Author's response for Ref: egusphere-2025-377

Ref. No.: egusphere-2025-377
Title: Isotopic signatures of methane emission from oil and natural gas plants in southwestern China.

Journal: Atmospheric Chemistry and Physics.
Authors: Dingxi Chen, Yi Liu, Zetong Niu, Ao Wang, Pius Otwil, Yuanyuan Huang, Zhongcong Sun, Xiaobing Pang, Liyang Zhan, and Longfei Yu.

Dear Editor,

We would like to express our sincere appreciation to you, and the anonymous reviewers for your constructive comments and suggestions on our manuscript (egusphere-2025-377) submitted to Atmospheric Chemistry and Physics. We have carefully considered all reviewers' comments and have responded to each point in detail.

Regards,
Longfei Yu
On behalf of all coauthors
May 14, 2025

- **Reviewer comments**
- Author's response

RC2

The paper explores the isotopic signature of the oil and gas (ONG) sector in China, one of the major sources of methane emissions. The scientific methods used in the study are sound, and the results reveal some interesting findings. I recommend major revisions to improve the clarity, and completeness of the manuscript. Given the scientific relevance of the study, it aligns well with the journal's scope and should be considered for publication, provided that all suggested revisions are implemented.

R: Thank you very much for your comments and constructive suggestions. Regarding the key aspects which require improvement, we have replied by points and will attend to the revision accordingly.

However, several aspects require improvement:

1 . The manuscript requires a thorough review for grammatical errors, especially in the introduction, which needs significant rewriting. Although some errors are noted in the specific comments below, this is not an exhaustive list, and the entire manuscript would benefit from careful revision.

R: Thanks a lot for the critical comment. We see that there are still many places to revise and proof-reading. We will thoroughly review our grammatical errors with carefulness. In addition, we will ask a native speaker to help in the revision and proof-reading.

2 . The source signatures of other methane sources (for example: microbial, pyrogenic) in and around this region are not considered when attributing the isotopic signature solely to ONG sources. A more comprehensive discussion of these sources would strengthen the conclusion that the primary contributor is the ONG sector.

R: Thanks for the valuable comments. As also mentioned by RC1, we agree that this is an important issue to clarify in both our method and discussion. Indeed, the location areas of these ONG sites were mostly rural, with very few residence or livestock farms. There were some scattered paddy fields and small streams, however, may not likely exert large influence on the sampling from ONG sites. Our unpublished data of CH_4 isotopes sampled near the paddy field of this region from a parallel study also supports our idea. In addition, either ground-based sampling points or UAV take-off points are located near middle of ONG plots or not in vicinity to the borders. Further, we considered the influence of meteorological conditions on the CH_4 isotope measurements, clarifying that ONG-source acts as the major drivers of the variations of isotopic signals. For more details, please refer to our earlier response to RC1 (point 3).

3． The paper lacks a thorough discussion and comparison with previous studies. Several key papers in this field are not cited, limiting the depth and impact of the findings.

R: Thanks for your time and effort in helping us improve the paper quality. We agree with Reviewer 2 that our work should build more link with previous studies. In the revision, we will conduct substantial revision and improvement in the introduction as well as our discussion section, to cover the current progress and gap in global ONG-CH_4 isotope research. Further, we will also discuss the uncertainty of the study, as well as the value for future work in evaluation CH_4 leakage from Chinese ONGs and global anthropogenic CH4 budgets.

A few specific comments:

- **There should be space before the references in the text.**

R: Thank you for your suggestion. We will add spaces before the references in the text.

- **There should be space between the numbers and units (for example -45.06 ‰).**

R: Thank you for your suggestion. We will add spaces between numbers and units.

- **Adding the measurements from this study to the general source composition figure would enhance visualization and provide a better context within a global framework.**

R: Thank you for your constructive suggestion. We will include this content in the revised manuscript.

L20: to the atmosphere from the Chinese oil and gas

R: Thanks. We will add "the" in the revised manuscript.

L63: account

R: Thanks. We will change “accounting” to “account”.

L66-L67: This sentence is not clear.

R: Thanks. We will revise it.

L69-L70: This sentence is not clear.

R: Thanks. We will revise it.

L78: isotopic composition?

R: Thanks. We will revise it.

L83-L85: Grammatically incorrect

R: Thanks. We will revise it.

L92: research

R: Thanks. We will change “researches” to “research”.

L120-121: Grammatically incorrect

R: Thanks. We will revise it.

L177: bags were lifted to the altitude

R: Thanks. We will change “was” to “were”.

L183: sentence unclear

R: Thanks. We will revise it.

L220: rewrite this sentence

R: Thanks. We will rewrite this sentence.

L227: ‘method of’ is a repetition

R: Thanks. We will delete “method of”.

L378: the Keeling plot

R: Thanks. We will change “keeling plot” to “the Keeling plot”.

L479 and L512: wrong reference formats

R: Thanks. We will revise it.