

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-270

Anonymous Referee #2

Referee comment on "Measurement report: On the contribution of long-distance transport to the secondary aerosol formation and aging" by Haobin Zhong et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-270-RC1>, 2022

General comments:

The paper titled "Measurement report: On the contribution of long-distance transport to the secondary aerosol formation and aging" by Zhong et al. present detail analysis in physio-chemical properties of aerosol transported from major pollution regions in North China at a regional receptor site located at the junction of the North China Plain and Fenwei Basin. The chemical composition of non-refractory PM_{2.5} were measured by a ToF-ACSM and organic aerosol source apportionment were resolved and analyzed with measured black carbon, gas-phase pollutants and meteorological parameters to explore the secondary inorganic/organic formation during the transport. This study provide useful information on understanding the influence of long-distance transport of aerosol on the atmospheric environment. The manuscript was well written and presented, but some issues needed to be clarified. Therefore I recommend the publication of Zhong et al. work after replying the following comments clearly.

Specific and technical comments:

- Line 26-27, three or four pollution transport sectors? It seems four sectors as it describe that Beijing-Tianjin- Hebei (BTH), urban Guanzhong Basin (GZB), northern China and one clean transport sector from rural Guanzhong Basin region were identified. Please confirm it and revised it properly.
- Line 45-47. Some recent studies about the air pollution in China are missed here, such as "Atmos. Chem. Phys., <https://doi.org/10.5194/acp-18-8849-2018>".
- Line 157, the height of 200 m is above the ground? As the observation site is on the rooftop of a 33-floor tall building which is already 200m above the ground, the height of backtrajectories would be better than 200m. Please clarify it
- Line 189-199. It is interesting to note that the average PM₅ concentration is higher in the northern China transport sector than that in the urban GZB transport sector, the latter sector usually has more anthropogenic emissions and more polluted than the

former. Maybe the much higher frequency of pathway in urban GZB transport sector (60%) resulted in the lower PM_{2.5} value. Please clarify it.

- Line 235-240. It is a good idea to compare the chemical composition between the receptor site and the transport sector. However, it should keep in mind that the difference in the chemical composition would be also originated by the different observation period, not only due to the transformation during the long range transport. I note that the observation period in Beijing urban area by Xu et al., 2019 was almost the same as the present study, but the observation period in Xi'an urban area by Duan et al. 2021 (not Duan et al., 2020 in Figure 4) was different. In addition, as the BTH transport sector and GZB transport sector only contributed a part of the full observation period, it is better to select the same period to do the comparison. Thus, more information should be provided here.
- Line 267-268 I do not understand the explain for the less oxidized SOA observed in the rural transport sector. The atmospheric oxidation of anthropogenic VOCs is prevail over the biogenic VOCs? Please clarify it.
- Line 274-278. To backup the much higher O/C ratios observed in the transport sector, the O/C ratio results observed in the background area in North China would be suitable to explain the long range transportation from source region to the receptor site. Such as the results reported in Li et al., 2021 (Atmos. Chem. Phys., <https://doi.org/10.5194/acp-21-4521-2021>) conducted at a mountainous site in North China Plain in summer 2019.
- Line 278-281. The comparisons of O/C and SOA fractions between the receptor site (this study) and the source regions (previous studies) should be also notice the difference would be caused by the different observation period. More discussion should be provided before analysis the comparison results.