Atmos. Chem. Phys. Discuss., 10, C8282–C8285, 2010
www.atmos-chem-phys-discuss.net/10/C8282/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "GOME-2 observations of oxygenated VOCs: what can we learn from the ratio glyoxal to formaldehyde on a global scale?" *by* M. Vrekoussis et al.

Anonymous Referee #2

Received and published: 5 October 2010

0.1 Overview

This paper is clear and well written. The data presented is new and the analysis timely, and I believe it will be suitable for publication in ACP after addressing the following comments, which mainly request additional explanations about the variability of the ratio of glyoxal to formaldehyde.

0.2 General comments

1. Figure 3. The conclusions of this paper are centered around differentiating $R_{GF} > 0.4$ and $R_{GF} < 0.4$. It would greatly assist the reader if the plot of R_{GF} thus makes a clear color distinction at this threshold. I would suggest using a blue-white-red color scheme centered at 0.4. Use another color (e.g., grey) for areas without data.

2. The authors clearly demonstrate that the significance of R_{GF} in many areas is driven by anthro vs natural sources. However, there are many areas with substantial variability in R_{GF} that are not addressed at all in the paper, nor are they easily rationalized given the explanations provided for other areas. For example, there are wide regions of the globe where the ratio seems to have somewhat random pattern of high and low value (e.g. midwestern US, most of South America below 20° S, central Australia, most of Russia, etc.). Certainly not all of these variations are indicative of anthro vs natural sources. I suspect that this ratio is only very meaningful where the absolute concentrations of either species are significantly large. Thus, I suggest that in Figure 3 the plot omit any areas where concentrations of one or both of the species is not above a threshold. Otherwise, please provide an explanation for the variability in these areas – is it lightning NOx or soil NOx? Why do areas with high altitude seem to have high R_{GF}?

3. Section 2.5: The trend noted over the given set of cities is quite interesting, and is remarkably consistent within the set of cities selected. Yet, when looking at Figure 3, one wonders if only favorable locations were selected for inclusion in this analysis. I was wondering why cities such as Rio, Buenos Aires, Lima, or Mexico City, were not included. Does the trend break down in these areas, was the data just not available there for other reasons? Over how wide of an area is the trend significant? In other words, are the variations seen in places such as these, or others, such as France, Spain and England, truly indicative of anthropogenic vs

natural land use? I think an easy test of the authors' assumptions would be to make a scatter plot of R_{GF} vs a relatively recent estimate of anthropogenic NO_x emissions, as used in global chemical transport models, and see what fraction of the variability of R_{GF} can actually be explained by variability in the anthropogenic emissions.

4. Do recent papers on isoprene photochemistry (e.g., those from Paulot et al., Science 2009) affect the estimates of isoprene yields of HCHO and CHO.CHO?

5. p19035: Could SOA serve as a CHO.CHO source owing to oxidation / volatilization of other compounds (e.g., Kwan et al., GRL 2006), rather than just reversible uptake of CHO.CHO itself?

6. p19049, 23: I was a bit confused when I read this line, as I thought the authors were attributing lower R_{GF} values to higher NO_x levels rather than larger emissions of anthropogenic VOCs.

0.3 minor corrections

- abstract: missing a closing bracket in line 4
- 19033, 23: "on its"
- 19033, 27: "2006),"
- p19040, 28: "by Spaulding"
- p 19043, 24: change "confronted" to "compared"?
- 19048, 13: "rate oxidation" to "oxidation rate"
- 19049, 22: "RGF" to "R_{GF}"

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 19031, 2010.