Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-979-AC2, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterization of fresh and aged organic aerosol emissions from meat charbroiling" *by* Christos Kaltsonoudis et al.

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Received and published: 6 March 2017

(1) *The current paper reports some great novel experiments aiming to study a very important source, namely not well understood. Cooking Organic Aerosol (COA), namely meat charbroiling. It would be good maybe to call it Meat-COA, or simply at least well state it in the abstract, where "COA" is reported but not defined.*

We appreciate the positive assessment of our work. We now clarify in the abstract that we are referring to meat charbroiling. We would prefer to keep the term COA in the rest of the paper for simplicity.

(2) *As the authors state, "there are a number of remaining questions regarding the characterization of the emissions related to cooking practices." Hence, a fair descrip-*

tion is required. The authors could do a better job in describing the available literature and recent papers on COA reported by the AMS community. I will give a number of examples that I hope can clarify and improve this great experiments carried out with an array of instruments.

The authors do not cite the paper of Hayes, P. L., et al. (2013), Organic aerosol composition and sources in Pasadena, California during the 2010 CalNex campaign, J. Geophys. Res. Atmos., 118, 9233–9257, doi:10.1002/jgrd.50530, where it is well described a problem of COA being called Cooking Influenced Organic Aerosol (CIOA) due to the fact this factor is not uniquely associated to a single source. Urban increments of gaseous and aerosol pollutants and their sources using mobile aerosol mass spectrometry measurements by Elser et al 2016 (http://www.atmos-chem-phys.net/16/7117/2016/). A factor similar to COA but called Residential Influenced OA (RIOA, probably mostly from cooking processes with possible contributions from waste and coal burning), suggesting similar sources described by Dall Osto et al (2015), issues about COA not really addressed in the current version of the paper. It is suggested to read the useful ACPD comments, may be worth to add this Elser et al study in figure 11. Taking from ACPD comments of Elser et al. (2016) "The high correlation between RIOA and published cooking mass spectra suggests that RIOA may be heavily influenced by cooking processes. However, we could not exclude the contribution from other residential sources (e.g. waste or coal combustion), especially also due to the lack of statistically robust diurnal patterns for cooking that are not affected by the drives. Therefore, we prefer to refer to this factor to RIOA, rather than cooking."Would be interesting to see what it looks like in Figure 11, and discuss briefly problems associated to COA. It is also still a pity after almost a decade of the first AMS papers related to COA, it has not been supported by external measurements. 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. (http://www.atmos-chem-phys.net/16/13773/2016/acp-16-13773-2016-discussion.html) discuss the fact there is potentially a factor of two in the COA AMS efficiency. It is suggested to read the ACPD

comments of this paper and add in the introduction that there is still very high uncertainty on this COA AMS factor. This is only a number of important papers stressing that "COA" is still a bit of a confusing factor. A better introduction and a better discussion is suggested in the major revision this paper strongly need.

We agree with the point of the reviewer that a lot of the controversy regarding COA has resulted from ambient AMS studies. We have followed the corresponding suggestion and improved the introduction and the corresponding discussion in the revised manuscript.

Minor comments:

(2) *Page 1 line 20, I would explain better what thetas 27 degrees is in the text.*

A brief explanation has been added.

(3) *Page 17. Figure 1. I would add a part (c) with the difference between the two spectra so one can see what the positive and negative peaks are.*

Figure 1 has been updated to include the suggested difference of the spectra.

(4) *Figure 9. One would argue that for the previous Wednesday and the following Friday, the emission of COA are minor. If it is important to stress 85 percent of OA in two hours of a spike event is important, perhaps is important to stress that the previous and following day, COA was about 5 percent of the OA during peak lunch and dinner times, as Figure 9 suggests.*

The proposed comment has been included in the revised manuscript. On average COA appear to be 15-20 percent of the OA in major Greek cities.

(5) *Figure 11. It would be good to report some statistics and stress what this figure means. It looks that the difference of the Thetas are only in Sun 2011 and Ge 2010. It*

would be useful to add other factors partially due to cooking and see if they match more or less (it would be good to add the factors of Elser 2016 and Hayer 2013, showing they do not match with the current pork meat cooking COA herein reported).

This is a good point. Figure 11 has been updated and it now includes comparisons to additional studies. One of the points of this figure is that depending on atmospheric conditions (oxidant levels) the COA AMS spectrum can be different. This can be seen by the comparison of fresh and aged COA in these experiments against the summer and winter COA factors in Greece. Other factors that appear to drive variability can include the PMF analysis itself (e.g., mixing with other sources), the type of food cooked, etc. This discussion has been added to the paper.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-979, 2016.