

Interactive comment on “Simulation of the chemical evolution of biomass burning organic aerosol” *by* Georgia N. Theodoritsi and Spyros N. Pandis

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(1) *This paper describes simulations using the PMCAMx chemical transport model of concentrations of organic aerosol (OA) over Europe for a wintertime period and a summertime period, with the simulated OA concentration fields subdivided according to biomass burning POA, fossil POA, and SOA derived from biomass burning emissions and from other I/S-VOC. The purpose is both to simulate the biomass burning source of OA specifically, but also to be able to apply differential volatility distributions and aging characteristics for the biomass burning source compared with other OA sources. The time periods simulated include instances of very large localised biomass burning*

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emissions, such as wildfires, and winter-time heating emissions in northern Europe.

This is a short and very clearly presented piece of work. Methodological approach and results are clearly described. I do not have any scientific/technical issue with the work. The work adds to the estimations of amount of OA from different origins for the European domain, where that estimation is sometimes derived from 'backward' source-receptor modelling of measurements or, as here, from 'forward' chemical-transport modelling from estimated emissions. Where this paper has some limitation is in 'ground truthing' the model simulations. The authors do provide some comparison summary statistics between their model concentrations and those derived from AMS-PMF measurements at a few sites across Europe but it can be difficult to draw conclusions from such comparisons because model and measurement data do not always represent exactly the same chemical/source entity. The authors conclude there is a potential shortcoming in emissions data for residential heating but do not undertake model sensitivities on changing the emissions.

Overall, however, I am happy to recommend this manuscript for publication as it is. I spotted only very few formatting errors:

We appreciate the positive feedback from the referee. Indeed, the evaluation of the ability of PMCAMx-SR to reproduce the biomass burning OA is necessarily limited, because of the lack of the corresponding necessary measurements. Comparisons of total OA measurements and model predictions are difficult to interpret, because there are so many OA sources. We did our best using the available estimated biomass burning OA concentrations from the analysis of the Aerosol Mass Spectrometer measurements during the period (see for example Figure 8). Improving the OA emission estimates from residential heating in Europe is a major undertaking and it is clearly beyond the scope of the present work. Such an effort is described by Denier van der Gon et al. (ACP, 15, 6503-6519, 2015). However, we clearly need to do better and this requires a good pan-European OA measurement dataset that is currently lacking. We have added some discussion about this important model evaluation issue in the

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revised paper.

(2) *Line 112: insert “and” before “intermediate”.*

Done.

(3) *Line 283: cite to Fig. 4a rather than generically to Fig. 4.*

Corrected.

(4) *Line 302: after “on March 21” add a citation to Fig. 4b.*

Done.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-1166>, 2018.

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