

Comment on acp-2021-606

Anonymous Referee #3

Referee comment on "Continuous CH₄ and δ¹³CH₄ measurements in London demonstrate under-reported natural gas leakage" by Eric Saboya et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-606-RC2>, 2021

The manuscript of Saboya et al. presents an assessment of bottom-up greenhouse gas (i.e., methane) emissions estimates through direct measurements (mole fractions and carbon isotope data) and simulation methods available for the UK. This is a well written manuscript that contributes to a better understanding of greenhouse gas emission dynamics in urban areas and the usefulness of carbon stable isotope data in this matter. However, I would like the authors to address and discuss on the following points:

- The authors need to better delineate the overall message from the manuscript. From the first sentence in the abstract (Line 9-10) is not clear what the intention is. Are the authors evaluating the reliability of bottom-up methodologies vs. measured values or the reverse? The authors may need to better define the overall objective to clearly discuss the data.
- Lines 45-50: Could the authors better describe how carbon isotope data is usually incorporated into the inventory estimations? Is the isotope data only useful for source identification or they may be used for contribution estimations?
- Lines 151-155: Did the authors apply corrections for potential interferences of hydrocarbons like ethane? What about sulfur from H₂S too? Given the vicinity of waste facilities and the influence of local traffic emissions and gas leakage, I consider that more information about the influence of these potential interferences may be needed.
- Lines 178-180: Could the authors better explain how the data for the selected time interval (13:00-17:00) were analyzed for the 3-day or 7-day lengths? How were the data aggregated to perform this analysis?
- Lines 364-367: Did the authors explore the influence of the local atmosphere stability (height of the local ABL) rather than the wind direction/speed?
- Section 3.2.1 and 3.2.2 (mole fractions and carbon isotope simulations): There are striking differences between the mole fraction biases from EDGAR and NAEI. Mole fraction biases seem to be systematic, but carbon isotope values are rather constant for both EDGAR and NAEI. Could the authors expand on these differences and explaining better the possible factors related with these deviations? This explanation could be inserted in lines 495-500.

Figures and Tables

Table 3: Could the authors please clarify the UK NAEI SNAP and EDGAR IPCC 1996 sectors nomenclature?