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Interactive comment on “Temporal and spatial variability of glyoxal as observed from space” by M. Vrekoussis et al.

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We would like to thank both reviewers for their comments and suggestion which helped to improve our manuscript. Below we present the responses to comments and describe the modifications made to the manuscript.

Reviewer 2:

Comment 1: Did the authors calculate the correlation between the concentrations inferred from the SCIA and the surface obs? Such analysis including statistical significance and a scatter plot would be preferable, or a nice addition, to the bar chart of Fig 3. Further, in the discussion of the comparison between these two, it is noted that the SCIA values are generally higher. There is some discussion of the resolution error in

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Interactive Discussion

Discussion Paper



Interactive
Comment

degrading the observations to 1x1 which is used to explain the measurements being higher than SCIA near anthropogenic sources. Later, in section 3.5.2, there is discussion of how averaging over larger boxes decreases the concentrations, this time near biomass burning sources. Are these two invocations of resolution error consistent? And why is the analysis done at 1x1, rather than the resolution of the SCIA instrument (30x60km)?

Reply: As proposed by the reviewer, we added a new plot, 3b which shows the correlation of the reported ground based measurements and the SCIAMACHY observations. We divided the data into 3 groups, rural (green colour), urban (red colour) and marine (blue colour) (see table 1). As depicted in this figure, the SCIAMACHY underestimates most of the urban measurements and slightly overestimates the rural ones. Concerning the second part of the comment, indeed the anthropogenic sources are underestimated due to the applied gridding. However the argument posed for the biomass burning region is misinterpreted. Two biomass burning affected regions, both found in S. America were compared. It was stated that although “Nevertheless the relative importance of fires depends on the total area of the chosen regional boxes. Thus, taking into account that box 2 is about seven times larger than box 3, it is clear that fires affect more drastically box 3”. In other words we compared the two boxed in terms of fire occurrence and not in terms of gridding. Lastly, the 1x10 grid resolution has been selected in order to minimize the errors emanating from each single measurement.

Comment 2: It's not clear at first what Fig 5a is showing. Please elaborate in the text.

Reply: We modified the text as “In order to compute the annual changes of glyoxal on a global scale, a linear regression of the annual averages of tropospheric CHO.CHO was applied and plotted in Fig. 5a. In addition, the absolute difference of VCDCHO.CHO for the period 2003 to 2007 has been calculated (fig. 5b).”

Comment 3: The introduction (sections 1 and 2) is too long. Given that this is not the first paper to present SCIA retrievals of glyoxal, it isn't necessary to go into as

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Interactive
Comment

much detail. Similar for description of glyoxal budgets and chemistry relying more on citations to papers such as Wittrock et al, 2006, Wittrock 2006, Fu et al 2008, and Myriokefalitakis et al, 2008 is advised. Otherwise, your readers might get a bit impatient (as I started to get) and give up before getting to the real content of this article. For example, sections 2.2 - 2.5 could be condensed. The titles of 2.2 and 2.3 alone are redundant.

Reply: According to the suggestion of the reviewer the titles of 2.2 and 2.3 have been changed to:

2.2 Glyoxal spectral bands

2.3 DOAS technique and Slant Column densities computation.

Concerning the introduction we agree that it is long however our goal was/is to present it as an overview of the current knowledge as in a previous work of ours, Wittrock et al., 2006, the length of the paper didn't allow us to present in details the instrumentation and the retrieval procedure. In response to the reviewer's comment, we have tried to reduce the length of the introduction/instrumentation while still keeping in all relevant information. Therefore, the overall length was not much reduced.

Comment 4: Why the use of CHO.CHO instead of just saying glyoxal? The article readability would be much improved by just saying glyoxal.

Reply: Following the comment of the reviewer we changed half of the words "CHO.CHO" to "glyoxal".

Comment 5: When mentioning that convection of organic aerosols on page 9015, it's not clear what you are suggesting. That glyoxal is evaporating from the OC to be observed by SCIA, or that these are depositing into the ocean leading to a source of carbon that later enhances production of glyoxal from the surface layer?

Reply: We suggest that the glyoxal entrapped into aerosols rich in OC is released to the gas phase and then observed by the SCIAMACHY instrument. The source however

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[Interactive Discussion](#)

[Discussion Paper](#)



Interactive
Comment

is still unknown as we do not know the lifetime of CHO. CHO when trapped into the aerosols and then re-released to the atmosphere. The OC content may emanate from the oceans or from the land (e.g. biomass burning).

8996, 24: extend → extent- Corrected

8998, 9: columns surrogate → columns are a surrogate- Corrected

9012, 25: regions regions → regions- Corrected

9015 13: reach → rich- Corrected

Comment 6: The use of commas is excessive. I realize that sometimes a comma seems optional but in the following places it is not appropriate and should be removed:

8995 16: whereas human - Corrected

8995 22: distribution make- Corrected

8998 17: HCHO make- Corrected

8998 20: distribution and- Corrected

9000 17: DOAS is- Corrected

9000 25: photons during- Corrected

9002 8: AMF on- Corrected

9002 9: regions where- Corrected

9004 8: areas having- Corrected

9004 10: regions where- Corrected

9006 6: that high- Corrected

9006 15: VCD for- Corrected

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9006 16: 2007 shows- Corrected
9008 7: interest where- Corrected
9013 7: increase found- Corrected
9013 8: also in- Corrected
9015 4: regions where- Corrected

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 9, 8993, 2009.

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9, C2135–C2139, 2009

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