

Dear Reviewer:

Thank you for your help and valuable comments on our manuscript entitled “Estimation of CFC-11 emissions from coal combustion in China”. These comments are very helpful for improving this manuscript and guiding our future research. We have viewed the comments carefully and have made corresponding corrections in the manuscript. Following lists the responses point by point.

Responds to the reviewer’s comments:

The research “Estimation of CFC-11 emissions from coal combustion in China” detects CFC-11 emission factors from coal combustion in China and establishes a multi-year (2000~2021) emission inventory of CFC-11 from coal combustion in China. This study provides substantial evidence of CFC-11 emission from coal combustion and highlights the role of combustion emission under the background of reducing CFC-11 from production and use emission sources. I think the manuscript needs some minor revisions.

Response: Thanks for your positive opinions on this manuscript. We have addressed your comments point by point as follows. We really appreciated your suggestions, which helped us to improve this manuscript.

1. Line 22: “Results indicated that its annual...” was not clear.

Response: Thanks for this comment. “Results indicated that its annual emission averaged 233.5 t yr⁻¹” has been replaced by “Results indicated that CFC-11 annual emission from coal combustion in China averaged 233.5 t yr⁻¹”.

2. Line 46~48: Give the specific GWP values of CFC-11 and CO₂.

Response: Thanks for this suggestion. “Over a 100-year time horizon, CFC-11 has a global warming potential (GWP) thousands of times greater than that of carbon dioxide (CO₂) (Chiodo & Polvani, 2022; Polvani et al., 2020), such as 7090 (Burkholder et al., 2022).” has been added in this part.

3. Line 91: “The second was a bottom-up method.” is too simple.

Response: Thanks for this comment. The sentence has been changed to “The second method to estimate CFC-11 emissions was a bottom-up method.”.

4. Line 103: What are the specific combustion sources?

Response: Thanks for this comment. “and combustion sources were always not included.” has been changed as “and combustion sources (such as coal combustion, diesel combustion, etc.) were always not included.”.

5. Line 123: in our combustion lab in Wuhan→ in the laboratory in Wuhan.

Response: Thanks for this suggestion. We have changed it according to your suggestion. It has been modified as “A total of 10 kinds of chunk coals and 11 kinds of honeycomb briquettes were collected and burned in the laboratory in Wuhan.”.

6. Line 124~131: Add a map to show the location of these eight agricultural regions.

Response: Thanks for this suggestion. We have added figure as Figure S1 in the supporting information.



Figure S1 The location of eight agricultural regions of China

7. Line 223: Previous studies → Previous study.

Response: Thanks for this suggestion. We have changed it to “Previous study...”.

8. Line 255: mg/kg → mg kg⁻¹.

Response: Thanks for this suggestion. We have changed it according to your suggestion.

9. Line 287~290: The comparation here is meaningless, the main topic here is that stationary combustion of biomass, trucks, vessels, and corn stover burning were also the CFC-11 emission sources. Rewritten this part.

Response: Thanks for this suggestion. This part has been rewritten as “The CFC-11 also detected from stationary combustion of biomass (0.01%) (Ye, 2018), heavy-duty diesel

trucks (0.05% or 0.2%) (Wang et al., 2020), vessels (0.07%) (Ye, 2018), and corn stover burning (0.3% or 0.2%) reported in the literature (Figure 1c) (Sun et al., 2018).”

10. Line 299: In this part, you only show the spatial emission in 4 years (Fig. 4), give other years’ result in supporting information.

Response: Thanks for this suggestion. I have added figure (Figure S7 CFC-11 emission intensity of CFC-11 from domestic coal combustion in 2005~2020) in supporting information.

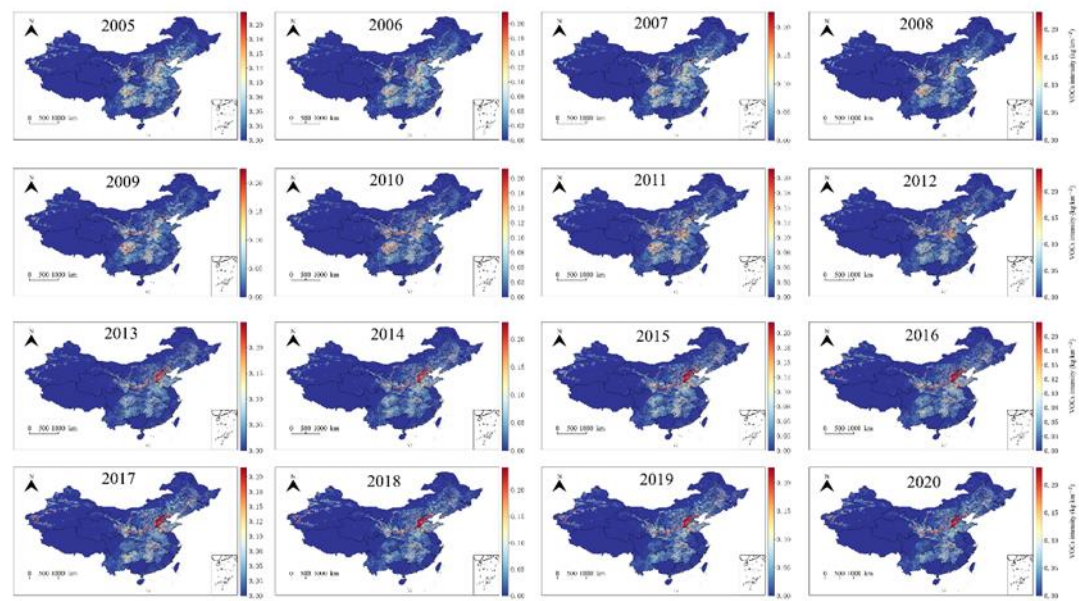


Figure S7 CFC-11 emission intensity of CFC-11 from domestic coal combustion in 2005~2020

11. Line 326: Label is not clear. Honeycomb → Honeycomb briquetted combustion; Power plant → Coa-fired power plant; Chunk coal → Chunk coal combustion

Response: Thanks for this suggestion. We have changed the label according to your suggestion.

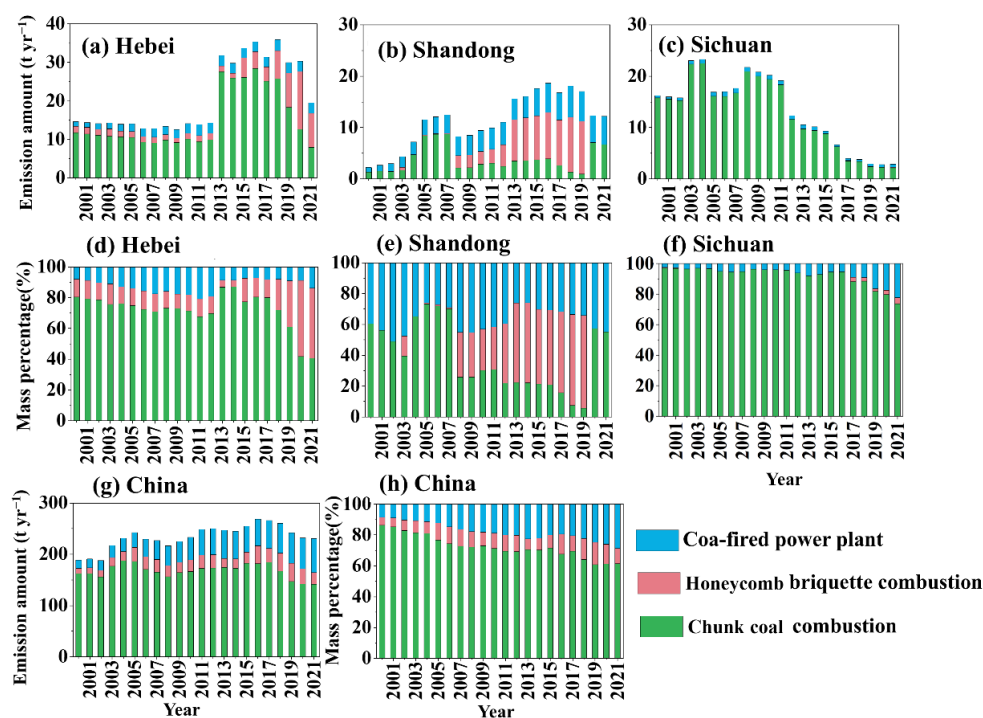


Figure 3. The CFC-11 emissions (a~c) and mass percentages (d~f) from power plant, domestic chunk coal, and honeycomb combustion in Hebei, Shandong, and Sichuan provinces.

12. Line 343~345: Add a Figure to present the location of these provinces.

Response: Thanks for this suggestion. We have added figure (Figure S6) in supporting information to show the location of heating and non-heating areas in China.

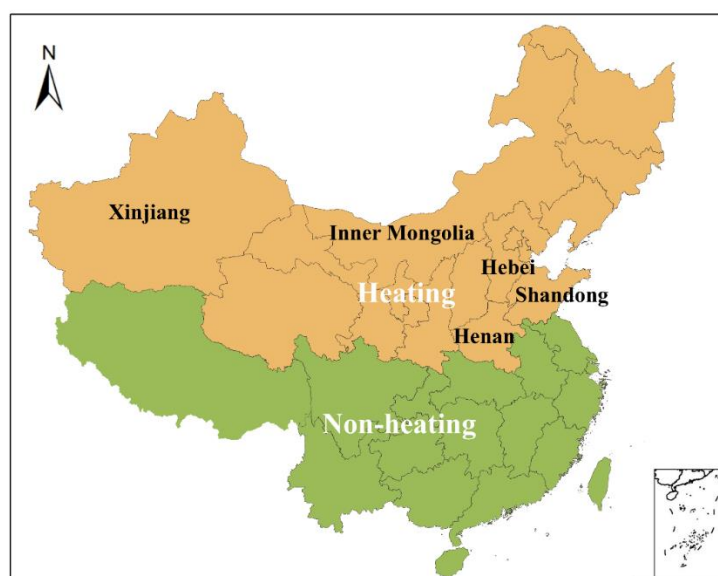


Figure S6 The heating and non-heating areas in China

13. Line 352: Add markers to show the location of Hebei, Shandong, and Henan.

Response: Thanks for this suggestion. I have added markers in the Figure as follows:

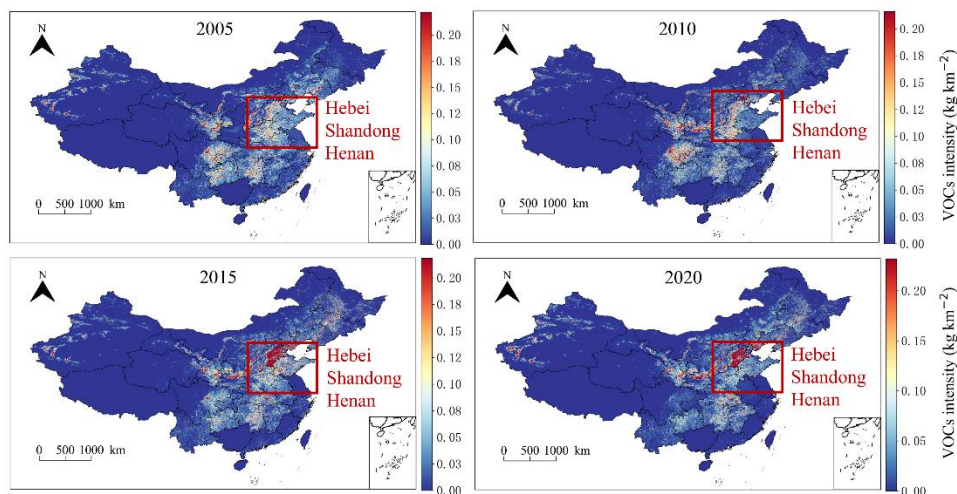


Figure 4. CFC-11 emission intensity of CFC-11 from domestic coal combustion in 2005, 2010, 2015, and 2020

14. Line 390: “After 2025, the CFC-11 emissions from PAU in China was 0” adds reference.

Response: Thanks for this suggestion. The sentence has been changed to “After 2025, the CFC-11 emissions from PAU in China was 0 (Fang et al., 2018),”.

15. Line 465: Label is not clear. Honeycomb → Honeycomb briquetted combustion; Power plant → Coal-fired power plant; Chunk coal → Chunk coal combustion

Response: Thanks for this suggestion. I have changed the label according to your suggestion.

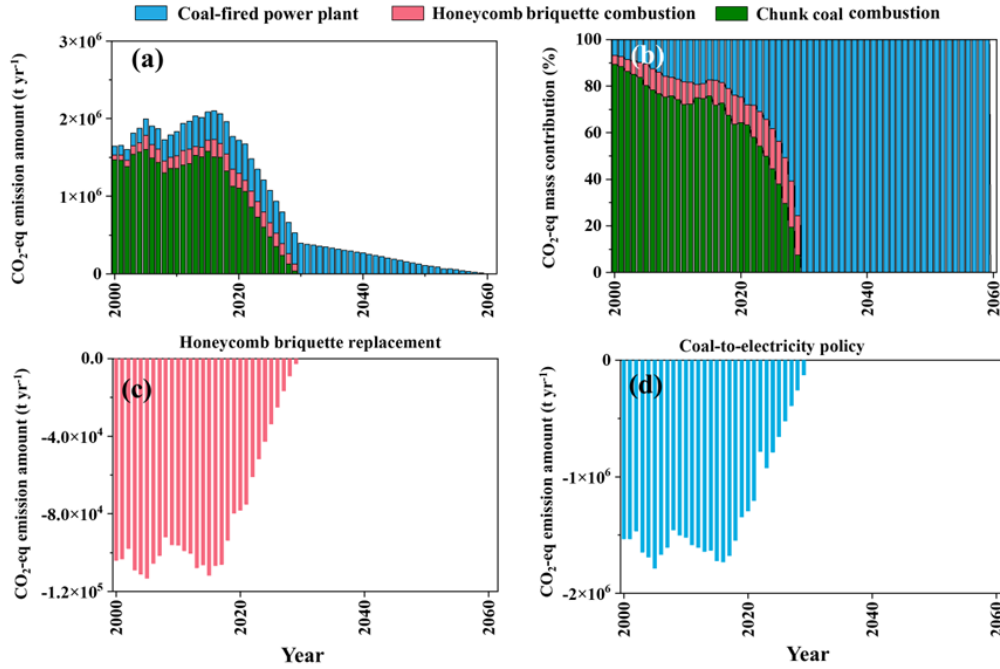


Figure 7. CO₂-eq emissions for CFC-11 emitted from coal combustion in China in this study (a) and (b). The changes of CO₂-eq emissions from CFC-11, if coal was replaced by honeycomb (c) and if domestic coal was replaced by electricity produced in coal-fired power plant (d).

16. Line 487: 0.23 → 0.23 kg km⁻².

Response: Thanks for this suggestion. I have changed it (0.23→0.23 kg km⁻²) according to your suggestion.

17. Line 495: What is the meaning of 410 km? Where is the influencing area within 410 km?

Response: Thanks for this comment. I have added the sentence in this part: CFC-11 emissions from coal combustion in the two provinces could lead to localized atmospheric concentrations of 254~1062 ppt within a 410 km radius of the source regions during January. These values exceed the observed CFC-11 concentration of 249 ± 13 ppt at Mount Tai during winter 2017 to spring 2018 (Huang et al., 2021). The influence within 410 km is unlikely to extend to monitoring stations outside China.

18. Line 538: for → from

19. Response: Thanks for this suggestion. We have replaced “for” with “from”.

20. Line 547: tons → t

Response: Thanks for this suggestion. We have replaced “tons” with “t”.

21. Line 764: (In Chinese) → China (In Chinese).

Response: Thanks for this suggestion. It has been modified as “China (In Chinese).”.

22. Did the authors consider the CFC emissions from old refrigeration equipment, such as the process of scrapping?

Response: Thanks for this comment. According to Fang et al. (2018), sales of refrigerators using CFC-12 were completely in China banned by the end of 2007. CFC-11 is used in making foam insulation in freezers. The consumption and emission of foam agents are included under the foam-blowing sector as seen in Figure 2f.

23. How about the emissions of form utilization, e.g., in constructions?

Response: Thanks for this comment. In Figure 2, foam-blowing sector includes CFC-11 rigid polyurethane (PU) foam subsector, CFC-11, CFC-12 flexible polyurethane foam subsector, refrigerator foam subsector, and freezer foam subsector. But we didn’t calculate the CFC-11 emission from constructions separately. In the future, we will consider calculating CFC-11 emission from all the possible emission sources.