Atmos. Chem. Phys. Discuss., 9, C5709–C5712, 2009
www.atmos-chem-phys-discuss.net/9/C5709/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the capability of IASI measurements to inform about CO surface emissions" *by* A. Fortems-Cheiney et al.

A. Fortems-Cheiney et al.

frederic.chevallier@lsce.ipsl.fr

Received and published: 7 October 2009

General comment about the revision

We wish to thank both referees for their helpful comments. We address all the issues they have raised in the following. The full reviews are copied hereafter and our responses are inserted where appropriate.

The questions posed by Reviewer #1 about the consistency of the MOPITT and IASI L2 products made us revise our full processing chain. The results have slightly changed for IASI and much more for MOPITT. Indeed we found that we did not use the MOPITT L2 products at the pressure level (700 hPa) that we thought we were using. The new

results show consistent behaviour of the IASI-based inversion and of the MOPITT-based one. We updated the text accordingly. We are both sorry for this and grateful to the reviewer for having encouraged us to investigate the previously-found differences.

Referee #1

> Fortems-Cheiney et al. use IASI and MOPITT CO retrievals in an inverse modelling framework to investigate the capability of IASI (relative to MOPITT) to draw conclusions about CO surface emissions. As CO is an important atmospheric constituent and because IASI measurements will be available for many years, it is important to assess the performance of IASI with respect to the information which can be derived from IASI concerning CO emissions. The authors cover an important topic, appropriate for ACP. The manuscript is well written and a comprehensive overview about the existing literature on this topic is included. I recommend its publication in ACP after the few minor comments listed below have been considered by the authors.
>
> Page 7508, line 9: I recommend to put MCF in brackets.

We did it.

> Page 7509, lines 5-7: Is my understanding correct: The method requires to perturb the emissions and the observations (!) in order to get an error estimate. Or are error estimates also available without perturbing the observations. Please add more information on this.

The method reconstructs the posterior error statistics based on an ensemble of individual realizations of the error statistics in the optimality system (prior + observations).

Therefore both the prior and the observations need to be perturbed consistently with their respective error statistics (given by B and R).

> Page 7511, line 5: The layer closest to 700 hPa has been used for this study. Neither IASI nor MOPITT enable the retrieval at 700 hPa but only an average over a large altitude range. In addition, the vertical sensitivities of IASI and MOPITT are different. Therefore one may expect that the results of the study differ depending on which layer has been used. Is this selection critical for this study ?

We consistenly use the 700 hPa retrievals together with their respective averaging kernel for both IASI and MOPITT. This pressure level was chosen as a compromise between closeness to the surface and noise level (see Section 2.4.2). The results would slightly differ if another level had been chosen, but we do not expect any change in the conclusions of this paper.

> Equation (2): Please add what units have been used for the state vector elements (mixing ratios for MOPITT and layer columns for IASI ?).

We did it.

> Page 7514, line 26: IASI and MOPITT are broadly consistent in terms of correlation but not in terms of there absolute values as there are clear biases. I recommend to rephase the sentence to consider this.

The inconsistency was caused by our processing of the MOPITT data (see above). The paragraph has been corrected.

> At the end of the paragraph it is mentioned that IASI CO is higher compared to MOPITT. As the IASI averaging kernels peak higher in the atmosphere one might have expected an opposite finding (lower CO from IASI compared to MOPITT). Please comment on this.

The inconsistency was caused by our processing of the MOPITT data (see above). The paragraph has been corrected.

> In addition, please add information on validation of both MOPITT and IASI. Are the differences due to a significant high bias of the IASI retrievals ? If yes, what might cause this bias ?

We now refer to the paper by George et al., also in the ACPD-ACP IASI special issue, which provides a comparison of CO total column distributions as measured by different instruments (MOPITT, AIRS, TES and IASI).

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7505, 2009.