACHY algorithms (Buchwitz et al., 2007) show much smaller column densities, which is probably related to the effect of clouds". Sorry, but this is not acceptable. Neither the Fig. of Buchwitz et al., 2007, nor the spatial averages shown in Liu et al., are "true multi-year averages" which can directly be compared to drawn such conclusions as other aspects also play an important role such as the spatio-temporal sampling. Either provide a detailed comparison with the Buchwitz et al., 2007, data set, or remove this guess. In addition: If statements are made which of two or more algorithms gives better results, as in the Sichuan case, please do so only if you can provide a clear proof. Only higher values near a source region are no prove as the algorithm giving lower values may be better one !

Section 2.3, page 1273, line 20: Please cite Tangborn et al and Dils et al (see above).

Section 2.3, page 1274, line 23: I think "weaker" needs to be replaced by "stronger".

Section 2.3, page 1275, line 4 and following: As shown in Gloudemans et al., 2005, and discussed in Buchwitz et al., 2007, there is in fact a problem related to the instrument

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slit function, but mainly concerning its shape (wing versus center) but not concerning its width. It is therefore not clear for me if the discussed determination and consideration of a time dependent slit function width improves the CO retrieval or not. Please show that the implemented approach results in an improvement (not only in a change).

Section 4, page 1283, line 17 following: The authors state that "The importance of a proper cloud correction is illustrated in ...". What is shown is that there is a change (sensitivity) but no proof is given that the approach really results in more accurate retrievals. Perhaps this can be addressed with the additional information on validation the authors intend to include as can be concluded from the authors answers to the comments of de Laat.

Conclusions, page 1294, line 26: See comment given above on "proper cloud correction".

Conclusions, page 1295, line 8: The averaging kernels do not support the conclusion that SCIAMACHY is "especially sensitive ... to ... the surface". Instead sensitivity is nearly equal for all altitude layers.

Fig. 1: Please comment on the large drop of the uncorrected SCIAMACHY CO after 2005.

Fig. 7, caption: As already noted above: Remove speculation about other algorithms or provide a detailed analysis.

Fig. 8, caption: 3rd line. I think "right column" needs to be replaced by "middle column".

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 1265, 2011.

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