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Comment on acp-2021-32

Anonymous Referee #2

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., https://doi.org/10.5194/acp-2021-32-RC2, 2021

The authors have carried out comprehensive chemical characterization of atmospheric aerosols and investigated the contribution of different sources to aerosol mass under various atmospheric conditions using positive matrix factorization (PMF) and tracer-based method (TBM). This work provide new valuable field data to better understand the sources, formation and composition of atmospheric aerosols in HKSAR. The paper is well written. However, I have one question about the data analysis.

Major comment

My major question is about the aerosol sample collection and some parts of the data analysis. Line 82, "A high-volume air sampler was used to collect PM2.5 onto a quartz fiber filter (20 cm × 25 cm) at a flow rate of 1.13 m3 min-1 for 24 h.". Could the authors provide more details on how they obtain the 24-h or time averaged values for some parameters (such as NO3, particle acidity (HP+) and particle liquid water content (LWCP)) in their study? Further, the authors have conducted the correlation analysis of SOC terms with O3, NO2, SO2, OX, NO3, sulfate, particle acidity (HP+) and particle liquid water content (LWCP). Given 24-h samples were collected, could the authors comment how to quantify the effect of NO3 on the formation of atmospheric aerosols using 24-h samples? Same question for some species which have photochemical origins like O3. Could the authors also comment on this?

Minor comments

Line 99, "Air pollutants origin from the northern PRD region can travel together with air masses and transport into Hong Kong. Same as in our previous study (Hu et al., 2010; Ma et al., 2019), we carefully examined the air mass backward trajectories, the spatial

distribution patterns of SO2, the concentration levels of both PM2.5 and O3, and the synoptic weather conditions during the sampling period." Please provide this information in the supplement for reference.

Line 123, " We then categorized all sampling days into three groups, i.e., days mainly influenced by the regional pollution from the PRD region (regional days), days influenced by long-regional transport of air mass from the northern and eastern China (LRT days), and days dominated by the locally generated pollutants (local days)." Could the authors provide the guidelines or justifications for this classification.

Line 180, "We applied the Kintecus kinetic model to quantitatively evaluate the fractions of these two Isop_SOA intermediates that undergo gas-phase oxidation, aerosol-phase acid-catalyzed ring-opening reaction, and dry deposition processes. Details of the model calculations were provided in the appendices." Do the authors run the model with the 24-h averaged values? With time revised data (if available), how would the simulated results vary with the hour of the days and day of the years (or different seasons) in this study?

Appendices, Line 476, "Simulation time was set to be 100 h to ensure the completion of reactions." Why the simulation time was set to 100 h? Also, why the completion of reactions was assumed in the simulations? How the variation of the parameters during the day and over the year would affect the simulations?

Line 212, "This seasonal trend of monoterpene SOA tracers may be partly due to the lower mixing height and temperature during autumn/winter, which favored the partition of Mono_SOA tracers onto the aerosol phase." Has this correction applied to all samples?

Line "353, "It has been well noted that results obtained from this tracer-based method are subject to potential uncertainties from various aspects, e.g., the larger variation of precursor concentrations and more complicated environmental conditions in the real atmosphere than in smog chamber experiments, the decay of some tracer compounds during transport, mismatch of ambient and smog chamber generated SOA compositions, using surrogates other than ketopinic acid for the quantification of tracer compounds, and so on (Ding et al., 2014; Hu et al., 2008; Kleindienst et al., 2012, 2007)." Could the authors comment more quantitively how these factors would affect the results in this study?