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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 #3

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General comments:

Chow et al. present a sensitivity analysis of CMB models applied to simulated data. The authors carefully investigated if source profiles with organic tracers improve the capability of CMB models to resolve the contribution of emission sources. The conclusions obtained from the sensitivity analysis are used in a CMB source apportionment for PM2.5 at the Fresno supersite. I recommend this paper to be published after clarification and correction of the issues listed below.

Specific comments:

1. One of the main conclusions of the paper is that organics are not required to estimate hardwood combustion sources and the most important and sufficient residential wood combustion marker was water-soluble potassium (no organic markers required). This is surprising and should be discussed in more detail: One could argue, that emissions of water-soluble potassium and organics from wood combustion sources are not necessarily highly correlated and may represent different states of wood combustion processes. For example, it can be deduced from Khalil and Rasmussen (Atmos. Environ., 37, 1211-1222) that the potassium emission factor is three orders of magnitudes lower in cold wood burning as compared to hot wood combustion. In contrast, emission factors of OC are considerably higher under cold burning conditions than during hot wood combustion. In the same study, about 80% of the air pollution at Olympia-Lacey (Washington) could be attributed to wood burning dominated by emissions at low-temperature combustion. Those findings question that potassium is a good and sufficient tracer for the total emissions of primary particles (inorganic and organic) from wood combustion. One could expect that beside potassium (tracer for inorganic particles) a second organic tracer (for organic aerosols) is required to determine the contribution of the total primary particle emissions from wood combustion sources at a receptor site.

2. Evaluation of the different CMB models applied to the simulated data showed that “it is not feasible to distinguish hardwood and softwood contributions from the source profiles used in this studyĚ” (page 10352 lines 14-15) because of collinearity of the hardwood and softwood profiles. Nevertheless, in the CMB models used for PM2.5 source apportionment at the Fresno supersite the collinear hardwood and softwood source profiles are used, and the contribution of hardwood and softwood combustion is determined (e.g. abstract line 15-16, and table 6). This is contradictory and I suggest do redo the CMB modelling for the Fresno PM2.5 data using only the hardwood source profile since this one is “sufficient to estimate the total burning contribution within 20%” (page 10351, lines 8-9).

3. The authors mention that “PVRD Ě contributions became negative in the iterative

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solution and that their respective source profiles were dropped from the model" (p. 10352, lines 19-21). On the next page (p. 10353, lines 5-8) the authors state that Fe was the most influential marker for BURN-S and add "This is not reasonable and probably results from the fact that the geological profile (PVRD) was dropped from the fit [Ě]" Thus, on one hand, PVRD is dropped from the set of source profiles (is considered insignificant), on the other hand, the authors guess that PVRD species cause the unreasonable BURN-S markers in the MPIN matrix (has significant influence on the results in that case). This is again contradictory and requires clarification.

4. Page 10348, line 4: Reference source profiles from almond and eucalyptus, oak and tamarack were used. Please comment if these woods are the ones that are dominantly used for residential wood combustion in the Fresno region.

5. Source contributions are compared to results of a previous study (SJV study). Those are called "true" (10349, lines 15 and 18) source contributions. Unfortunately, the quotation marks get lost as of p. 10349 (incl. Tables), which is misleading.

6. A reference for the MPIN diagnostic (p. 10352, line 25) should be given: Kim and Henry, 1999, J. Air & Waste Manage. Assoc., 49, 1449-1455.

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