

## ***Interactive comment on “Stable isotope measurements confirm volatile organic compound oxidation as a major urban summertime source of carbon monoxide in Indianapolis, USA” by Isaac J. Vimont et al.***

### **Anonymous Referee #2**

Received and published: 16 August 2018

#### General Comments:

This manuscript by Vimont et al. presents CO stable isotopes on air samples collected during the summers of 2013 – 2015 at three tower sites (one background site and two urban sites) in and around Indianapolis, USA. They collected the background air samples from the windward site of the city to remove the background CO signal from the urban measurements and detect the urban CO enhancement to characterize the stable isotopic compositions of the summer time urban CO source. Their isotope results pointed out that the BVOC oxidation could be an important urban source in the summer

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time.

If their CO data have not been published elsewhere, it could be worth publication in ACP. Since the data have already been reported in the previous paper (Vimont et al. 2017), it is hard to recommend this manuscript for publication in the current state. They should work hard to add some new experimental data to support or improve their summertime analysis; e.g. try to determine stable isotopic compositions (especially for oxygen isotope) of photochemically produced CO from BVOC because their isotope analysis depends heavily on it.

#### Specific Comments:

Comment 1: Figures 1, 2, 3 It will be a lot better to draw the maps in same range (latitude and longitude) and plot the same stations; the readers could easily compare the figures 1, 2, 3.

Also, it is better to limit the number of the stations to six stations that you mentioned in Page5 line 17 of the text (perhaps stations 1, 2, 3, 5, 6, 9 ?).

Comment 2: Figure 2 The readers want to see more useful information in the map such as land use and cover classification than just showing the road map.

Comment 3: Figure 3 The figure seems exactly the same as Figure 1 in Turnbull et al. 2015. The authors should make the original version of the figure or just refer Turnbull et al. 2015.

Comment 4: Figure 5 Add graphs showing the time series of the deference between the data (CO mole-fraction, carbon-13, and oxygen-18) from the urban site (Towers 2 and 3) and those from the background site (Tower 1) to Figure 5, because the discussion in this paper is focused on the deference between the urban site and the background site

Comment 5: Figure 5 (horizontal axis) Please show the months in horizontal axis. Furthermore, could you please draw two-way arrow below the horizontal axis to show the period you used in the manuscript for discussing the summertime source of CO.

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Comment 6: Page 5, Line 17 Please add the name of the six stations. (perhaps Towers 1, 2, 3, 5, 6, 9 ?).

Comment 7: Page 6, Line 25 The temperature of the cryogenic trap (-60 oC) is different from that in Vimont et al. 2017 (-70 oC).

Comment 8: Page 6, Line 30 Please write a temperature of the second cryogenic trap.

Comment 9: Page 7, Formula (1) Remove 103 and permil from the formula.

Comment 10: Page 8, Line 13 – 16 Please cite the source of this explanation.

Comment 11: Page 9, Line 16 The reader wants to know the result of the calculation (1.4 nmol:mol CO), before moving on to the next explanation (the change in stable isotopic compositions).

Comment 12: Page 10, Line 10 Even though the formula is simple, I think it is better to show the formula (e.g.  $\Delta XCO = (XCO,i) e^{-kt}$ ) in the text.

Comment 13: Page 10, Line 12 I think the word “net loss” is used as the meaning of “total loss” in the text. The word “net loss”, however, might be confused with the same word meaning the opposite of “gross loss” for some readers and may think that the authors have mistaken “net loss” as “gross loss”. Can you use the other apposite word?

Comment 14: Page 10, Line 12 The same as Comment 11.

Comment 15: Page 10, Formula (5) Remove 103 and permil from the formula.

Comment 16: Page 18, Line 30 - Page 19, Line 1 This sentence explains about the “short” lifetimes of monoterpenes in the atmosphere. Why are there no explanations about the lifetimes of monoterpenes that react with OH ?

Comment 17: Reference Some of the references are not written in the proper form. Please correct them.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-506>, 2018.

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