

Revision

Emission Inventory Development for Spatiotemporal Release of Vanadium from Anthropogenic Sources in China

The manuscript presents and discusses, to some extent, the calculated anthropogenic Vanadium emission inventory at China for the period 2015-2019. The emissions are reported in terms of compartments, atmosphere, water and soil over the years and for the 31 Chinese provinces/7 regions. The content is of great relevance considering China as one of the main, perhaps the largest economy in the planet with strong and active industry and energy production sectors. However, in my opinion, the paper lacks in discussing their findings. For example, the authors did not put the findings into a world perspective, did not compare with other studies, etc., which could enhance the importance of such results. Also, the methodology is poorly described. In my opinion, the paper requires substantial improvement in order to be accepted.

General points

- 1) In the methodology section, it is important that the authors provide far more details on how the inventory was built. For example, what were the data sources for each category presented in the Supplements? The inventory described in the supplemental material, is it available somewhere, is it public? Please include some information on how those values reported on the tables were obtained, were they measured, were they modelled? On page 10 and line 233-236 the authors mention about the data availability, please provide more description in the methodology section about that. Some explanation on why this specific period was selected would be interesting.
- 2) In Figure 1, the arrows going into the atmosphere compartment sum up 205.466t. is there something missing in there, or is the reported 211.094t wrong? Could the authors clarify it, please? Also, if needed, make it clear in the text.
- 3) Are there any studies with vanadium measurements to corroborate with the inventory emission findings? I mean, are there evidences that those environmental fluxes numbers make sense? Perhaps, comparison with previous studies or observed measurements?
- 4) Could the authors expand on the use (or the lack) of technologies to reduce/control the vanadium emissions in the different sectors? Which technologies were in use during that period and what would be expected for more recent years emissions? Are there new technologies being applied in the last years, especially on the coal and oil burning sectors? Also, some info about the regional and national laws on technology control methods. For example, do they change at different provinces/regions? Could that help to explain the differences?

- 5) Concerning the spatial Vanadium releases in the 7 geographic regions, I think it would enrich the discussion if the authors include and relate socioeconomic characteristics and the findings. For example, it would be terrific to see if there is any correlation between GWP or other socioeconomic indexes (population, number of industries, income, ...) and specific V emission sectors. I think the discussion in this 3.3 manuscript section does not represent the complexity observed in such a huge country with strong spatial discrepancies as China.
- 6) In the uncertainty section the authors applied a Pearson correlation as a sensitivity analysis. The reason for such and the conclusions from that are unclear. What did the authors intend to show through those correlations? What did they expect as results? Please expand the discussion on that.
- 7) Finally, a significant discussion is missing around the Vanadium emissions compared to other locations and studies. I would like to encourage the authors to put the Chinese Vanadium emissions into a wider perspective to the reader. That is, include some discussion comparing the emissions in China with other locations/countries. For example, in the research of Bai et al. (2021) V emissions were estimated till the year 2017 for China, however, the authors did not compare the results with those findings. What about other countries?

Specific points:

- 1) P1, L19: "... Emissions pertinent to raw coal and coke combustion was..." were, not was. Also, please add the word "respectively" at the end of this sentence, if appropriate.
- 2) P1, L27: ... accounts for...
- 3) P3, L70: Could you please cite the figures in here?
- 4) P4, L86: Could you detail the unit of this total production volume (EPI)? Is it in tons, or m3, ...?
- 5) P6, L136: The raw coal and coke presented in Figure 1 sum up 100.372t, however, the Figure S2 displays a total amount of 100.381t. Is there a reason for such inconsistency?
- 6) ? Which one is correct? Note that also oil burning (86.001t vs 86.068t), transportation (17.649t vs 17650t) and waste (3.277t vs 3279t) emissions do not match. Please verify.
- 7) Figure S2: I believe the industrial process and Transportation labels are misplaced. Please verify.
- 8) Figure S2: Could the authors please add the percentages (%) of each category in this figure? Those % are mentioned in the text ~P5, however, they were not displayed. Please make sure they are in line with the #5-6 above.
- 9) P10, L225-226: This new sentence is not making sense, please rewrite or clarify.
- 10) P10, L227: Please correct the typo analyzed.