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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Primary sources of $PM_{2.5}$ organic aerosol in an industrial Mediterranean city, Marseille" *by* I. El Haddad et al.

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The paper presents a source apportionment study of fine aerosol mass in a European urban site heavily affected by industrial emissions. The source apportionment is performed with the Chemical Mass Balance (CMB) approach. The main primary sources include vehicle emissions and industrial emissions. Nevertheless, primary carbon represents less than 25% of the organic carbon, and the non-apportioned carbon fraction is assigned to secondary sources. This conclusion will be further illustrated in the companion paper.

General Comments

The referee appreciates the use of Principal Component Analysis to preliminary identify

the most relevant fine aerosol sources and to define the number of sources to use in the CMB model.

Moreover, the paper highlights uncertainties and limitations of the CMB method, pointing out the need of an extended discussion of the source apportionment results. Nevertheless, to improve the readability, I would suggest to divide the content of section "Results and discussion" into three sections: "CMB method set up", "Results", and "Discussion".

It is sometimes difficult to understand if the scope of the paper is the apportionment of the fine aerosol mass or the carbonaceous aerosol mass. I would suggest to clarify why the authors focus on the carbonaceous fraction in the "Results and discussion" section.

The low sugar content would indicate that spores are not a significant contributor to primary biogenic aerosol particles (PBAP) in Marseille, although previous studies identified spore emissions as one of the main source of PBAP, even in urban areas (Jia et al. 2010, Bauer et al. 2008). How would you comment that vegetative detritus represent 2% of OC and other submicron PBAP are not observed?

The discrepancy between fossil carbon from 14C measurements and from CMB model in figure 7b looks larger when the concentration of PAH is higher (figure 4a). Is this correct? How would you explain this?

To calculate the fraction of non-fossil carbon from the fraction of modern carbon the authors used the reference value of 1.1 according to Levin and Hesshaimer, 2000. Measurements performed in 2006 (Levin et al. 2008) suggest that the correct reference value for this study would be 1.05. The use of an incorrect reference value would lead to an underestimation of the non-fossil carbon and an overestimation of the fossil carbon. This might explain partially the difference between 14C measurements and CMB results.

Moreover the reference value of 1.05 is correct for atmospheric CO2 and biogenic particles (PBAP and secondary biogenic aerosol) but is inadequate to describe biomass burning particles (Lewis et al. 2004).

Minor Comments

Page 25442 line 17 replace ml with mL

Page 25443 line 8 replace ml with mL

Page 25452 line 2 replace a prior with a priori

Page 25458 line 10 remove parenthesis.

Inconsistent tense in the experimental section.

Captions: Figure 2 alpha-pinene

Figure 5 Ambient

References:

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Levin, I. Hammer, S., Kromer, B., and Meinhardt, F.: Radiocarbon observations in atmospheric CO2: determining fossil fuel CO2 over Europe using Jungfraujoch observations as background, Science of the Total Environment, 391, 211–216, 2008.

Lewis, C. W., Klouda, G. A., and Ellenson, W. D.: Radiocarbon measurements of the biogenic contribution to summertime PM2.5 ambient aerosol in Nashville, TN, Atmo-

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