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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Importance of transboundary transport of biomass burning emissions to regional air quality in Southeast Asia" *by* B. Aouizerats et al.

Anonymous Referee #1

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This study presents model simulation results about tropical biomass burning emissions affect air quality of Singapore. This study applied WRF-Chem model to simulate transport of biomass burning emissions in Jul.-Oct. 2006 and the model results are compared with measured PM10 and CO, also satellite measured AOD. The influence of biomass burning to the air quality of Singapore is also evaluated by turning "on" and "off" biomass burning emission. This work is important as it present how emissions from several hundreds km away affect air quality of a highly populous metropolitan. However, the analysis in the manuscript is weak at this point, I recommend major revision before it can be published in ACP.

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Interactive Discussion
Discussion Paper

1. This study compare WRF-Chem simulation with measured PM10 in Singapore, measured CO at a station in Sumatra. They also compared WRF-Chem results with satellite measured AOD, but it is kind of failed. The good agreements of PM10 and CO with measurements at two locations are somewhat convincing. But, they have no aerosol composition measurements at all. Good agreements of PM10 can arise from overestimating one species and underestimating the other species, or arise from overestimating primary emissions and underestimating secondary formation. The authors spent a whole section to discuss aerosol compositions in Section 3. If the authors can not provide some evidence to validate their model, it is hard to believe the results. The sentence (P11228 L21-23) "The comparison of model outputs with observations shows that the WRF-chem model set-up is capable of representing quite accurately the evolution of the aerosol concentration for the 4 months of simulation" is just too ambitiously.

2. The authors also use aerosol compositions data form model to investigate secondary formation in biomass burning plume. Many related important studies are not cited in the paper, including several aircraft BB plume observation data and also laboratory data, such as Vakkari et al., 2014; Yokelson et al. 2009; Akagi et al., 2012; Cubison et al., 2011; Capes et al., 2009; Hennigan et al., 2011. Some of the studies show than OA formation can be very significantly in BB plume. The study of Yokelson et al., 2009 saw very fast (1.4 h) of OA enhancement of a factor 2.3 in tropical BB plume evolution in Yucatan, Mexico and the study environment is highly relevant in this study. This is contrast with the authors' model results. Given that SOA is usually underestimated in models and very low SOC/POC ratio in this study, I would recommend the authors work more on this issue.

3. P11226 L13: How PM10 and CO are measured. How many sites do you have PM 10 data. Are they urban sites? Please provide the information.

4. P11247: Fig. 6 Please provide more explicit x-axis in the figure, e.g. latitude.

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5. What is the different between POA and OCp. Please use a consistent terminology in the paper.

References: Vakkari, V. et al. Rapid changes in biomass burning aerosols by atmospheric oxidation. Geophysical Research Letters 41, 2014GL059396, doi:10.1002/2014GL059396 (2014).

Yokelson, R. J. et al. Emissions from biomass burning in the Yucatan. Atmospheric Chemistry and Physics 9, 5785-5812 (2009).

Akagi, S. K. et al. Evolution of trace gases and particles emitted by a chaparral fire in California. Atmos. Chem. Phys. 12, 1397-1421, doi:10.5194/acp-12-1397-2012 (2012).

Cubison, M. J. et al. Effects of aging on organic aerosol from open biomass burning smoke in aircraft and laboratory studies. Atmos. Chem. Phys. 11, 12049-12064, doi:10.5194/acp-11-12049-2011 (2011).

Hennigan, C. J., et al. : Chemical and physical transformations of organic aerosol from the photo-oxidation of open biomass burning emissions in an environmental chamber, Atmos. Chem. Phys., 11, 7669-7686, doi:10.5194/acp-11-7669-2011, 2011.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 11221, 2014.