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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluation of organic markers for chemical mass balance source apportionment at the Fresno Supersite" *by* J. C. Chow et al.

Anonymous Referee #1

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General Comments:

This paper investigated the application of organic markers to better distinguish some sources of aerosols, especially those from combustion sources using simulated data. The sources of high PM2.5 episodes at Fresno in winter (2000-2001) were also studied using CMB and organic tracers. The study concluded that "organics were not required to estimate hardwood combustionĚ The important RWC marker was the water soluble potassium ion." Resin acids are known to be enriched in softwood combustion including pimaric, isopimaric, and sandarapimaric acids, but they were not included as the fitting species in this study. With the simulated data, it showed that softwood was overesti-

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mated by the model (Table 2). Table 4 also showed that the softwood source estimates were either highly uncertain or overestimated. Adding these known softwood tracers may lead to a better estimate of contributions from softwood source. Therefore, without confidence in the estimation of softwood source contribution, it is hard to conclude that the most important marker is potassium ion. The authors stated in the Conclusions section that "The cooking contribution did not depend on cholesterol..". Cholesterol has been detected in meat cooking sources (McDonald et al., 2003, Vol 53, 185-194, J. Air Waste Manage. Assoc.). Because cholesterol in most samples in this study was under detection limit or with high uncertainty, cholesterol was not used as a tracer. But it does not necessarily mean that cholesterol is not a good tracer for meat cooking. More evidence is needed if the authors want to question if cholesterol is a good tracer for meat cooking or not. I recommend this paper to be published after modification and clarification. Specific comments are listed below.

Specific Comments:

1. Page 10343: RWC is common in winter. Are emissions from prescribed burning and wild fires important in this area?

2. Page 10345, line 4: "..while hopanes, steranes, and high molecular weight molecular weight organic acids and alkanes are present mainly in particle phase." References should be cited.

3. Page 10345, line 7: Dicholoromethane and 10% diethyl ether in hexane were used for extraction of ambient samples. Is the analytical method applied for the ambient samples in this study the same as those source samples including solvent system, quantification method, GC/MS analysis (e.g. chemical ionization in this study)? If not, would the author expect any impact on the CMB results?

4. Page 10345, line 9: The extracts from the PUF plugs and filter-XAD pairs were combined. Any special reason for the authors to combine the extracts? Only species that are considered as conservative (from sources to receptors) are normally used as

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fitting species.

5. Page 10345, Lines 14-21: One half of extract was analyzed for non-derivative SVOC. Was the other half analyzed for polar compounds with derivatization? If so, state it clearly.

6. Page 10345: It would be helpful to indicate QA/QC of the organic tracer analysis including recovery and blank etc.

7. Page 10346: Lines 7-10: The authors collected samples during different periods. This paper should include discussions of the CMB results during different periods. What are the dominant sources for each period from this study? Do the results correspond well to the authors' speculations, e.g., more emissions from evening traffic, cooking, and home heating during 16:00-24:00 PST? The readers do not have these information since the averaged values are presented in Table 6.

8. Page 10347, Line 2: The authors present the criteria for evaluating the CMB results. Are the fitting species well explained in this study? What about the C/M ratios (calculated to measured ratios)?

9. Page 10347, Line 13: "post-2000 vehicle exhaust": When were these source tests conducted exactly?

10. Page 10347, Line 25: The Teflon filters were over-loaded. Was it significantly overloaded or not? Say 200% or more?

11. Page 10347, Line 28: The authors stated that three PAHs (i.e., indeno[123-cd]pyrene, benzo[ghi]perylene, and coronene) can be used to separate diesel exhaust from gasoline exhaust. Since PAHs can be emitted from sources with incomplete combustion such as coal combustion, appropriate references or more supporting evidence should be cited or provided to demonstrate the power of three PAHs in diesel and gasoline split.

12. Page 10348, Line 29: In the road dust profile, specific organic compounds were not

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measured and they are set to zero in the profiles. Table 7 shows the huge difference between the CMB estimate of road dust (zero) compared to the inventory (22%). Is it possibly due to the source profile or other reasons?

13. Page 10350, Lines 1-3: Cholesterol was below detection limit in most samples. Does the highest cholesterol concentration occur during the 16:00-24:00 period?

14. Page 10350, Line 4: This reference (Dreyfus et al., 2005) is not found in the References section.

15. Page 10350, Line 7: The uncertainty of the ambient measurement was assumed to be 10%. Why was the uncertainty of 10% assumed and used? Is it based on experimental results? Schauer et al. estimated the average uncertainty of 20%.

16. Page 10350, Lines 14-26: Explain the difference between Case 1 and Case 3. What does the "actual" in Table 2 mean? If that represents "actual uncertainty", present the value.

17. Page 10351, Lines 20: The 00:00-05:00 period was used in the discussion. What not using the 16:00-24:00 period when evening traffic, meat cooking, and residential heating are active? Or at least a comparison between different periods should be made.

18. Page 10352, Lines 3-4: "These species may be enriched by exhaust from the sampling equipment." Any references or supporting evidence for this? For example, there are studies to show that Cu can be a contaminant due to pump exhaust of high vol sampling.

19. Page 10353, Line 18: Cooking contribution seems large (e.g., as high as 30% of mass in some cases) during 00:00-05:00 period. One would imagine it should be higher during the active cooking period in the evening. Is it likely that cooking source was overestimated? Could it be due to the tracers used such as palmitoleic acid? On page 10356, Line 5, the authors also stated that "this study estimates 50% higher

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cooking contributions" compared to Schauer and Cass (2000).

20. Page 10366: In Table 2, the number of samples (n) used in the statistics should be shown.

21. Page 10367: Why are some lighter (in molecular weight) species such as pristane and phytane used in the fitting species? They are found in petroleum, but they are not as heavy as other organic species. Are they conservative?

22. Figure 1 should include the standard deviation of the average concentration.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 10341, 2006.