

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-32

Anonymous Referee #1

Referee comment on "Tracer-based source apportioning of atmospheric organic carbon and the influence of anthropogenic emissions on secondary organic aerosol formation in Hong Kong" by Yubo Cheng et al., Atmos. Chem. Phys. Discuss.,
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The authors reported measurement results of ambient particulate matter in Hong Kong using detailed chemical speciation methods. The results of the speciated organic portion by GC-MS suggested dominant contribution of secondary organic carbon (SOC) to total organic carbon (OC) measured. Focusing on the loading and sources of SOC, the authors used positive matrix factorization (PMF) and tracer-based method (TBM) to quantify the concentrations and source contributions of SOC in Hong Kong. Results showed that these two methods tracked well, but the latter method gave a much lower SOC loading compared to the former method (by a factor of 4). The authors went on to use linear correlation and multi-linear correlation to explore the relationships between different SOC types with other air pollutants or indicators, and found that nitrogen oxides (both NO_x and NO₃) and sulfate might play important roles in SOC formation in Hong Kong.

This is a rigorously performed field measurement study with very detailed chemical speciation information on ambient particulate matter in a typical urban environment in South China. The chemical characterization, data analysis, and discussion are scientifically sound. The manuscript is fairly well written. I therefore recommend Minor Revision with some comments provided below.

Major:

- I was a bit confused about how different sub-types of SOC were calculated. On P11/L304, the authors showed that SOC_BB was calculated from OC_BB. But where was OC_BB from? The "BB/SOA" factor from PMF analysis? In addition, where were SOC_SOA and SOC_SS calculated from? The organics (since mostly polar and believed to be SOA species) in the "SOA" and "SS" factors from the PMF analysis? It would be better to have some description on how the concentrations of those sub-types of SOC were obtained.
- Section 3.4: I am not fully convinced that a good correlation between daily concentrations of SOC factors and daily concentration of NO₃ can support the statement that oxidation by NO₃ radical plays a very important role in SOC formation (although this process might actually be important in Hong Kong, to be confirmed by other evidence). In the daily average concentrations, the diurnal profiles are not reflected, but the most likely case would be that most SOC factors would have peak concentrations during day time, while NO₃ would have a peak concentration at night time (although one cannot completely exclude some presence of NO₃ at daytime). Therefore, a good correlation between SOC factors and NO₃ can at most suggest an indirect relationship between the two.

Minor:

P2/L16: monoterpenes to monoterpene

P2/L30&31: please add "and" before the last item of a list.

P8/L203: I do not see any relevance to HO₂ channel from the discussion above. The paragraph is mainly about ring-opening reaction of IEPOX under conditions of high LWC and low pH. Am I missing something here?

P10/L269-289: better to put this detailed description of PMF in the Method section.

P13/L364: just "Offenberg et al. (2017)".

P14/L390: mass to air mass?

P15/L410: better use proper scientific notation, instead of engineering notation, for the temperature-dependent rate constant.