

Interactive comment on “Spatial and temporal variability of urban fluxes of methane, carbon monoxide and carbon dioxide above London, UK” by Carole Helfter et al.

Anonymous Referee #2

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The manuscript "Spatial and temporal variability of urban fluxes of methane, carbon monoxide and carbon dioxide above London, UK" reports over three years of eddy covariance measurements made in London, UK. The manuscript compares the component fluxes with each other and the CH₄ and CO₂ flux measurements made at height 190 m with the measurements made on a roof top level.

The long dataset of the different urban fluxes is definitely unique and worth of publishing, and after minor corrections it could be accepted in Atmospheric Chemistry and Physics.

General comments

C1

There is no information on the details of CH₄ flux measurements made using QCL at the rooftop level. If these are given elsewhere, please give the reference. If not, the authors should add details of these measurements (e.g. measurement frequency, distance of the inlet to the anemometer, how long was the inlet tube etc.)

Data processing and filtering steps for the BT tower measurements are given in Section 2.3. Why EC_KCL post-processing is not part of this section but rather there is a separate sentence on this at P4, L5. Are there some differences between the data processing steps or filtering at the different sites? How were the KCL CH₄ fluxes processed? How much data eventually were available for final analyses from the different sites? This is particularly important for the diurnal plots. It is not clear are the same 30-min values plotted in Figs. 4 and 6 for CH₄ and CO₂ fluxes in summer. If not, then the different morning behavior could be purely due to this. If the same 30-min values are plotted already, it is interesting that the two fluxes behave so differently. Are their transfer efficiencies different?

What is the reason that the attenuation of the closed-path system due to limited sampling rate is corrected twice (P5, L6-11 and Section 3.2.1)? I don't understand why the spectral correction is not enough especially when there are many uncertainties in the FOP, CO₂ (e.g. high-frequency correction, effect of rain on the measurements, possible heat flux caused by the analyzer itself). Similarly, on P6, L19-20 the authors compare the closed- and open-path CO₂ fluxes and explain how the difference can be caused by the maximum covariance method. How about uncertainty in the open-path carbon fluxes?

The authors compare the fluxes of CH₄ and CO₂ to measurements reported in other studies. How about CO flux?

Minor comments

P2, L3: For current number of sites Baldocchi (2008) is used as a reference, but this was eight years ago. Either add newer reference or modify the sentence so that in 2008

C2

over >400 active sites.

P2, L8-9: verify emissions obtained how if direct measurements can be used for independent verification?

P2, L19: two times at missing from the sentence.

P3, L31: EC not opened in the text.

P4, L5: Could directly use FCO2_KCL here instead of EC_KCL

P5, L14: Earlier the authors use half-hourly fluxes, but here 30-minute flux. This should be systematized within the manuscript.

P5, L20: In the text it reads that footprints were calculated for non-neutral conditions, but in Figure 1 it is said that the footprints are calculated for near-neutral stratification. Which is the correct one? If the latter, how was the near-neutral limit defined and how much did this limit leave data for each season?

P6, L9-11: I don't understand how the negligible effect of RH on temperature co-spectra suggests that the attenuation in the tube is not caused by RH.

P9, L32-33: How did the CH4 fluxes at BT tower and rooftop level actually vary with wind direction during simultaneous measurements? Similarly to CO2?

Figure 4: It would be good to have the confidence intervals similarly as in Fig. 6.

Figure 5: Figure shows daily means classified based on wind direction. What happens if within the day, the wind direction turned? How would the fittings change with "raw" 30-min data? Would it be possible to somehow indicate the wind directions of overlapping footprints to Figure 5 itself? If not possible, maybe pointing these out in figure text.

Figure 7: Why the minimum of all fluxes is measured in April?

P16, L11 and P18, L7: Add spaces between the references.

C3

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C4