Atmos. Chem. Phys. Discuss., 12, C3540–C3543, 2012
www.atmos-chem-phys-discuss.net/12/C3540/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Isoprene emissions in Africa inferred from OMI observations of formaldehyde columns" *by* E. A. Marais et al.

E. A. Marais et al.

emarais@fas.harvard.edu

Received and published: 12 June 2012

(1) The discussion of the low-NOx chemistry is important and the authors clearly have paid a lot of attention to this. The manuscript mentions that Stone et al. report an average of 70% high NOx pathway during AMMA and that AMMA was between high and low NOx conditions. However, I think it would be useful to be more quantitative overall, especially as the authors have clearly considered this aspect carefully. The manuscript would be strengthened if the authors state what fraction of peroxy radicals reacts with NO versus HO2 for the different conditions discussed. Otherwise it is hard to judge the claim that smearing results from low NOx conditions. It could be useful to add a map of the fraction of peroxy radicals reacting with HO2, and use this to compare the AMMA conditions with Central Africa in view of the smearing proposed

to result from the latter region. I think this would be particularly useful given the large current interest in this topic.

Response (1): We have now inserted a new figure between Figures 5 and 6 (labeled Figure 6 and included at the end of this manuscript) showing the percentage contribution of the RO2+NO reaction to overall loss of RO2 in Africa for July 2006 in GEOS-Chem and refer to it on page 7491 line 27 and page 7492 line 25. In the AMMA region ∼50% of ISOPOO react via the high-NOx pathway, whereas in central Africa only 15% of ISOPOO react with NO.

(2) The authors state that uncertainties in low-NOx isoprene chemistry could affect the model results and the other reviewer and short comment also raise this point. I concur with these statements and also believe this suggests weakening the last sentence of the abstract with respect to MEGAN. In the conclusion this is already discussed in a more balanced way.

Response (2): Done. The final sentence in the abstract now reads as follows: "Our results suggest that isoprene emission from the central African rainforest is much lower than estimated by the state-of-the-science MEGAN inventory."

(3) This work, as well as related manuscripts, excludes conditions above a certain degree of cloud cover, for obvious and valid reasons. This selects speciïňĄc conditions for deriving isoprene emissions in that cloudy days are not amenable for analysis. I realize that the authors cannot derive isoprene emissions for these days, but are there estimates of how big uncertainties in the isoprene emission inventories are for cloudy days compared to cloud free days. In other words, what fraction of the annual isoprene emissions in Africa is captured by cloud-free days and how big is the uncertainty in this, if it is known. I think it would be useful to have a brief comment on the impact of cloudy days on the isoprene budget in the manuscript.

Response (3): We have now included a statement about the effect of clouds on isoprene emissions in MEGAN at the end of Section 5 (page 7497, line 16): "The discrep-

ACPD

12, C3540–C3543, 2012

ancy in central Africa increases to 53% if scenes with >40% cloud cover is excluded from the MEGAN emission inventory for consistency with the OMI screening threshold." Therefore, filtering for cloudy scenes in the MEGAN inventory does not change our conclusion that OMI is lower for central African and higher for southern African deciduous forests.

Technical comments:

(a) P. 7478 Line 22-23. Although it is fairly obvious it should be made clear that the typical HCHO lifetimes mentioned are noon-time, if I understand correctly. It could be helpful to put this directly in context with the nighttime HCHO transport and state whether/where transported HCHO could contribute to the observed smearing. From my reading of the paper this is not the case for biogenic areas, but a more direct statement would be helpful.

Response (a): We have now inserted "midday" on page 7478 line 22 for clarity. Night-time HCHO will not be detected far from the point of origin as OMI observes at 13h30 local time when night-time HCHO is erased.

(b) Related to the above point: What is the lifetime of the low NOx isoprene oxidation products in the model. This information also would be useful to compare with the smearing observed in the satellite retrievals and what causes this.

Response (b): We now include a lifetime range of isoprene hydroperoxides (ISOPOOH) from Paulot et al., 2009 at the end of Section 3.2 (page 7485 line 24), as ISOPOOH is advected from the source of emissions and thus contribute to smearing.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 7475, 2012.

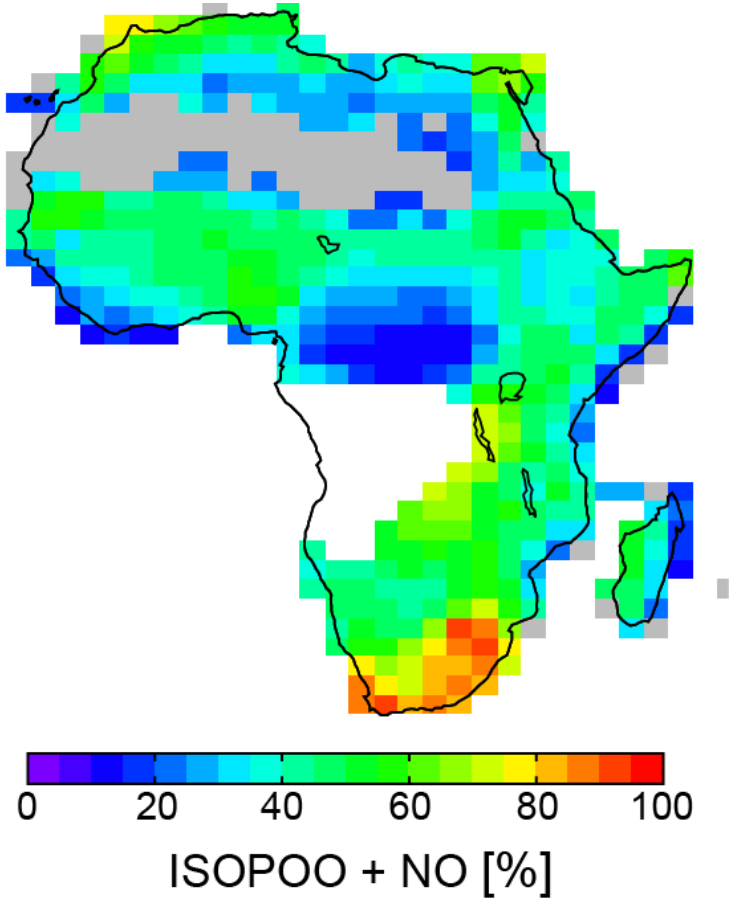

Fig. 1. Figure 6. Percentage ISOPOO reacting with NO in GEOS-Chem for July 2006 using the Paulot scheme for isoprene chemistry. Values are computed from monthly mean reaction rates.

ACPD

12, C3540–C3543, 2012