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.

This study obtained CFC-11 emission factors (EFs) for the combustion of typical Chinese domestic coal (chunk coal and honeycomb) through laboratory combustion experiments. EFs for coal-fired power plants were obtained through field sampling. Based on China's coal consumption data from 2000 to 2021, CFC-11 emission inventory for coal combustion in China was developed. Additionally, the study used Monte Carlo simulations to analyze the uncertainty in the emission inventory. The study systematically assessed the sources, emission amount, and trends of CFC-11 emissions from coal combustion in China. It improved the identification of non-conventional ODS sources in China, provided scientific basis for China's implementation of the Montreal Protocol and formulation of atmospheric pollution control policies. It is suggested that the manuscript be accepted after revising the following issues:

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

1. Stove operation habits significantly influence pollutant emissions from domestic coal combustion. It is suggested to clarify whether the stove operation methods in the experiment align with the actual coal usage practices of rural residents in China.

Response: Thanks for this comment. We have carefully considered your suggestions. The experiment method has been adopted for many years in our group and was described in our previous papers (Yan et al., 2020; 2022). We wrote this section briefly before, now we accepted the suggestions and added the following sentences to the manuscript as follows:

To minimize the impact of ignition smoke, both honeycomb briquettes and chunk coal were lit from beneath pre-measured charcoal. An electric oven was used to ignite the charcoal, allowing it to burn until visible smoke dissipated. The combustion state was controlled by adjusting the stove's bottom air door: fully open for flaming and closed for smoldering. This method replicated the actual burning practices observed in rural China (Yan et al., 2020; 2022).

Yan, Q., Kong, S., Yan, Y., Liu, H., Wang, W., Chen, K., et al. (2020). Emission and simulation of primary fine and submicron particles and water-soluble ions from domestic coal combustion in China. *Atmospheric Environment*, *224*, 117308. https://doi.org/10.1016/j.atmosenv.2020.117308

Yan, Q., Kong, S., Yan, Y., Liu, X., Zheng, S., Qin, S., et al. (2022). Emission and spatialized health risks for trace elements from domestic coal burning in China. *Environment International*, *158*, 107001. https://doi.org/10.1016/j.envint.2021.107001

2. The paper refers to that the EFs for CFC-11 exhibits significant variability (chunk coal: 0.3–12.7 mg/kg). It is suggested to include an analysis of the reasons for these fluctuations, such as the impact of halogen content in the coal.

Response: Thanks for this suggestion. As described in Section 3.1, from previous studies, CFC-11 includes chloride (Cl) and fluoride (F), the formation of CFC-11 needs the participation of Cl and F. F and Cl were widely distributed in China's coal (Jin et al., 2025; Yang et al., 2017). Former studies indicated that F content was 20~300 mg kg^{-1} from coals in the North China Plane and Northwest China, lower than the Southwest China (50~3000 mg kg^{-1}) (Luo et al., 2004). The F content in China's coal was 11~3575 mg kg^{-1}, averaged as 130 mg kg^{-1} (Yang et al., 2017). The chlorine content of bituminous coal was 252.5 mg kg^{-1} in China (Jin et al., 2025). Chen et al. (2010) collected 305 kinds of coal samples all around China and analysis the Cl content, results indicated that the Cl content in different provinces were also different, which were 13.2~2815 μg g^{-1}. We agree with you and infer that halogen content in the coal may influence the EFs of CFC-11 from coal combustion. Unfortunately, we discovered that the combustion of coal could produce CFC-11 by accident, so we didn't analyze the content of halogen in the coal. In the future, the formation and emission mechanisms of CFC-11 during coal combustion and the influencing factors need deep research.

Chen, L. (2010). Study on environmental geochemistry of Chlorine in Chinese coals. Nanchang University.

Jin, W., Yan, Y., Qiu, X., Peng, L., Li, Z., & Tang, Y. (2025). Characterizing full-phase chlorine species emissions from domestic coal combustion in China: Implications for significant impacts on air pollution and ozone-layer depletion. *Environmental Pollution*, 372, 126043. https://doi.org/10.1016/j.envpol.2025.126043

Yang, N., Tang, S., Zhang, S., Huang, W., Chen, P., Chen, Y., et al. (2017). Fluorine in Chinese coal: A review of distribution, abundance, modes of occurrence, genetic factors and environmental effects. *Minerals*, *7*, 219. https://doi.org/10.3390/min7110219

3. The paper uses Monte Carlo simulation for uncertainty analysis. It is suggested to clarify the sources of the coefficient of variation for activity data and EFs in the simulation.

Response: Thanks for this comment. I have added the detailed information as follows: The uncertainty of CFC-11 emission inventory from coal combustion in 2021 was ±50.2% through 100000 Monte Carlo simulations with a 95% coincidence interval. In this study, the coefficients of variation (CV, the standard deviation divided by the mean) for coal consumption in power plant was assumed as 5%, and for domestic coal consumption it was 20% (Zhao et al., 2011). The uncertainty for EFs were calculated according to the EFs from experiment in this study (Table S2).

Table S2 The emission factors (mg kg^{-1}) of domestic coal combustion used for estimating domestic CFC-11 emissions.

Types	Sources	CFC-11
Chunk coal	Northeast Plain	5.5±0.4
	Arid and semi-arid regions of north China	5.6±2.1
	Loess Plateau	3.6±3.0
	North China plain	2.1±0.3

	Yangtze Plain	2.5±3.7
	Sichuan Basin	3.4±0.8
	Yunnan-Guizhou Plateau	1.6±3.6
	Tibet Plateau	2.2±1.7
	South China	1.6±3.3
Honeycomb briquette	Northeast Plain	3.3±9.3
	Arid and semi-arid regions of north China	1.5±1.5
	Loess Plateau	3.3±10.9
	North China plain	3.8±9.9
	Yangtze Plain	3.2±12.7
	Sichuan Basin	3.1±10.9
	Yunnan-Guizhou Plateau	1.5±1.7
	Tibet Plateau	3.3±9.3
	South China	4.7±10.9
Coal	Power plant	0.02±0.004

Zhao, Y., Nielsen, C. P., Lei, Y., McElroy, M. B., and Hao, J. (2011). Quantifying the uncertainties of a bottom-up emission inventory of anthropogenic atmospheric pollutants in China. *Atmospheric Chemistry and Physics*, *11*, 2295–2308. https://doi.org/10.5194/acp-11-2295-2011

4. The paper uses the CO tracer method to calculate CFC-11 emissions. It is suggested to supplement relevant details about this method in Chapter 2.

Response: Thanks for this suggestion. I have added the method in Section 2.3 as follows:

When using CO as a tracer to calculate the CFC-11 emissions, the method was as follows (Palmer et al., 2003):

$$E_{CFC-11} = E_{CO} \times \frac{\Delta CFC-11}{\Delta CO} \times \frac{M_{CFC-11}}{M_{CO}} \quad (4)$$

In which E_{CFC-11} was the CFC-11 emissions, t; E_{CO} was the CO emissions, t; $\frac{\Delta CFC-11}{\Delta CO}$ was the slope of the linear correlation between ΔCFC-11 and ΔCO; M_{CFC-11} and M_{CO} were the molecular weights of CFC-11 and CO.

Palmer, P. I., Jacob, D. J., Mickley, L. J., Blake, D. R., Sachse, G. W., Fuelberg, H. E., et al. (2003). Eastern Asian emissions of anthropogenic halocarbons deduced from aircraft concentration data. *Journal of Geophysical Research: Atmospheres*, *108*(D24), 2003JD003591. https://doi.org/10.1029/2003JD003591

5. In Fig. 3(e) and (f), there is a significant difference in the emission quantities and their proportions for different coal types. Please confirm if the data in the images are accurate.

Response: Thanks for this comment. I have checked the data and put the right Figure in the draft. The right Figure is as follows:

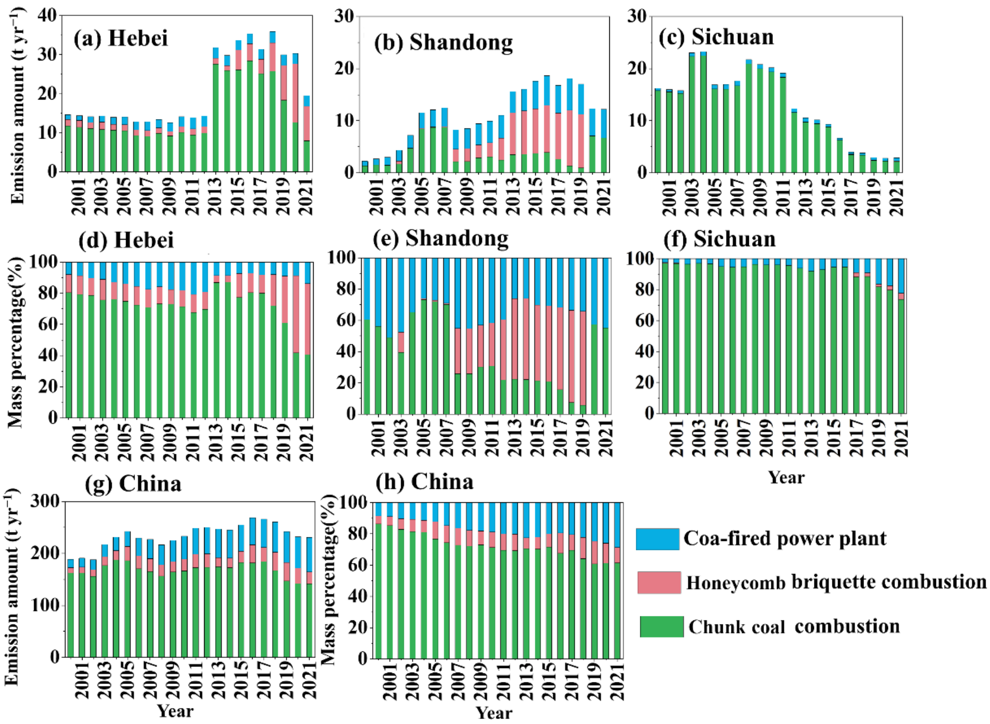

Figure 3. The CFC-11 emissions (a~c) and mass percentages (d~f) from power plant, domestic chunk coal, and honeycomb combustion in Hebei, Shandong, and Sichuan provinces.