Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-342-RC2, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Model simulations of cooking organic aerosol (COA) over the UK using estimates of emissions based on measurements at two sites in London" *by* Riinu Ots et al.

Anonymous Referee #3

Received and published: 21 August 2016

This paper describes a development of a new top-down emission inventory for cooking organic aerosols (COA) in the UK. The COA emission estimates were included in an offline air quality model to simulate the COA distribution over a British Isles domain. The simulated COA concentrations were compared with surface measurements (inferred from PMF analysis) of COA concentrations at several cities in the UK.

It's crucial to quantify the contribution of the COA emissions to total OA burden. This also could help to interpret the radiocarbon analysis of particulate matter. Currently there is poor understanding of the COA emissions. As the authors noted this sector is totally missing from the European emission inventories of primary OA. The paper could help us to understand and quantify the role of COA emissions in air qualiy over major

Printer-friendly version

Discussion paper

metropolitan areas in Europe.

I think the text needs some revision for final publication.

Major comments: The paper neglects the discussion of radiocarbon analysis of organic carbon (OC). Was radiocarbon analysis done during the ClearfLo field campaign? I suggest adding discussion of such studies done in the past, e.g. Weber et al., 2007, Zotter et al., 2014. How better characterization of COA could help to explain the radiocarbon analysis of OC, such as modern vs. fossil carbon in aerosols?

There are a few studies, where the ambient COA was estimated using the PMF analysis. The paper by Hayes et al. 2015 reported COA, namely cooking influenced organic aerosol (CIOA) estimates based on the AMS measurements during the CalNex field campaign in the Los Angeles basin. Hayes et al., 2015 discuss the uncertainties related to identifying the OA burden due to the cooking sources. The findings of the study by Hayes et al., 2015 aren't discussed in this paper at all. Also, I think using the term as "CIOA" instead of "COA" would be more accurate.

The authors treated COA as non-volatile. Please elaborate on this point. What about other POA species, are they also treated as non-volatile. From the PMF analysis do you identify COA as HOA (primary) or OOA like (secondary)? Wouldn't scaling the COA emissions directly from the atmospheric measurements (by neglecting secondary OA) lead to overestimation of the COA emissions in this study?

Another missing point in the paper is the role of intermediate VOCs (IVOC) from the cooking sources. The studies by Schauer et al. aren't referenced here at all. I realize that it's hard to characterize the emissions of the IVOCs from cooking sources. But discussing on this topic is important here.

The authors mention possible measurement uncertainties in the text, but I don't see any uncertainty numbers related to the collection efficiency and PMF method are presented in this paper. How much those measurement uncertainties change the conclusions

drawn from the model-measurement comparisons?

Paragraph 20: I think this statement is little misleading. At present there are a number of SOA precursors and mechanisms (proposed during last 5-10 years) that are used in the models, which lead to overestimation of OA in some cases. I think what is more important now to constrain the different mechanisms (aging e.g.) and sources of OA in air quality models.

It'd help to include the measured total OA concentrations at the sites discussed in this paper. Also, their PMF composition to give a better idea to a reader about the role of COA and other sources in driving OA pollution across those cities.

References: Weber, R. J., A. P. Sullivan, R. E. Peltier, A. Russell, Y. Bo, Z. Mei, J. de Gouw, C. Warneke, C. Brock, J. S. Holloway, E. L. Atlas and E. Edgerton (2007). "A study of secondary organic aerosol formation in the anthropogenic-influenced southeastern United States." Journal of Geophysical Research-Part D-Atmospheres 112(13): D13213-13211-D13213-D13213-13213.

Zotter, P., El-Haddad, I., Zhang, Y., Hayes, P. L., Zhang, X., Lin, Y.-H., Wacker, L., Schnelle-Kreis, J., Abbaszade, G., Zimmermann, R., Surratt, J. D., Weber, R., Jimenez, J. L., Szidat, S.,Baltensperger, U., and Prévôt, A. S. H.: Diurnal cycle of fossil and nonfossil carbon using radiocarbon analyses during CalNex, J. Geophys. Res.-Atmos., 119, 6818–6835, 2014.

Hayes, P. L., A. G. Carlton, K. R. Baker, R. Ahmadov, R. A. Washenfelder, S. Alvarez, B. Rappengluck, J. B. Gilman, W. C. Kuster, J. A. de Gouw, P. Zotter, A. S. H. Prevot, S. Szidat, T. E. Kleindienst, J. H. Offenberg, P. K. Ma and J. L. Jimenez (2015). "Modeling the formation and aging of secondary organic aerosols in Los Angeles during CalNex 2010." Atmospheric Chemistry and Physics 15(10): 5773-5801.

Schauer, J. J., M. J. Kleeman, G. R. Cass and B. R. T. Simoneit (1999). "Measurement of emissions from air pollution sources. 1. C-1 through C-29 organic compounds from

meat charbroiling." Environmental Science & Technology 33(10): 1566-1577.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-342, 2016.

Printer-friendly version

Discussion paper