

## ***Interactive comment on “Comparison of Emissions Inventories of Anthropogenic Air Pollutants in China” by Eri Saikawa et al.***

**Anonymous Referee #2**

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This manuscript examines 5 existing inventories of anthropogenic gases and aerosol in China. It compares emissions (CO, NO<sub>x</sub>, SO<sub>2</sub>, and PM) over national, regional, and sector level over 2000 to 2008. It then uses WRF-Chem to evaluate how the differences in emissions inventory influences air quality modeling. Overall, this is an informative paper and adds to the larger research discussion about uncertainty in emission inventories. However, many (but not all) of the comparisons between inventories are called out with simple comparisons with little effort to decompose the reasons behind the differences. In many sections, a deeper dive into why there are differences in the inventories would be really useful, similar to the discussion in L316 – 32 or L360 - 64, rather than just pointing out where differences occur. This is not always possible, as transparency and methodological documentation in inventories is often lacking, which the authors allude to, but even a discussion of why you can't explain the differences

C1

would be helpful. Additionally, a discussion of how uncertainty varies over sectors and emission species would be helpful to put uncertainty in China inventories in context. I would recommend this paper for publication with revisions.

General Comments:

- In section 3, many of the sources sectors are compared across inventories as percent of total emissions. For example, (line 333) SO<sub>2</sub> industry emissions have shares of 53,33,53,44, and 27% nationally for the 5 different inventories. This comparison is often somewhat misleading because the differences in other sectors, as well as aggregate totals, influence those percentages. For many of these comparisons, absolute emission values would be more informative.
- Manuscript is organized nicely, but writing style is very wordy. More concise writing style would aid in comprehension.
- Figure axes: many of the figure axes would benefit from formatting with commas or the use of Tg rather than Gg.
- This paper would benefit from a discussion or literature review of uncertainty in emissions inventories. Certain emissions species and sectors are more uncertain across the board in all countries. A discussion of how the differences in China inventories fit into that narrative (or don't) would be useful context.
- A summary discussion of the influence of activity data versus emissions factors in different sectors/regions would be helpful.

Specific Comments:

- Table 1: it looks like there is a reference, in the “Coverage” column for GAINS inventory
- Figure 1: The scale of the figure makes it difficult to see the differences between SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>10</sub>.

C2

- The world “Total” in section title 3.1 and 3.2 is very misleading. The entire section is spent breaking down the national/regional TOTALS by sector.
- Figure 9 – label units of y axis
- L460 – 4: Why is Zhao estimate of off road estimates so much higher? – this is an example of where deeper discussion would be really useful.
- L153: please give a better discussion of figure 3
- L150: EDGAR doesn’t “underestimate” CO emissions. It produces a smaller estimate than the other inventories. It may, infact underestimate CO emissions, but the analysis in this paper is not enough to assert that statement.
- L269-77: I’m not convinced that the ranking order of sectors “clearly illustrates” that emissions should be better constrained. Here (and elsewhere in the paper too) absolute differences (or percentages of sector totals) in inventory estimates would be more convincing than percent of total inventory value or ranks.

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