

Referee 2#

In this paper, Wu et al. combined several existing high-resolution emission inventories to develop a highly accurate dataset for China. This integrated approach, instead of the traditional bottom-up method relying on fundamental emission rates and factors, facilitates easier construction of large-scale and high-spatiotemporal-resolution emission inventory. The resulting integrated inventory highlights an increased proportion of point source emissions, along with enhanced accuracy in emission magnitudes and spatiotemporal patterns. The figures in the paper offer clear evidence of how the new inventory has improved the model performance. Compared to the widely-used China's emission inventory MEIC, which is applicable at resolutions lower than 0.25 degrees, this new 0.1° dataset is proved to be a highly valuable asset for researchers in the field of emission inventory development and air quality modeling. The paper is well-written, logically structured, and straightforward. I would recommend publication after a minor revision.

Response: We thank Referee #2 for the encouragement and insightful comments on our manuscript. Below, we provide responses to each of your points to improve our work.

•**Comment 1:** Why is the integrated emission inventory only constructed for the year 2017? Would it be extended to have a time series or more recent years in the future?

Response: The establishment of INTAC is the outcome of collaborative efforts among multiple Chinese institutions, with support from organizations like the National Natural Science Foundation of China. The data collection process posed significant challenges. We selected 2017 as our focal year based on the intersection year for each collected inventory component. Additionally, 2017 marked the conclusion of China's most stringent Air Pollution Prevention and Control Action Plan. Recognizing the importance of this dataset in both atmospheric science and policy research, we aim to extend our dataset in the future.

We have a short discussion in Sect. 4 of the manuscript: "Limited resources present a substantial challenge in gathering emission inventories over extended time series from diverse research institutions within the scope of this study. Consequently, we exclusively present the INTAC for the year 2017, with the possibility of extension to other years in subsequent research."

•**Comment 2:** Why not integrate CO₂ in this study? While it's not classified as an air pollutant, it's a crucial species to consider.

Response: CO₂ holds significant importance in emission inventories for climate research and emission mitigation policies. However, it's not included in our work due to we need to comprehensively consider the species provided by each inventory. Therefore, the INTAC only focuses on air pollutants. We aim to extend our dataset to include CO₂ in the future.

•**Comment 3:** In the section 2.2.1, could you provide more details about the 88 standard sectors? I think a supplementary table would be helpful. I'm also a bit confused about the sectors in the legends of Figure 2. There are sectors labeled "passenger vehicle" or "truck", but also one called "storage and transportation". Could you clarify the relationships between those vehicles and transportation?

Response: We thank the reviewer for the valuable comments. We have added a table in the supplementary information, labeled as Table S1.

The "storage and transportation" refers to storage and transportation of crude oil and natural gas, which has been revised in the legend of Figure 2. The difference between "passenger vehicle" or "truck" lie in the intended purpose and capacity. The "passenger vehicle" is classified for passenger transportation, encompassing mini passenger cars, small-duty passenger cars, medium-duty passenger cars, and heavy-duty passenger cars. The "truck" is used for freight transportation, which includes mini-duty trucks, light-duty trucks, medium-duty trucks and heavy-duty trucks, as well as low-speed freight trucks and three-wheeled vehicles. To enhance clarity, we have replaced "truck" with "freight truck" in the revised manuscript.

•**Comment 4:** In Figure 2, the legends are so close to the pies. It would be better if this is modified.

Response: The legends have been modified as suggested.

•**Comment 5:** The conclusion is a little long and should be shorten.

Response: The conclusion has been shortened as suggested.