Anonymous Referee #2

The manuscript presents airborne remote sensing observations and quantification of methane plumes in Romania over two days in 2021. The findings are compared with previous ground-based and drone measurements from 2019, and a total emission estimate for the region is calculated. The study discusses the advantages and limitations of each measurement technique, concluding that methane emissions in the region have decreased between the two studies. While comparing the results is challenging due to the variability in the oil and gas production landscape and differences in the design of the studies, the authors have made a commendable effort to address these complexities.

Reply: We like to thank Reviewer #2 for their positive and constructive comments. In the following, we address the comments point by point.

We have the following comments that need clarification/correction:

1. Line 32: How do you define super-emitters? Are all AVIRES-NG detections declared super-emitters here?
   Reply: We define super-emitters as those sources in the high-emitting tail of the emission distribution that contribute a major proportion of total emissions, i.e. 10 kg/h for oil and gas in Romania. See also our reply to comment 1 by Reviewer #1.
2. Line 122: The two profiles here are theoretical and not used in this study. Please clarify here.
   Reply: We have rewritten the paragraph to better clarify how the effective wind speed is computed in our study. We also moved the description of the wind uncertainty completely to the relevant section.
3. Line 123: change "a" to "at".
   Reply: Done.
4. Line 124: The local wind speed uncertainty might be very different from an uncertainty at 10 km resolution. Please comment.
   Reply: We now include an estimate of the uncertainty due to interpolation from the model fields (10 km hourly) to the source location of 1.0 m/s. This value was estimated by comparing the model fields with wind observations in the study area. See also our reply to comment 14 by Reviewer #1.
5. Line 185: Where does this assumption stem from?
   Reply: We now clarify how this was estimated: "The uncertainty of the plume length was set to 10% and to at least half a pixel size (i.e. about 5 m), which is a rough estimate considering how the plume length can vary when modifying the threshold for the plume detection algorithm."
6. Line 186: "plumes"
   Reply: Done.
7. Line 197: Where do the 15% for the height-dependency uncertainty stem from?
   Reply We estimate this number by computing the wind speed at 5 m and 20 m for the logarithmic wind profile, which is 15% lower and higher than the wind speed at 10 m. This is also described in the text.
8. Line 200: "would be"

Reply: Done.

9. Line 200: What is the contribution of wind speed uncertainty to the total uncertainty?
   Reply: After revising the estimate of uncertainty for wind speed, the average contribution of wind speed to the total uncertainty is about 80%. We added the following to the manuscript:
   "The mean uncertainty of the estimated emission rate is 84% ranging from 40 to 241%. Our total uncertainty in the estimated emissions is dominated by the uncertainty in the wind speed, which has a mean uncertainty of 76% (32-239%). The mean uncertainty in the integrated mass, i.e. the uncertainty in the CH4 retrieval, is 25% (9-64%)."
10. Line 249: remove "that"
    Reply: Done.
11. Line 252: Please explain why you chose these scenarios and what they infer for the change in emissions.
    Reply: We have added an explanation of the scenarios to the method section: "Scenario 1 uses the mean distribution from 2019 and Scenario 2 uses the distribution from 2019 that corresponds to the lower limit of estimated emissions. Scenario 1 and 2 assume that the emission distribution is still valid below the AVIRIS-NG detection limit, meaning any emission reduction results from fewer than expected AVIRIS-NG detections. Scenario 3 and 4 assume that emissions also changed below the AVIRIS-NG detection limit. To account for this, we reduce the standard width σ for Scenario 3 and mean μ for Scenario 4 of the 2019 distribution such that the number of expected emitters above the detection limit matches the six emitters found with AVIRIS-NG. Scenario 3 reduces the width of the emission distribution meaning there are fewer low and high emitting sources. Scenario 4 shifts whole emission distribution assuming all emissions were reduced equally, instead of addressing only the largest sources."
12. Line 264: The table states and EF of 1.2 for scenario 4.
    Reply: Thank you for catching this. We changed to the correct value of 1.2.
13. Line 293: That is quite a high contribution from "unassigned" sources. Are these findings considered when relating to 2019 findings?
    Reply: 6 out of 12 sources in the open field were classified as "unassigned" sources. The other 6 sources were assigned to facilities in the proximity. The unassigned sources are considered as own category contributing 9 kt of the total emissions.
14. Figure 5: Please show the values of the individual emissions estimates that contribute to the mean emissions.
    Reply: We have added the individual estimates to the figure.
15. Line 364: "a robust estimate"
    Reply: Done.
16. Line 410: Replace "surveys with instruments" with "surveys using instruments"
    Reply: Done.
17. Line 413: Change "entirely" to "entirety"
    Reply: Done.