Atmos. Chem. Phys. Discuss., 10, C9513–C9518, 2010
www.atmos-chem-phys-discuss.net/10/C9513/2010/


Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Characterization of high-resolution aerosol mass spectra of primary organic aerosol emissions from Chinese cooking and biomass burning" *by* L.-Y. He et al.

**L.-Y. He et al.**

hely@pku.edu.cn

Received and published: 8 November 2010

The manuscript submitted by He et al. describes an interesting data set of Chinese cooking and biomass burning organic aerosol emissions, analyzed by aerosol mass spectrometry. Given the fact that the analysis and characterization of ambient (organic) aerosol relies heavily on source emission studies, that there are still many (organic) aerosol emission sources which have not been characterized yet, that many studies are focused on Northern America and Western Europe, the present study is an important complement to the already existing datasets. The manuscript has a clear structure, the analysis is well-thought out. There are a few aspects with regard to contents which

should be addressed, and a revision of language is needed before publication. Specific comments 1. Signal at m/z: Throughout the whole manuscript, there is confusion about the expressions “ions at m/zX” or “masses at m/zX”. It should be made clear by the authors that what is measured at a particular m/z is the signal (of that mass fragment”, that different ions can contribute to a signal at a mass integer, and that the mass fragments described in section 3.4 are used as markers for different OA compounds rather than the individual ions, which nevertheless help to interpret better the characteristics of the respective compounds. See e.g. conclusions, where “ion fragments” is used instead of “ions”. Reply: Thanks for this instruction. We misused “ion fragments” for “mass fragments”. In the revised paper, “mass fragments” is used instead. Other relevant mistakes were also corrected.

2. Introduction: The authors only give rather limited information on Chinese cooking and its emissions, and a few more paragraphs on that topic could be included. Are there studies estimating the contribution of cooking emissions to ambient PM1 levels? Why were exactly those four dishes chosen? Reply: A new paragraph about the background of cooking emissions has been added into the introduction part, as below: “Another significant primary OA source is cooking emissions. Some previous studies reported that meat cooking emissions contributed about 20% to particulate organic matter in PM2.5 in Los Angeles, Hong Kong, and Beijing (Schauer et al., 1996; Schauer and Cass, 2000; Zheng et al., 2006; Wang et al., 2009). Therefore, cooking emissions can play an important role in determining ambient OA loadings. Recently, cooking-related organic aerosol (COA) has also been identified to be significant by factor analysis of AMS datasets of urban atmospheres (Allan et al., 2010; Huang et al., 2010). Since the characteristics of cooking emissions strongly dependent on cooking methods and ingredients, the OA features in Chinese cooking emissions could be different from western-style cooking due to the unique styles of Chinese cooking (Rogge et al., 1991; He et al., 2004).” The following sentence has been added into the begging of section 2.2 to give brief reasons why the four dishes were chosen. “These dishes were selected to test because they are among most popular Chinese dishes and their



ACPD

10, C9513–C9518, 2010

cooking processes use various ingredients (e.g., vegetables, eggs, pork, and chicken) and include different cooking methods (e.g., frying, sauteing, stewing, and simmering)."

3. Experimental setup: Further details should be given for the setup of the experiments. -Was the inlet heated? What are the particle losses expected in the inlet line? Reply: Our AMS inlet line was <1 m long and not heated, which is a typical configuration for AMS sampling. Since the AMS inlet line was quite short, submicron particles would not be lost significantly during the experiments. In addition, the main focus of this paper is to investigate the relative MS profiles, which could not be influenced significantly by absolute amounts of particles.

-About the dilution factors: With a dilution factor of 10 – 100, did the authors get atmospherically relevant concentrations? After the residence chamber, the sample is further diluted, but there is no information on the dilution factor. Reply: The dilution ratios of 10-100 times were used to mean the designed capacity of the dilution system, not the exact cases for our experiments. The detailed dilution information about our experiments has been supplemented into section 2.1 (totally 50 times for biomass burning and 5 times for cooking). The following sentence has also been added into section 2.1. "The OA concentrations sampled by the HR-ToF-AMS for all the experiments were less than 100 $\mu$g m-3, as shown in Fig. S-2, which is atmospherically relevant."

-What was the exact temperature of the residence chamber? The authors mention that the smoke resides in the residence chamber for 30 s, where it cools down and becomes aged. What kind of aging do the authors refer to? "Aging" in atmospheric chemistry usually denotes oxidation processes, which under the setup described here is rather unlikely to be meant. Reply: The temperature in the residence chamber ranged between 25 and 40 °C during the experiments (this information has been added into section 2.1). The authors admit that "aging" has been misused. We only want to mean "cooling". "Aging" has been deleted from the sentences.

-For both the cooking and the biomass burning experiments, further details should be



ACPD

10, C9513–C9518, 2010



given on the conditions of the fire (stable burning? Flaming? See e.g. Weimer et al., 2008, Geophys. Res. Atmos.) and the cooking when acquiring spectra. Was the cooking process representative for people's way of cooking? Reply: The following sentence has been added into section 2.1: "Since the biomass samples were burning with good ventilation, the fire was during the flaming phase for most of the time." It is hard to describe the processes of cooking due to the complexity of Chinese cooking methods. We sampled for the whole processes of Chinese cooking and biomass burning, and used the data with OA concentrations elevated largely from the baseline concentrations ($\sim$10 times) to get the MS features of CC and BB emissions, which is referred to in section 2.3. The cooking processes in the experiments fully simulated Chinese people's way of cooking, and the dishes were eaten after the experiments.

-The time trends given in the supplementary section should be given in $\mu$g m-3, and the measurement periods should be labeled. Would it be possible to derive (preliminary) emission factors from these experiments? Reply: The time trends in Fig S-2 are now given in $\mu$g m-3. The measurement periods can be identified by the elevated concentrations. The sentence "the elevated concentrations correspond to the measurement periods" has been added into the caption of Fig S-2. The calculation of emissions factors needs a lot of other information and steps, which may be far beyond the purpose and scope of this paper. The authors would consider emission factors in future.

4. N/C ratios: The N/C ratios reported for the BB and CC emissions are very low. Are they significant, especially considering the rather high fitting error for the nitrogencontaining species when doing high-resolution analysis? Reply: In this paper, we reported the N/C ratios of 0.008-0.018 for the CC and BB emissions. Aiken et al. (2008) detailed the accuracy of elemental analysis by HR-ToF-AMS. By sampling standards, Aiken et al. indicated that the measured N/C ratios had a small bias (slope=0.96, R2=0.95 in the plot of measure N/C ratio vs standard), and showed that the accuracy of N/C ratio in the range of <0.02 was still acceptable (Figure 1 in Aiken et al., 2008). Aiken et al. (2008) also reported the N/C ratios in the range of 0.00-0.09, with an average of 0.02,



ACPD

10, C9513–C9518, 2010



in the urban atmosphere of Mexico City. Therefore, the N/C ratios reported in this study are not very low and should be significant. In fact, the useful conclusion derived from our results is just like what was stated in the text: the N/C ratio is SMALL (0.008-0.018) for all the CC and BB emissions.

Technical comments 1. References: References should be given for the statements made in the first and second sentence of the introduction. In the references for Factor Analysis of AMS measurements, Lanz et al., 2007, ACP, should be included. Reply: "Zhang et al., 2007; Kroll and Seinfeld, 2008; Jimenez et al., 2009" have been cited for the statements at the beginning of the introduction. "Lanz et al., 2007" is now cited in the references related to Factor Analysis of AMS measurements.

2. Plural versus singular: -AMS measurements. Plural instead of singular should be used throughout the whole paper for "AMS measurements" (see lines 8, 10 and 21 in abstract, line 25 in introduction, lines19 and 23 in section 3.1, line 7 in section 3.3, etc.). In abstract, line 1, "Aerosol Mass Spectrometry" should be used, since it is more the description of a technique than an instrument in this context. -Composition: Use singular (abstract, line 10; introduction, last section; section 3.3, line 1; section 3.4, line 14;) Reply: All corrected.

3. Vocabulary: "Systematically" instead of "systemically" (abstract, line 13); "while" shouldn't be used as in abstract, line 19, or section 3.3, line 6, or conclusions; "moreover" as in abstract, line 22, should be replaced by e.g. "in addition"; "reference for" instead of "reference in" (abstract, line 26); "identifying" instead of "suggesting" (introduction, line 27); "adsorption" instead of "absorption" (section 2.1); "lichen" instead of "wattle" (section 2.2); "heating" instead of "warming" (section 2.2); delete "on the other hand" (section 2.2); throughout the whole manuscript: "great", in a normative sense, is used instead "high" or "many", (see e.g. introduction or section 3.1, line 18); rephrase title of section 3.2; "included" instead of "involved", section 3.3, line 28; rephrase "benefiting" in section 3.4; Reply: All corrected except "wattle", which is the right name of the tree.



ACPD

10, C9513–C9518, 2010

4. Commas: Set commas in the following and similar sentences (abstract, lines 15 and 16; conclusions): “The MS of the CC emissions show high similarity, with m/z41 and m/z55 being the highest signals. . .”; introduction, lines 5-6; Reply: All corrected.

5. Grammar: “Compare” as in abstract, line 23, should be used in passive form; use “Chinese” instead of “China” (section 2.2); “0.5 – 1.5 kg biomass were used” instead of “was used” (section 2.2); rephrase “The calibration of IE used. . .” (section 2.3); use “to discuss” in passive form (section 2.3, line 22); use “contributed to” (section 3.1); “it can be seen” instead of “it is seen” (section 3.1); “As a general evaluation” (section 3.2, first line); generally check English grammar for section 3.2; rephrase “as in this study” (section 3.4); Reply: All corrected accordingly.

6. Verbalism: Introduction, line 14: Say “submicron aerosol chemical composition” instead of “submicron aerosols” only, because the latter doesn’t refer to a measurable quantity; introduction, line 27: append “emissions” to motor vehicles, meat cooking, and trash burning; section 3.1: do not use expression “our group” (manuscript should be impersonal); section 3.3: use “O/C ratio” consistently; “AMS community” should be avoided since it might not be understood by people outside that community (introduction) Reply: All corrected accordingly.

7. Symbols: Use “-“ instead of “∼” (throughout the whole manuscript) Reply: Corrected.

---

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 21237, 2010.