

Comment on acp-2022-603

Anonymous Referee #1

Referee comment on "Biogenic and anthropogenic sources of isoprene and monoterpenes and their secondary organic aerosol in Delhi, India" by Daniel J. Bryant et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-603-RC1>, 2022

The manuscript titled "Biogenic and anthropogenic sources of isoprene and monoterpenes and their secondary organic aerosol in Delhi, India" investigates the concentration trends in precursor gas-phase emissions of isoprene and select prominent monoterpenes, and the resulting secondary organic aerosol in Delhi.

The paper is properly structured and well-written, and, there is a nice effort on the part of the authors to thoroughly explain the trends they observed in their ambient measurements. I think this work is suitable for publication in ACP after some minor issues are resolved.

- One of my major concerns is that even though the title says "secondary organic aerosol", the SOA section of the paper almost entirely revolves around the NOS and OS species in SOA from isoprene and/or monoterpenes, which constitute a small fraction of the total SOA. Either the relevant discussion sections should be expanded to include some broader details of SOA from these precursors, or, the sub-section titles should be changed to more accurately represent the discussion contained therein.
- Based on the title, I was very curious about the anthropogenic sources of isoprene and monoterpenes in Delhi. However, I think that potential anthropogenic contributions are not discussed sufficiently in the paper. For example, correlations with CO are briefly discussed, and biomass burning and VCPs are hinted at as likely contributors. But this is all general information and as a reader, I am not able to gain significant insights into anthropogenic sources of terpenes in Delhi. I would appreciate seeing some correlations of compounds of interest with D5 or Benzyl alcohol. D5 can be measured via GC techniques so it would be useful to include at least some information on it (e.g. temporal trends even if ion abundance-based). Delhi is densely populated and characterized by a lot of street activity with temperatures reaching 30-40 C (pre-monsoon) so I would assume that there should be D5 in Delhi's air.

Additional comments:

- Section 2.3: Please add some sentences about the mass resolution of the spectrometer. Also, it would be good to add a brief discussion (3-4 sentences) about the quantification method before citing Bryant et al. 2021.
- Figure 3 (e,f): α -pinene concentrations do not show significant dilution during pre-monsoon daytime conditions when compared to post-monsoon. This is despite the daytime PBLH being substantially higher during pre-monsoon than post. Shouldn't your discussion in lines 405-408 apply here? Is there an explanation for this?
- Lines 497-499: Shouldn't low ventilation and stagnant conditions lead to greater accumulation and higher concentrations of isoprene and sulfate? Or the magnitude of sources also drops?
- Line 505: Please be consistent in using "sulfate" versus its formula in the text.
- Line 577: Adding a brief discussion on C₉H₁₆O₆S (or citations) would be of help here to an unfamiliar reader, especially since it contributes a large fraction to the OS(MT) mass. Is this species consistently observed in OS(MT) across different sites?
- Lines 582-587: The authors should discuss what changed between pre- and post-monsoon around the site that led to seasonal variation in the significance of atmospheric reaction chemistry (e.g. MT+NO₃ being more important in post-monsoon).
- Lines 636-638: This sentence is confusing. qSOA is all isoprene and monoterpene derived species. So how come the fractions are not all 100%?
- Line 608: Are the higher post-monsoon concentrations of monoterpenes only due to lower PBLH or are the source profiles any different?
- Line 643: There should be some discussion in the methods section on how were the iSOA tracers quantified using an ACSM.
- Please proofread the manuscript for typos (e.g. line 434: "tarcers"; line 476: "update"; line 477: "into to").