

Interactive comment on “Source characterization of volatile organic compounds measured by PTR-ToF-MS in Delhi, India” by Liwei Wang et al.

Anonymous Referee #2

Received and published: 27 March 2020

The authors performed measurements of VOCs, NO_x and CO at two locations in New Delhi, India: an urban and a suburban location. For VOC measurements, two proton transfer reaction time of flight mass spectrometers (PTR-ToF-MS) were used. VOC data was interpreted using positive matrix factorization (PMF). The authors find six factors explaining observations for both sites reasonable well: Traffic1, Traffic2, Solid-FuelCombustion1, SolidFuelCombustion2, Secondary1 and Secondary2. Overall, the manuscript is suited for publication in ACP after revisions.

Specific comments:

1) The authors explain that they excluded ions such as methanol, acetaldehyde, acetone, and acetic acid with extremely high mixing ratios. A comprehensive list would be useful; I assume it also includes Formaldehyde, (which is hard to quantify with PTR-

Printer-friendly version

Discussion paper



MS, but it would be worth mentioning). It would be useful to quantify all ions not taken into account, and plotting a diurnal cycle of these compounds. Although I'm not an expert in PMF, I wonder if downscaling these signals before feeding it to the PMF algorithm would solve the issue that these signals dominate PMF factors. More discussion is needed on that.

2) Diurnal patterns of Traffic1 and Traffic2 in Figures 3 and 4 are quite similar; Assigning Traffic2 to heavy-duty vehicles seems to be problematic, since the diurnal pattern of this factor is very close to zero (including its 90th percentile) from 10 am to 5 pm, which is exactly the time window where the ban of heavy-duty vehicles is lifted.

3) (Line 245+:) Are there numbers on how much traffic increased in New Delhi during the last two decades? Is traffic really the dominant VOC source when large VOC signals are not accounted for in PMF (acetone etc.)

4) Evaluation of biogenic VOCs: Line 359: please avoid "very low" and similar ill-defined expressions; I don't think that 0.46 ppbv is "very low"; Personal care products may be another possible source of Monoterpenes.

Technical comments:

Abstract: avoid abbreviations "IITD" and "MRIU" Line 44: no need for "natural" when talking about BVOCs Line 54: "high atmospheric reactivity and higher SOA yield" - need reference Line 64: "The critical air quality problems have left India with high death rates from ..." need reference or numbers Line 71: "..., a comprehensive investigation *of* VOC pollution levels..." Line 75: "..pointed out the lack of ..." Line 93: "The study site is approximately 150 m north of a busy street and surrounded by several streets as well" - unclear Line 97: "The site is located to the southeast of higher elevation terrain as shown in Figure 1" - unclear Line 116" use the term *reduced* electric field (E/N) Line 124: *Volume* mixing ratios Line 125: Please add a note of how and how often background measurements were performed Line 203: "... nor included in the PMF analysis ..." -> "... or not included in this PMF analysis ..." Line 208: please

[Printer-friendly version](#)[Discussion paper](#)

define "very high" Line 252: "These ions are tentatively attributed to phenolic compounds and furans" - reference needed Line 279: "However, many of these ions can be formed rapidly during daytime and may have a short lifetime owing to partitioning to the condensed phase and/or heterogeneous processes" - please re-phrase: I think this is suggested by the data, not by the identity of the compounds. Line 287: "Major fractions of alkyl nitrates (RONO₂) are detected as (ROH+H⁺) fragment ions by the PTR-ToF-MS" - please cite Aoki et al: "Detection of C₁–C₅ alkyl nitrates by proton transfer reaction time-of-flight mass spectrometry" or similar Line 350: "But more importantly, differences in SecVOC *is probably owing to that chemical ...*" - please rephrase; hard to follow.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-11>, 2020.

[Printer-friendly version](#)[Discussion paper](#)