**Atmospheric
Chemistry
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Discussions**

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Comment

Interactive comment on "Reconstructing ozone chemistry from Asian wild fires using models, satellite and aircraft measurements during the ARCTAS campaign" *by* R. Dupont et al.

Anonymous Referee #1

Received and published: 19 December 2010

The paper discusses the ozone production from biomass burning plumes during the ARCTAS campaign in April 2008. Using a combination of DC-8 aircraft measurements, TES CO and O3 satellite retrievals and global modeling with the RAQMS model, biomass burning plumes from Asia are followed from their origin to their intersect with the DC-8 and the plume evolution during transport examined. This paper is of scientific interest given the up to date still open questions regarding the ozone production from biomass burning sources and the significance of biomass burning as a major source of trace gases and aerosols to the global atmosphere. The study benefits from the integration of a suite of different tools. Given the importance of the topic and the integrative approach I recommend this paper for publications, however, suggest more work to be

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done to improve the quality of the manuscript as well as the analysis. Following more detailed comments and suggestions:

The structure of the paper should be improved and the different parts of the analysis consolidated more clearly. For example, the authors start by discussing flight 11 in-situ and DIAL aircraft data results, then move on to giving an overview of TES and modeling tools. Model evaluation with aircraft data is very vague and spread across the manuscript. I suggest introducing all tools first, and then describe the aircraft LIDAR and measurements together with model evaluation. This way the model evaluation can be deepened by adding also modeled time series of trace species in Figures 5 and 6. A restructure would also allow cutting back on the fairly high number of figures. E.g., DIAL ozone and backscatter ratio data are shown in Figures 3 and 4, and then again in Figures 9 and 10.

Page 26758, line 26:

A number of species are mentioned but only few are shown in the Figures; I suggest indicating more clearly what is shown and what not. There is no mention of measurements of trace species that are well-known fire tracers, like acetonitrile or HCN. Are measurements of these species available for Flight 11?

Page 26760, line 5:

Please also state values for TES CO validation results.

Page 26760, line 25:

How where fire emissions treated in the model? Was a fire injection height considered?

Page 26762, line 7:

I am confused by the definiton of the baseline simulation. In the model description it is stated that the current study applies assimilation of O3 and AOD satellite data in RAQMS and I assume this is considered the baseline simulaiton. Then, on page

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26764, line 21 it is mentioned that the sensitivity simulations do not include assimilation. This implies, that when the baseline and sensitivity results are subtraced to estimate the fire influence, then it is not only differences in fire emissions that are impacting this difference. How does this model inconsistency impact the results? And why was a baseline simulation not conducted without assimilation to allow consistency between all model runs? I also suggest moving the description of the sensitivity simulations earlier to Section 2.4 (model overview).

Section 3.2:

I suggest moving this section to the discussion part of the paper (Section 4) after the plume evolutions have been discussed.

Section 3.3.1:

The model performance for this plume analysis if in my opinion rather poor. The authors do not state any possible reasons for the high CO –low O3 bias in the model and in what way this impacts their conclusions.

Page 26767, line 15:

The last 2 sentences of this section do not make sense. If there is signifcant cloudiness in an area, should there be even any TES retrievals?

Page 26768, line 27:

Specifying the latitude where this happens would make the localization in the graphs easier.

Section Discussion:

It would be benefitial to provide in this Section also a brief summary and comparison of the TES/RAQMS/aircraft derived ozone enhancements (dO3/dCO) before the modeled enhancements are extrapolated to a larger picture.

Figures 4 and 10:

Why are there gaps in the ozone curtain in Figure 10 but not in Figure 4?

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 26751, 2010.