

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

Anonymous Referee #1

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The paper presents the results on source apportionment in the city of Marseille, which is influenced by a variety of sources and is affected by intense photochemical activity. The tools used are appropriate: organic speciation and Chemical Mass Balance, and ¹⁴C measurements. The manuscript is in general well organized and the results are shown clearly with proper tables and figures. Nevertheless some improvements should be made.

GENERAL COMMENTS:

1. Why is there non distinction between Heavy Duty Vehicles (HDV) and Light Duty Vehicles (LDV)? Only one vehicular source profile is included in the CMB. The distinction can be very useful (see more specific comments below)

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2. Natural gas is included in the methods as a source profile input but it is not in the results. Why?
3. The contribution from shipping is not shown separately and it is probably worth, since ship emissions are now an open research field
4. Important references are missing. About 14C: Szidat et al., 2004 and 2009; Gustaffson et al., 2009 (Science), among others.
5. Comparison with similar studies is missing: for example Minguillón et al., 2008 (CMB in Long Beach-Los Angeles harbor)
6. A lot of the text included in the results section is actually introduction and methods. See specific comments below.
7. The manuscript is too long. Some sections could be shortened. See some suggestions in the specific comments below.

SPECIFIC COMMENTS:

8. page 25437, line 9. Define HFO. Abstract should not include abbreviations even if they are defined in the text
9. page 25437, line 12. ...accounts on average for 22% of total OC and...
10. page 25437, line 14. What is 17% of PM_{2.5}? the total OC? Please specify
11. page 25437, line 14. Remove comma after even though
12. page 25437, lines 20-23. Re-write this sentence
13. page 25437, line 28. Try to avoid personal style writing
14. page 25438, line 6. Remove comma after OC
15. page 25438, line 14. Add reference Jimenez et al., 2009 (Science)
16. page 25439, line 7. ...can not be apportioned by primary sources...

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17. page 25441, lines 2-18. Too long, please shorten. This information is not used in the discussion afterwards
18. page 25441, line 29. 'including and a Tapered. . .' please complete
19. page 25442, lines 4-12. Too much detail, please shorten.
20. page 25443, lines 1-2, and lines 16-17. This is not methods, move to results.
21. page 25443, line 18 and line 19. Organic species analysis
22. page 25444, lines 5-8. Merge into one sentence.
23. page 25444, line 6. . . .using authentic standards for some species
24. page 25444, line 11. 14C analysis on total carbon
25. page 25444, lines 9-10. This is not methods, move to results
26. page 25444, lines 18-19. fM should be $(14C/12C)_{\text{sample}}/(14C/12C)_{1950}$. Add reference Stuiver and Polach, 1977
27. page 25445, lines 20-27. This is introduction-methods, not results.
28. page 25446, line 6. Remove 'and the 3 major ions (ugm-3) of mainly secondary origins', and leave only the ions themselves
29. page 25446, lines 9-10. Only two factors were identified? Was it forced to 2 factors? Please explain.
30. page 25446, line 24, till page 25449, line 11. 3.3 CMB modelling. This is intro and methods, not results.
31. page 25448, line 7. Natural gas source is mentioned here but not included in the results afterwards. Explain why.
32. page 25449, line 16. You can add Querol et al., 2007.

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33. page 25449, line 16. . . .and references therein
34. page 25449, line 21 till page 25450, line 4. Mixing introduction, methods and results
35. page 25450, line 17. Plot also sulfate.
36. page 25450, line 24. You can add Querol et al., 2007.
37. page 25450, line 26. . . .also follow trends. . .
38. -page 25451, line 16. Why primary? PAH can not be secondary? The fact that there is unaccounted PAH is not enough to say there are missing primary sources.
39. page 25451, line 26. . . .and marker species for. . .
40. page 25452, lines 1-9. This is introduction and methods. Moreover, it is similar to and somehow repetition of page 25449, lines 1-12. Both parts could be merged.
41. page 25452, lines 1 and 2. However, however
42. page 25452, line 29 till page 25453, line 2. Repetition
43. page 25453, line 3. Elemental lead? Use name or symbol for all the elements, do not mix.
44. page 25453, lines 7-9. Again repetition
45. page 25453, lines 13-28. This is introduction, review of previous studies. This information is not used for anything in this work. The fact that the authors looked for it does not mean they have to include it here if it is not used.
46. page 25453, line 15. 12% of the emitted PM. From where? Non exhaust? Total traffic?
47. page 25454, lines 3-7. Repetition of page 25452, lines 12-14.
48. page 25454, lines 22-25. You mention 4 criteria, and then say 3 criteria.

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49. page 25455, lines 2-3. The discrepancies can also be due to the lack of distinction between HDV and LDV (see more comments about this below)

50. page 25455, line 8. However, on a general basis. . .

51. page 25456, line 6. . . . higher than the. . .

52. page 25456, lines 16-17. Before, with PAHs, the authors say that it is because of additional primary sources not included in the CMB, now the un-apportioned is due to SOA. Why?

53. page 25456, line 28. Add here additional 14C references.

54. page 25457, lines 1-14. It can be shortened.

55. page 25457, line 14. It is not so simple!! Wood burning isotopic signal is not 1.1. It needs to be more accurate, biogenic sources have the current 14C/12C ratio, but biomass burning sources isotopic signal is different, it should be calculated considering the tree age and the year the trees were harvested. These assumptions influence the results!! See more info in Szidat et al., 2009.

56. page 25458, lines 1-3. What about non fossil TC? Why is it not plotted and compared?

57. page 25458, lines 17-18. Meteorological conditions and/or other factors.

58. page 25458, line 20. Meteorological

59. page 25459, lines 10-11, and Figure 9. The % of HDV in the tunnel may be different from the % of HDV near the sampling site, which can lead to different hopanes/EC ratios. $(\text{Hopanes/EC})_{\text{HDV}} < (\text{Hopanes/EC})_{\text{LDV}}$. If the traffic near the sampling site includes a higher percent of HDV (with respect to total traffic, LDV+HDV) than the traffic in the tunnel, then this could explain also the variation found in the hopanes/EC ratios.

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60. page 25460, lines 4-6. A source with smaller hopanes-to-EC ratio is also HDV.
61. page 25460, line 22. Decay of hopanes. . .
62. page 25461, line 20. This agreement may also depend on the OM/OC ratio used for calculations
63. page 25462, lines 17-19. Phthalate esters are <1% of ambient OC, but how much is the % of phthalate esters in the emissions? The sources emitting phthalate esters do not emit only this compound, so the contribution to OC may be higher than the concentration of phthalate itself. It is the same consideration as with the biogenic sources described later, where the authors consider the ratio tracer/OC to estimate the contribution.
64. page 25464, lines 13-16. The ratio 1.67 is based on PM1 measurements. Maybe for PM2.5 this ratio is different, so one should be cautious when using this ratio for PM2.5 and taking conclusions from the results obtained with this ratio.
65. page 25464, line 28. Mineral matter <2% is very low. You can compare with other European sites (Sillanpaa et al., 2005; Querol et al., 2008)
66. page 25465, line 13. What do you mean with 'mainly'?
67. page 25465, line 13. In the manuscript the contribution from shipping is not estimated independently, but it is mixed with industrial sources, it is not very coherent to mention shipping in the conclusions as a separate and main source.
68. page 25465, line 18. HFO combustion means HFO combustion+shipping? In the rest of the manuscript the source profile used corresponds to HFO combustion+shipping.
69. page 25465, lines 22-23. . . . industrial emissions, including shipping emissions, contribute on average. . . It is important to say that the industrial emissions contributions in this study include the shipping emissions. Otherwise, one can wonder how much the shipping emissions contribute here.

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70. Figure 5. Ambient

71. Figure 6. Change to linear scale.

72. Figure S1. HFO combustion+shipping (if this profile actually represents also shipping as stated in the text)

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