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Evaluation of organic markers for chemical mass balance source apportionment at the Fresno Supersite

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Abstract. Sources of $PM_{2.5}$ at the Fresno Supersite during high $PM_{2.5}$ episodes occurring from 15 December 2000–3 February 2001 were estimated with the Chemical Mass Balance (CMB) receptor model. The ability of source profiles with organic markers to distinguish motor vehicle, residential wood combustion (RWC), and cooking emissions was evaluated with simulated data. Organics improved the distinction between gasoline and diesel vehicle emissions and allowed a more precise estimate of the cooking source contribution. Sensitivity tests using average ambient concentrations showed that the gasoline vehicle contribution was not resolved without organics. Organics were not required to estimate hardwood contributions. The most important RWC marker was the water-soluble potassium ion. The estimated cooking contribution did not depend on cholesterol because its concentrations were below the detection limit in most samples. Winter time source contributions were estimated by applying the CMB model to individual and average sample concentrations. RWC was the largest source, contributing 29–31% of measured $PM_{2.5}$. Hardwood and softwood combustion accounted for 16–17% and 12–15%, respectively. Secondary ammonium nitrate and motor vehicle emissions accounted for 31–33% and 9–15%, respectively. The gasoline vehicle contribution (3–10%) was comparable to the diesel vehicle contribution (5–6%). The cooking contribution was 5–19% of $PM_{2.5}$. Fresno source apportionment results were consistent with those estimated in previous studies.

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