

Two referees have posted reviews of your manuscript requiring major revisions. Both Reviewers have expressed concerns about the depth of the analysis as well as the amount of new information the paper brings to the community, particularly regarding sources of uncertainties in methane emissions in China. In submitting a revised manuscript, I encourage the authors to carefully consider whether they adequately address all of the concerns and comments detailed by the two reviewers.

Additionally, I'm concerned by the fact that the inventories presented in this study are outdated and don't provide any information on recent trends in methane emissions in China which have most likely changed significantly. The authors should make every effort possible to include more recent estimates of methane emissions which would be of great interest to the community and necessary information for policy makers. If this information does not exist, or is not publicly available, please speculate as to why this is the case in the manuscript. For example, in the authors' response to Reviewer #1 it is stated that the REAS inventory no longer includes methane emissions. Please inquire or speculate as to why. If there really are no recent estimates of methane emissions for China, perhaps the authors could use proxies to infer, at least qualitatively, how emissions have changed in recent years. For example, many coal-fired power plants have closed recently following the implementation of strict air pollutant policies in China after 2012. If a revised manuscript is submitted, please include a thorough discussion addressing all these points regarding recent trends in the last 5-10 years. This discussion viewed as very important to a paper whose goal is to provide a comprehensive evaluation of China's methane emissions to aide in climate change mitigation.

Please note that a revised manuscript does not necessarily guarantee acceptance and could be subject to additional reviews.

Response: Thank you for your invaluable comments.

Firstly, we conducted an extensive review focusing on recent 5-10 years' literatures and included the important references (e.g., Miller et al., 2019; Sheng et al., 2020) in our results and discussions. It presented the most updated outcomes and enhanced our understanding of the recent trends of China's CH₄ emissions. China's coal mine emissions have become flatten since 2012, which dominate present-day CH₄ emissions trend. We added discussions in Lines 165-168 in the revised MS.

Secondly, we estimated China's CH₄ emissions using IPCC Tier 1 method based on the national activity data from the National Bureau of Statistics of China (NBS) and localized optimized emission factors that we compiled in this MS (Table S5-S7) during 2015-2019. Our estimates show that the CH₄ emissions in China increased slightly in recent years, which can be attributed to the slowdown of coal and agricultural emissions and slight increase in waste emissions. We estimated an increasing trend of 0.5 Tg CH₄ yr⁻² for the period of 2015-2019, which is rather consistent with the values (0.3±0.1 Tg CH₄ yr⁻²) estimated from the top-down approach by (Sheng et al., 2020). Furthermore, we improved the understanding of the recent coal production in China according to the national activity data and published literature (Sheng et al., 2019; Sheng et al., 2020). We added these contents in results and discussions in Lines 161-165 and Lines 198-201 in the revised MS.

As for the REAS inventory, we communicated with Dr. Jun-ichi Kurokawa. CH₄ is not included in the latest version of REAS (REASv3.2), because REASv3.2 was developed based on a domestic

fund where CH₄ was out of scope. And we explained this reason in the response to Reviewer #1. Lastly, we thoroughly checked and revised the responses to the two reviewers and updated the above new findings.

Before taking a decision regarding your manuscript, I ask that you please address the editor's comments which were posted on December 24th. In particular, it's of concern that your comparison is for inventories which are not up-to-date, especially given the rapid changes that have occurred during the past decade in China due to the implementation of stringent policies.

I suggest that you make every effort to include more updated CH₄ emissions in your comparison which would be of more value to the scientific community. For example, the CEDS global emissions inventory has been recently updated (<https://github.com/JGCRI/CEDS/>) to the year 2018. I suggest you contact the CEDS manager (Steve Smith) to ask if the CH₄ emissions for China are available and could be included in your paper. In addition, you could consider including FAOSTAT emission estimates (<http://www.fao.org/faostat/en/#data/EM>) which go up to 2017. A discussion on the lack of recent data, and speculations as to why this is the case, would also be appropriate so that readers understand the limitations. Perhaps it would also be useful to contact the authors of the REAS inventory to enquire about why the CH₄ emissions have not been updated.

Lastly, please make sure that your revised manuscript has been properly edited for grammatical errors and misspellings. I noticed several as I read through the revised manuscript.

Response: Thank you for your suggestions.

We communicated with Dr. Steve Smith and he kindly provided the recently updated CH₄ emissions data. We have included this new data of CEDSv2021-02-05 with the years from 2015-2019. We compared it with our independent recent estimates for 2015-2019 and found they are quite consistent in both total and sectoral emissions (especially for the energy sector), and also close to the national reported values to UNFCCC, which is encouraging.

The FAOSTAT emission estimates during 1990-2017 have been included in this study (Fig. 1).

For the lack of recent data, bottom-up estimates of CH₄ emissions are based on both activity data and emission factors. The sources of these data are mainly from national or provincial statistics including energy (coal, oil and natural gas), agriculture (rice areas and livestock numbers) and waste (landfills and waste water), and these data generally lags 1-3 years. Considering the time for inventory compiling, the CH₄ inventory would lag 2-4 years.

In the revised paper, the language has been polished by a native editor.

We hope these major improvements and revisions can address the concerns of Reviewers and Editor.

Refenerce

Sheng, J., Tunnicliffe, R., Ganesan, A., Maasackers, J., Shen, L., Prinn, R., Song, S., Zhang, Y., Scarpelli, T., and Bloom, A.: Sustained methane emissions from China after 2012 despite declining coal production and rice-cultivated area, 2020. 2020.

Sheng, J., Song, S., Zhang, Y., Prinn, R. G., and Janssens-Maenhout, G.: Bottom-up estimates of coal mine methane emissions in China: a gridded inventory, emission factors, and trends, *Environmental Science & Technology Letters*, 6, 473-478, 2019.

Miller, S. M., Michalak, A. M., Detmers, R. G., Hasekamp, O. P., Bruhwiler, L. M., and Schwietzke, S.: China's coal mine methane regulations have not curbed growing emissions, *Nature communications*, 10, 1-8, 2019.