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Comment on acp-2022-283

Anonymous Referee #1

Referee comment on "Chemical characteristics and sources of $PM_{2.5}$ in Hohhot, a semi-arid city in northern China: insight from the COVID-19 lockdown" by Haijun Zhou et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-283-RC1, 2022

The manuscript addresses a topic of scientific interest during the last 2 years, such as the variation in air pollution during the COVID-19 lockdown. The study is interested in analyzing the variation of the chemical composition of PM2.5 (not only its concentration) obtained in an area with particular geographical conditions such as a semi-arid city of northern China. Several studies have reported changes in the concentrations of atmospheric pollutants such as PM, O3 and NO2 during the lockdown measures, but few studies have delved into the variation in the chemical composition of PM. This approach allows carrying out more detailed analyzes of atmospheric chemistry by relating the fluctuation of emission sources and the implications on the chemical composition of PM.

I appreciate if the authors can offer a response/discussion to each of the following comments:

- The authors define as objective of the study "identify the long-term chemical characteristics of PM2.5 in a semi-arid city". However, can one year of study be considered a long-term study?
- The manuscript suggests that the results obtained "can provide a new insight for the formulation of effective policies to improve aerosol pollution in semi-arid regions". The authors should go beyond the generality and could suggest concrete measures to improve public policies based on the results achieved.
- It would be interesting to present a comparative analysis of the variation in the composition of PM2.5 (not only concentrations) between the year of study and an average of previous years (to be possible). This is a good way to identify PM2.5 chemical composition anomalies during the COVID-19 lockdown measures.
- The authors calculated and reported two indicators related to secondary aerosols, the sulfur oxidation ratio (SOR) and the nitrogen oxidation ratio (NOR). What is the usefulness of these indicators and how are the results interpreted? What additional information do the indicators provide regarding the concentrations of SO2 and SO4?
- Please check in the title "3.2 Factors influencing PM2.5" the word "metrological" since it should be "meteorological".
- The source apportionment of PM2.5 was carried out for each of the four seasons. But how did the COVID-19 lockdown measures impact on sources of PM2.5?