

Interactive comment on “Isotope- and tracer-based measurements of fossil fuel and biospheric carbon dioxide in Paris during winter 2010” by M. Lopez et al.

Anonymous Referee #2

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General comments: This paper describes the source attribution of carbon dioxide in Paris during the MEGAPOLI campaign of January-February 2010. The authors use carbon isotopic compositions, $\delta^{13}\text{C}$ and $\Delta^{14}\text{C}$, to allocate local emissions among gas and liquid fuels and the biosphere. The fossil fuel-generated CO_2 amounts (CO_2ff) combined with CO and NO_x measurements are used to calculate emissions ratios of $\text{CO}/\text{CO}_2\text{ff}$ and $\text{NO}_x/\text{CO}_2\text{ff}$ to produce a continuous record of CO_2ff over the course of the campaign. CO_2ff depends on the meteorologic regime, being higher when the air arriving in Paris has come from the north over the industrialized continent than when it comes from the west. In the latter case, the CO_2ff is lower in abundance and is characterized by more local emissions. The tracer emissions ratios are compared to

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emissions inventories in order to further understand the sources of CO_2ff .

The inclusion of NO_x as a tracer for CO_2ff is new and offers an approach for identifying very local emissions, because of its very short lifetime in the atmosphere.

Although this paper is generally well-written, the Results and Discussion sections can be difficult to follow at times, especially section 3.5. A location map should be included to show the sampling sites and major wind regimes.

Specific comments: Abstract: You make no mention of the meteorological impact on observed sources, derived from your continuous record over the entire campaign.

p. 2375, line 12: insert “the” after “with”.

p. 2376, line 2: “attended” should be “intended”.

line 5: delete “of”.

p. 2377, line 19: Clarify what you mean by “in a vented location”.

p. 2378, line 12: “suburban” (no hyphen)

p. 2380, line 23: Change “Semi-urban” to “suburban”.

p. 2381, line 23: How were the flask samples dried?

Lines 25-27: Explain the sampling technique – were the samples collected into evacuated flasks or by flushing, and if flushing, what time period was integrated? What do you mean by “flasks were regularly filled for two complete days and one night”?

p. 2382, lines 6-9: The first sentence should mention that you are talking about the $\Delta^{14}\text{C}$ measurements. line 16: Delete “with” before “in situ”.

p. 2383, line 19: Does “one-hour resolution” mean that you averaged the continuous data into one-hour bins?

p. 2385, lines 22-29: Include a description of the methods for the non-methane hydro-

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carbon analyses in the Methods sections. This discussion seems to be just tacked on and not well integrated into the arguments.

p. 2387, lines 7, 12: Source/reference for the Mace Head data? And did you average these data over the entire time period to derive a constant background?

p. 2389, line 27: The $\delta^{13}\text{C}$ for liquid fuel from Widory and Javoy (2003) may be light. When was ethanol added to gasoline?

p. 2390, lines 13-22: Compare results with other cities – e.g., Dallas (Clarke-Thorne and Yapp, 2003); Salt Lake City (Pataki et al., 2003, 2006); Los Angeles (Newman et al., 2008).

p. 2391, line 4: The “slightly lower” value is well within the reported errors.

p. 2392, lines 9-18: Compare with results from other cities: e.g., Salt Lake City (Pataki et al., 2006); Heidelberg (Vogel et al., 2010); Los Angeles (Newman et al., 2012)

p. 2393, line 19: It is not clear what “in the sources spatial descriptions for Paris” means? Please clarify.

line 24: Replace “On a the French scale” with either “For France as a whole” or “On the countrywide scale”.

lines 26-29: All of the CITEPA numbers are for years well past 1970 and 1993. Were the regulations phased in during 2005-2010, such that they could account for the factor of 2 decrease during this time?

p. 2394: In general difficult to follow

line 9: “four inventories” – but 7 are given in the table

line 12: Insert reference to Table 5 after “total ratio”.

line 13: “more important CO₂ source” – clarify and explicitly relate to ratios.

p. 2395, line 12: inset “was” after “NO_x”.

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line 13: replace “show” with “reflect”.

Table 2: Should a particular time of day be used here – perhaps midday, during the time of greatest mixing and highest planetary boundary layer?

Add a footnote stating that “Gif” is Plateau of Saclay, since this is the name you use in the Discussion.

Give standard deviations or standard errors.

Fig. 3: Plotting the standard deviations so boldly suggests that the patterns for continental and oceanic regimes are not significantly distinct. Plot standard errors (listing *n* in the caption) of the hourly averages instead, perhaps with shading to indicate variability by standard deviation.

Fig. 4: line 4 of caption: Replace “blue dotted lines” with “blue horizontal dashed line”.

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