

## ***Interactive comment on “Assimilation of IASI satellite CO fields into a global chemistry transport model for validation against aircraft measurements” by A. Klonecki et al.***

### **Anonymous Referee #2**

Received and published: 19 January 2012

This is a very well written and presented manuscript, describing a new way to assimilate IASI CO observations into a CTM using superobservations. The assimilation results are compared to independent aircraft observations and generally show an positive impact on the simulations. Below I give some main and specific comments that could help to further improve the presentation of the results and to clarify some issues before publication.

#### Main comments

1. It seems that the approach of aggregating observations into superobservations introduces a resolution dependency. What is the maximum horizontal resolution at

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which the assimilation approach is practical?

2. What would be the effect of assimilating each IASI observation separately and to then average the resulting assimilated profiles at each grid box?

3. How exactly is the prior formed, is it one global mean profile, or is it variable in time and space? If it is a single profile, how may this affect the quality of the IASI retrievals in terms of temporal/latitudinal biases? Should this uncertainty not be part of the assimilation process as well?

4. The presentation of the effect of assimilating CO observations should be presented in more detail and made more quantitative, e.g. by showing difference plots of the assimilated model minus the control run and assimilated model minus the IASI observations. The reason for the discrepancy between the control run and the assimilation run could be further investigated.

5. The combination of a Discussion and Conclusion section seems awkward, it would be much clearer to separate writing this into two separate sections.

Specific comments

pg. 31692, l. 13: remove "an"

l. 27: "limited only": certainly, resolution is not the only limitation of the product: do you mean a certain aspect?

pg. 31693, l. 18: capitalize "Arctic"

l. 19-26: this section seems out of place, I suggest to place this at the end of the discussion or into the conclusions

pg. 31697, l. 3-10: This sections seems to explain the same things twice with different formulations.

Eq. 3 and 4: The apostroph at the symbols is not very clearly visible, consider using a

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different marker symbol, e.g. a tilde.

pg. 31704, l. 7: Do you mean model error parameterisation? Add this to clarify the distinction to other parameterisations (model physics etc.).

Fig. 5: Include difference plots assimilated-IASI, assimilated-control.

pg. 31705, l. 16: This aspect could be tested by doing the assimilation over Asia only and comparing to the full assimilation.

Fig. 6: Color scale is exceeded in Fig. 6a. A panel should be added showing the IASI observations (not only superobservations) for the same time instance.

pg. 31709, l. 15: "This plume which mixes..." sounds strange, rephrase.

l. 16: The presentation in this section would profit from using labels in Fig. 11. Also, Fig. 11b is described before Fig. 11a, which is confusing.

l. 24: "at about 80°N": How does the fact that data assimilation ends at 75°N affect this comparison?

pg. 31712, l. 17: This discussion seems out of place at this point in the conclusions. I suggest adding a separate Discussion section which also provides the space needed to highlight the important aspects.

pg. 31713, l. 7: Similarly, this section seems out of place and better be put in a Discussions section.

Fig. 6, 7, 10 need to have latitude-longitude coordinates indicated.

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 31689, 2011.

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