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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Carbon monoxide distributions from the IASI/METOP mission: evaluation with other space-borne remote sensors" *by* M. George et al.

Anonymous Referee #2

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The paper "Carbon monoxide distributions from the IASI/METOP mission: evaluation with other space-borne remote sensors", by George et al. presents global distributions of CO retrieved from the IASI instrument and compares these with CO measurements from MOPITT, AIRS, and TES. Such a comparison is very valuable as it will allow to demonstrate the performance of IASI in comparison with the other satellite instruments and will provide important information when using these data for inverse modelling or data assimilation. Therefore, the topic of the paper is very interesting and suitable for publication in ACP. However, the presented comparisons are very limited and on a very basic level. Therefore I recommend to provide a more detailed statistical analysis taking into account the major comment given below and also taking into account the

points raised by referee 1.

Major comment:

When comparing IASI CO with MOPITT, AIRS, and TES the averaging kernels and a priori need to be taken into account otherwise wrong conclusions could be drawn. See e.g. Luo et al. (2007), 'Comparison of carbon monoxide measurements by TES and MOPITT: Influence of a priori data and instrument characteristics on nadir atmospheric species retrievals'.

Specific comments:

1. The authors present results only for August 2008, but write that other months have also been investigated (p.9803,l.21) and give similar conclusions. Is this still true when the a priori and averaging kernels are taken into account in the comparisons? It would be illustrative to add a table with correlation coefficients also for a few other months for the global comparison. See also the next comment.

2. Fortems-Cheiney et al. (Atmos. Chem. Phys. Discuss., 9, 7505-7529, 2009) report higher emissions derived from IASI CO compared to MOPITT. This seems to be in contradiction with the findings in this paper: In section 3.3 the authors write that 'MOPITT is consistently higher than IASI for all latitudes'. Can you explain the differences between your results for August 2008 and those of Fortems-Cheiney et al. for the period July-November 2008? Is August 2008 different from the other months?

Minor comments:

1. Abstract, l.9: 'especially when thermal contrast is important'. Do you mean 'when thermal contrast is significant'?

2. Abstract, l.17: 'and can explain' . This is not shown in the paper.

3. p.9796, l.17: the proper references for SCIAMACHY are as follows: Buchwitz et al. 2004, 2007; de Laat et al. 2006, 2007; Frankenberg et al. 2005

-Buchwitz, M., de Beek, R., Bramstedt, K., et al.: Global carbon monoxide as retrieved from SCIAMACHY by WFM-DOAS, Atmos. Chem. Phys., Vol. 4, pp 1945-1960, 2004

-De Laat, A. T. J., Gloudemans, A. M. S., Schrijver, H., van den Broek, M. M. P., Meirink, J. F., Aben, I., and Krol, M.: Quantitative analysis of SCIAMACHY carbon monoxide total column measurements, Geophys. Res. Lett., 33, L07807, doi:10.1029/2005GL025530, 2006.

-De Laat, A. T. J., Gloudemans, A. M. S., Aben, I., Krol, M., Meirink, J. F., van der Werf, G. R., and Schrijver, H.: SCIAMACHY carbon monoxide total columns: statistical evaluation and comparison with CTM results, J. Geophys. Res., 112, D12310, doi:10.1029/2006JD008256, 2007.

4. p.9799, l.4: 'typical observation' : since this is an observation with high thermal contrast I wouldn't call this a 'typical' observation. What do the residuals look like for an observation with low thermal contrast? Are they comparable or larger?

5. p.9800, l.12: 'latitudes above and below 60 degrees': do you mean above 60 N and below 60 S or do you mean something else?

6. p.9803, l.11: 'partially clouded scenes' whereas p.9802, l.3 mentions: 'retrieved from AIRS cloud-cleared radiances'. Can you explain?

7. p.9804, l.4: ..different intensity.. : 'magnitude' may be a better word. How large are the differences between the different instruments? Also, what is the range of background values among the different instruments? The value of 4e17 for IASI sounds rather low.

8. p.9804, l.22-29 and p.9805,l.1-3: since the comparisons are done without taking the averaging kernels and a priori into account, these conclusions need to be checked after a proper comparison has been performed. The same holds for the conclusion section.

9. p.9805, l.15-16: This is not mentioned earlier in the paper. Please also add this to

section 3.3. See also specific comment 1.

10. p.9805, l.18-20: this is very similar to what is written in l.5-7 (p.9805). There is no need to say this twice.

11. Fig. 3: An interesting figure, but due to the large spectral range shown, the CO retrieval windows are difficult to compare. Adding a blow-up of the region defined by the start wave number of the TES retrieval window ($\sim$2100 cm-1) up to the end wave number of the AIRS retrieval window ($\sim$2210 cm-1) for each instrument would help. In addition, please add the exact ranges of the CO retrieval windows (in cm-1) of each instrument to the caption of fig. 3.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 9793, 2009.