Atmos. Chem. Phys. Discuss., 9, C8266–C8269, 2009
www.atmos-chem-phys-discuss.net/9/C8266/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Molecular characterization of urban organic aerosol in tropical India: contributions of biomass/biofuel burning, plastic burning, and fossil fuel combustion" *by* P. Q. Fu et al.

Anonymous Referee #2

Received and published: 12 December 2009

The work reports quantification of 155 individual organic compounds in twelve compound classes in 49 PM10 samples collected in a tropical location in India. Some of the quantified compounds serve as aerosol source markers. This information is used by the authors to infer source contributions by biomass burning, plastic burning, and fossil fuel combustion. Data in this work adds to the increasing database of aerosol organic speciation; however, the authors only reported part of organic aerosol characterization results in this manuscript, making this work appear to be fragmented. They also unnecessarily limit themselves to the 155 compounds reported here in their data

interpretation. More detailed comments are given below.

(1) From the information given in the manuscript, in addition to this ACP manuscript, at least two more papers report data derived from the same set of 49 aerosol samples. The two papers are:

Fu, P., Kawamura, K., Pavuluri, C. M., Chen, J., and Swaminathan, T.: Molecular characterization of urban organic aerosol in tropical India: Contribution of biogenic photooxidation and source apportionment, in preparation, 2009b.

Pavuluri, C. M., Kawamura, K., and Swaminathan, T.: Water-soluble organic carbon, dicarboxylic acids, ketoacids and _-dicarbonyl in tropical Indian aerosols, J. Geophys. Res. Atmos.,revised, 2009a.

As the authors explained in page 21672, the Fu et al paper (referred Fu 2009b paper below) reports biogenic SOA tracers while the Pavuluri et al paper reports low molecular weight dicarboxylic acids and hydroxyl-/polyacids. All the three papers are on organic aerosol characterization and implications for sources of organic aerosols. With the closely related information scattered in three papers, I feel this hampers the understanding of the overall picture on the organic aerosol characterization and how this molecular speciation work helps to elucidate source contributions. At the least, this paper and the Fu 2009b paper should be combined, focusing on using the whole suite of measured organic compounds for aerosol source analysis.

In my view, description of individual compound classes in sections 3.7-3.9 mainly provides trivial information on abundance of these compounds in this study and abundance comparison with measurements made in other locations. Much of the content in these sections is better presented as supplementary information. Removal of these sections also makes room for inclusion of the important results that the authors plan to present in the Fu 2009b paper.

(2) The authors' group appears to have done a comprehensive characterization of the

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49 aerosol samples, including inorganic ion components (which seem to be planned to be presented in another paper, Pavuluri et al, 2009b). However, they have not fully utilized the whole range of compounds quantified using various techniques. Example 1: on the discussion of biomass burning source, it is relevant to compare the organic tracers for biomass burning aerosols with K+, a known inorganic tracer for biomass burning. Example 2: land-sea breeze has been proposed to be responsible for the observed diurnal pattern of higher during the nights and lower during the days for many of the quantified organic compounds. If the authors can show the diurnal gradient in Na in the aerosol samples, that would give more support to the suggestion of the dominant role of land/see breeze on the diurnal variation of the organic compounds. Example 3: in the PCA analysis of sugar compounds, some components are suggested to be related to biological substance derived from surface soil. Inclusion of Ca2+ will help the identification of this soil-related source, but the authors unnecessarily limited themselves to the data reported in this manuscript alone.

(3) The authors state that recoveries of the quantified organic compounds were generally better than 80% (Page 21673). During the pretreatment, solvent extracts of the aerosol samples were blown to dryness with N2 before the derivatization step. I note some relative low-molecular weight organic compounds are among the 155 quantified compounds. Most notably are benzoic acid (MW 122) and o-, m-, p-toluic acids (MW 136). I am curious whether these small compounds were also recovered better than 80%, considering at one point the extracts were blown to dryness.

(4) In the conclusion section, in commenting the percent of OC mass explained by the 155 quantified compounds, the authors mentioned that part of OC mass unaccounted for is dicarboxylic acids and biogenic SOA compounds. The authors have data for dicarboxylic acids and biogenic SOA for this set of samples. Although these data are to be reported in other papers, it is relevant to give specific percent values of dicarboxylic acids and biogenic SOA compounds in this manuscript.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 21669, 2009.

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