

Interactive comment on “Southern California Megacity CO₂, CH₄, and CO flux estimates using remote sensing and a Lagrangian model” by Jacob K. Hedelius et al.

Anonymous Referee #1

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General Comments

Hedelius et al present flux estimates of CO₂, CH₄, and CO from Southern California using an inversion that combines satellite- and surface-based observations, with the HYSPLIT model. The paper is well written, within the scope of ACP, and provides substantial technical detail for the reproducibility of their results. I recommend accepting this work for publication after the following issues are addressed.

My main concern is regarding the a priori flux estimates used in this work, particularly given the acknowledged existing higher accuracy inventories. I understand that the methodology was designed to be applicable globally, but it is not clear how much the

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quality of the inversion suffers from this goal.

How different are the CO₂ fluxes using the modified ODIAC as compared to using Hestia-LA? Lauvaux et al (2016) used a different Hestia data product and tower measurements in a substantially smaller city; it isn't obvious that the comparison holds over SoCAB with remote sensing data.

Given a lack of information on landfills and the variability in the relationship between nightlights and emissions, is the custom tuned CH₄ inventory used in this work functionally more globally scalable than existing emissions inventories?

Additionally, this paper should include a data availability section as per the ACP data policy: https://www.atmospheric-chemistry-and-physics.net/about/data_policy.html

Specific Comments

Figure 1 & 2: The boundaries drawn on the map in blue and black should be described in the figure captions.

Figure 5: The grey and blue lines should be described in the caption.

P4 L5: Please provide more detail or a citation regarding CO emissions as 1% of CO₂.

P5 L18: Is the assumption that the flux from vegetation is balanced based on previous literature?

P13 L1 & P18 L27: Why a factor of 64?

P14 L3: Where is the 20% uncertainty from model winds discussed? If it isn't until the appendix, consider referencing that here.

P25 L24: How was this tuning with OCO-2 observations done?

Technical Corrections

P31 L36: Reference formatted incorrectly

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