

Interactive comment on “Concurrent variation in oil and gas methane emissions and oil price during the COVID-19 pandemic” by David R. Lyon et al.

Anonymous Referee #2

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This manuscript describes a combination of different atmospheric measurements—airborne and tower-based with inversion analysis—to estimate changes in methane emissions from oil and gas production in the Permian Basin over a period of large fluctuations in the price of oil. The authors report a large decrease (more than a factor of 3) in methane emissions from the study region coincident with a threefold reduction in oil prices comparing Jan-mid Mar 2020 with late Mar through the end of April. The analysis convincingly documents a change in emissions through several different lines of evidence, and is a laudable step forward in process understanding of methane emissions from oil and gas production in North America.

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Overall, the study is clear, but some improvements to organization could be made to improve communication with the readers of ACP. I recognize that the authors are presenting many different datasets from many different techniques, which is challenging to do. Currently there is too much mixing of methods and results, and the order of things appears to be a bit off. Most of the data (results, I would say, including the most important figures/tables) were presented in the methods section (section 2) rather than in the results section (section 3). I would recommend the authors carefully separate the methods and results sections, and put all data (findings: figures, tables, etc.) in the results. It would be helpful for the authors to use sub-heads in the results section to help guide the flow of data, including results from the main atmospheric analyses and the supporting information about flares and well starts.

It was also a bit unusual that there was no discussion section, instead this section was titled “conclusions”. There was some mixing of methods even into the results section. Line 342 is the first time VIIRS data is mentioned, and this should probably be at least mentioned in the methods. Upon re-reading, I saw that it was mentioned in lines 111-112, but a bit more context in the first description would be helpful. Methods to describe results presented in Figure 7 need to be fleshed out more as well in the methods section preferably. Some figures were presented out of sequence (e.g. Figure 4). A revision of the text with some attention to readability and a consistent order of data presentation is recommended.

Minor comments:

Incorrectly capitalized letters randomly scattered throughout (e.g., Figure 1 caption: lowercase “black” when referring to a color, Emissions on line 320)

Lines 146-7: “Our assumption that emissions are proportional to gas production should provide a reasonable estimate of the spatial pattern of emissions corresponding to well locations.” Can you provide a citation or further information for this reasoning?

Line 201: “16Z (11 LST) through 22Z (17 LST)“ Don’t know what Z means in this

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case, and please spell out that LST=local standard time (I assume) Line 208: Figure 4 presented out of sequence (prior to fig. 3) Line 209: "Although though" Line 215: what is "recharge"? Line 268: please provide a citation for this sentence: "Here we consider only higher-quality XCH₄ measurements (quality assurance value > 0.5)."
Don't know what a quality assurance value is. Figure 3: how were aerial & tower-based measurements combined to get 1 estimate? Apologies if I missed this.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-1175>, 2020.