

Atmos. Chem. Phys. Discuss., author comment AC2  
<https://doi.org/10.5194/acp-2021-464-AC2>, 2021  
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## Reply on RC3

Haiyue Tan et al.

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Author comment on "An integrated analysis of contemporary methane emissions and concentration trends over China using in situ and satellite observations and model simulations" by Haiyue Tan et al., Atmos. Chem. Phys. Discuss.,  
<https://doi.org/10.5194/acp-2021-464-AC2>, 2021

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## Response to Reviewer #2

**Comment [2-1]:** The authors integrated emission inventories, GEOS-Chem simulations, in-situ, and GOSAT satellite retrievals to investigate CH<sub>4</sub> concentrations, sources, and sinks over China. Such an analysis is very important because CH<sub>4</sub> is the second most important GHG and China is the largest emitter of anthropogenic CH<sub>4</sub> in the world. However, we lack a comprehensive study to focus on China's methane concentrations and budget at present. This study is a good first step, and I recommend this paper for publication in ACP.

**Response [2-1]:** We sincerely thank the reviewer for the valuable comments, and time spent reviewing the manuscript. The revised manuscript has implemented all of them. Please see our responses to each comment below.

**Comment [2-2]:** My main suggestion for the authors is that they can consider including the TCCON XCH<sub>4</sub> data to evaluate their GEOS-Chem simulations as well.

**Response [2-2]:** Thank you for pointing it out. We now add evaluations with column CH<sub>4</sub> measurements at six TCCON sites in Asia. The figure is added in the supplement as Figure S3. In addition, we add the following text in the Section 3.2: "Further evaluations of the two model simulations with CH<sub>4</sub> column mixing ratio measurements (since 2011) at six TCCON sites in Asia (Wunch et al., 2011) show similar results, with small biases of 0.2%–1.0% in CH<sub>4</sub> mixing ratios for GCC and negative biases of 2.6%–3.7% for GCE (Fig. S3). This again reflects the higher Chinese CH<sub>4</sub> emission estimates in years around 2012 in CEDS than EDGAR, which then affect the model simulations afterwards by using their emissions of the latest available years."

Reference: Wunch, D., Toon, G. C., Blavier, J. F., Washenfelder, R. A., Notholt, J., Connor, B. J., Griffith, D. W., Sherlock, V., and Wennberg, P. O.: The total carbon column observing network, Philos Trans A Math Phys Eng Sci, 369, 2087-2112, 10.1098/rsta.2010.0240, 2011.

**Comment [2-3]:** Besides, I suggest adding more figure legends to clarify that the global and regional CH<sub>4</sub> budgets (except those from GCE and GCC) and China's CH<sub>4</sub> emissions data plotted in Figs. 3-5 are derived from previous literature, not the estimates of this study.

**Response [2-3]:** Thank you for the comment. We have now revised the legends of Figures 3 and 4 by adding dark-colored and light-colored bars to represent the ranges estimated from Saunio et al. (2020).