

Atmos. Chem. Phys. Discuss., referee comment RC2
<https://doi.org/10.5194/acp-2022-212-RC2>, 2022
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Comment on acp-2022-212

Anonymous Referee #2

Referee comment on "Impacts of condensable particulate matter on atmospheric organic aerosols and fine particulate matter (PM_{2.5}) in China" by Mengying Li et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-212-RC2>, 2022

Organic aerosol, especially secondary organic aerosol (SOA), is a major component of the overall aerosol loading in various environments around the globe and significantly influences the air quality and climate. However, there is a significant gap between observed and modeled SOA. One possible reason is the incomplete information on emissions and properties of SOA precursors. This work modified the aerosol emission inventory by including condensable particulate matter (CPM) and tested this inventory by simulating some observations in Beijing and Beijing-Tianjin-Hebei region. The manuscript is overall well-written and fits the scope well of ACP. However, I have a few comments to be addressed before this manuscript can be published.

- **Estimations of CPM emissions (Line 160 – 198):** It is reasonable to assume that CPM contains many condensable substances, such as nitric acid, ammonia, S/IVOCs, and the gas-particle partitioning of which is regulated by temperature. Therefore, have many of the CPM components already been considered in the gas emissions inventory? This may lead to repeated consideration of many compounds and further overvaluing of emission intensity; please clarify how organic (gas + particle) emissions were considered in this study?
- **The model configuration (Line 200 – 246):** The emitted CPM can be further oxidized in the atmosphere to produce SOA. How does the model consider this process? It seems there is no component information of the CPM. Therefore, it is not clear to me how CPM performs atmospheric chemical reactions.
- **Line 241:** Please provide the reasons for setting the emissions to be reduced by 30%.
- **Table 4:** This study can be seen as an improvement to the emission inventory, but it seems that the model simulates SOA better than POA. Please clarify this.
- **Line 338-339:** how to make the estimation of uncertainties?
- **Line 82:** the reference here should be Huang et al., 2014.
- The distinction between SOA and POA based on OC/EC measurements is debatable. I recommended using some AMS data, published a lot during the last decades in the Beijing-Tianjin-Hebei region, to validate.