Comment on essd-2022-154
Anonymous Referee #2

Referee comment on "Multi-year emission of carbonaceous aerosols from cooking, fireworks burning, sacrificial incenses, joss paper burning, and barbecue and the key driving forces in China" by Yi Cheng et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2022-154-RC2, 2022

General comments:

This paper measured the emission factors of five miscellaneous sources including the burning of sacrificial incense and joss paper, traditional Chinese barbecue, Chinese style cooking, and fireworks burning. The emission inventories and their spatial and temporal (yearly and monthly) distributions were compiled based on the measurements and surveys. The paper is very informative and provides the results of emissions from some missing sources. However, my major concerns are the reliability of the underlying data in this study. For example, are thirty-eight measurements were convincible enough for these poorly understood miscellaneous sources? Of course, I know that such experiments are rare and labor-intensive. Is the questionnaire sufficiently representative? I believe the questionnaires were done rigorously, but this should be explained. As a kind of unconventional emission sources, more uncertainty analysis and validation might be necessary.

Specific comments:

Methodology

- Line 119: “This analyzer was developed by the Key Laboratory of Environmental Optics
Technology (Anhui Institute of Optics and Fine Mechanics, CAS) based on the thermal-optical method (Ding et al., 2014). The analyzer showed reliable stability and repeatability.” How the analyzer stable and repeatable should be described here. What about the response, accuracy, time resolution of this device? How to calibrate?

- Line 129: “𝑀 was the fuel consumption quality” What is fuel consumption quality?

- Line 170: “The original consumptions of sacrificial incenses, joss paper, and fireworks, were from a household investigation. We got the per capita consumption of sacrificial incenses, joss paper, and fireworks in each province. The data were adjusted to overcome the problem of insufficient sample size. In China, sacrificial activities mean honoring ancestors, and they mainly take place in temples or graveyards. Most traditional graveyards would be placed in hills that might be covered with vegetation. The data on the consumption of sacrificial incenses and joss paper will be revised based on the number of temples (data from POI) and frequency of forest fires caused by sacrifices (data from China Forestry Statistical Yearbook)” This paragraph mainly introduces the quantification method of FMS activity, which I think is very important. However, the description is somewhat simple and obscure. For example, how the household investigation was conducted? The authors only provided some brief introductions in Text S2. But how the questionnaires distributed in different regions, different cities, different ages, and even different nationalities? How to prove that there is an inevitable connection between burning incense and forest fires? What’s more, for some plain areas, the incense burning activities are not carried out on the hills.

- Table 1: Before these emission factors can be applied to the estimation of emission inventories, some remarks about the reliability of these emission factors are required. Also, why are the BC and EC emission factors so different for some sources?
Figure 4: Is there any evidence to prove the surge in emissions of firework in 2014 was correct, rather than a statistical error?