

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-911

Anonymous Referee #2

Referee comment on "Updated Global Fuel Exploitation Inventory (GFEI) for methane emissions from the oil, gas, and coal sectors: evaluation with inversions of atmospheric methane observations" by Tia R. Scarpelli et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-911-RC2>, 2021

Review of "Updated Global Fuel Exploitation Inventory (GFEI) for methane emissions from the oil, gas, and coal sectors: evaluation with inversions of atmospheric methane observations" (acp-2021-911)}

The manuscript presents an update on the Global Fuel Exploitation Inventory (GFEI) that estimates methane emissions from oil, gas and coal sectors and maps it on a 0.1×0.1 degree grid. The update includes annual trends in emissions from 2010-2019 that is very useful in understanding the changes in oil and gas activities and abatement measures from each country over time. The two versions of GFEI are compared to other bottom up emission inventories such as EDGAR and IEA as well as two top down emission estimates based on satellite observation inversions previously done by Lu et al. (2021) and Qu et al. (2021). Incorporating satellite inversion estimates to assess the bottom-up estimates submitted to the UNFCCC by each country is a useful way to independently validate these reports.

Here are some general comments that I think would help improve the manuscript:

- It is mentioned that bottom up emission inventories have large uncertainties but top down inversions are also prone to their own errors. However you haven't mentioned the order of magnitude of the uncertainty in each case. I suggest you add uncertainty values to table 1 and table 2. If the uncertainty in top down inventories are lower than the bottom up in that case we can state the bottom up estimates are underestimated or overestimated. Otherwise using the term bias is more appropriate as we don't know which one is closer to the truth.
- Figure 5. Could you use the trends in Figure 4 to project emissions from all the inventories to a reference year? That way the comparisons would become more meaningful.
- Line 307. You mentioned earlier that observations from latitudes higher than 60 are

excluded from both inversions. Given there are wetlands in these regions, wouldn't both models heavily rely on wetland priors in Canada and Russia?

Minor corrections and comments:

- Line 33. ...Nigerian emissions are too high. This sentence is a bit vague. Nigerian emissions are too high in the inversion results or UNFCCC report?
- Line 108. Do you mean total emissions used for Canada, Mexico and US are from UNFCCC but the distribution is scaled according to Sheng et al and Maasakkers et al? Please clarify.
- Line 121. Can you bring the updated emission value from Nigeria? (instead of stating much higher)
- Line 128. This sentence is a bit vague. Are you referring to improved emissions in distribution of "coal" emissions in Canada and Mexico? Can you explain in what way they are improved?
- Line 140. ...oil emissions more distributed among the top emitting countries. Do you mean more evenly distributed?
- Line 301. You are introducing a new inventory here. Can you add some information about the Climate TRACE inventory in the introduction?