

Atmos. Chem. Phys. Discuss., referee comment RC2  
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## **Comment on acp-2022-179**

Anonymous Referee #2

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Referee comment on "Contributions of primary sources to submicron organic aerosols in Delhi, India" by Sahil Bhandari et al., Atmos. Chem. Phys. Discuss.,  
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### **Reviewer Comments on manuscript titled "Contributions of primary sources to submicron organic aerosols in Delhi, India" by Bhandari et al. submitted to ACP Discussions**

This work by Bhandari et al. utilizes their companion study (Bhandari et al., 2022 AMT Discussions) that proposes a time-resolved method for source apportionment using the underlying approach of positive matrix factorization (PMF), also referred as "time-of-day PMF" and demonstrated statistical improvements over the traditional PMF (uncertainty owing to static mass spectral profiles). Delhi, India is one of most polluted megacities on Earth, with inarguably one of the highest Primary Organic Aerosol (POA) concentrations anywhere. This study critically focusses on Delhi to quantify the contributions of different POA components: BBOA (biomass burning), COA (cooking), and hydrocarbon like organic aerosol (HOA, from anthropogenic fossil fuel combustion) by applying "time-of-day PMF" (diurnal profiles as a result) on two seasons (winter and monsoon 2017) using OA measurements from an Aerosol Chemical Speciation Monitor (ACSM). They utilize the EPA PMF tool with the underlying Multilinear Engine (ME-2) as the PMF solver, and conduct detailed uncertainty analysis for statistical validation of their results. Assuming that the companion AMT manuscript will eventually go through final publication without any technical modifications in its method (given it's the bulk of the "Method" section of this paper as well), I think this work is very significant for better design policies to mitigate pollution in Delhi or National Capital Region (NCR, in vicinity of Delhi) caused by relevant primary sources of organic aerosols as analyzed in detail with the time-resolved component in this study.

I will suggest publication of this work, after the following comments are addressed by the authors:

#### **General comments:**

- Will suggest the authors to include updated citation of the finally published companion Bhandari et al., 2022 AMT paper as its it's the bulk of the underlying principle/Method of this section. That would be ideal before publishing this work. Any modifications/edits to the companion AMT paper on its final publication should be accommodated in current work (ideally before a final draft is accepted, if possible or as an addendum later).
- The current study needs to further decipher the identification of different markers for the presence of cooking organic aerosol (COA) based on the variability in cooking fuels or technology in Indian context (more regulated liquified petroleum gas connections vs wood or residual burning using open stoves- also presents a pragmatic contrast within different COA sources in Delhi), which is currently missing in the current discussion (Lines 385-395). It's understandable if it is beyond the scope of current study, but should be in that case, mentioned as a limitation of the current study that needs further exploration.

### **Specific (minor) comments:**

**Line 70:** Please refer '... and co-workers' as '... et al. (YEAR)' consistent with other instances in the manuscript text (rephrase Lines 70-72 accordingly, edit other such instances in the manuscript accordingly).

**Lines 96-97:** Add space between ' $\mu\text{g}$ ' and ' $\text{m}^{-3}$ ' (applies to similar other instances in the manuscript text).

**Lines 99-101:** Same point about citation being consistent: Rooney et (2019) and Rooney (2019) in consecutive lines, although it's the same reference. Try to keep citation of a paper consistent throughout the manuscript.

**Lines 104 and 133-134:** Please clarify the full form of any abbreviation at its first use in the manuscript, i.e. non-refractory (NR) and ACSM in this case at Line 104 instead of Lines 133-134. Similarly, apply for any similar instances in the manuscript.

**Line 185:** Rephrase "have been described previously" to "have been described in previous literature".

**Lines 291-304 (Section 3.1.1):** More discussions/hypothesis and/or details are needed on why there exists inconsistency in HOA average contributions to OA compared with previous studies? For instance , is difference in meteorology in different years between

different studies a factor as well besides the difference in profile of emission sources at site(s) between different studies?

**Line 351:** "relatively high volatility of BBOA": oxidized BBOA is low-volatility OA and more explanation needed here on why monsoons won't exhibit much of low-volatility oxidized BBOA?

**Figs 2 and 3:** Add "Monsoon 2017" and "Winter 2017" labels respectively to Figs. 2 and 3. (Applies to other figures also)

**Section 3.1.3:** more clarity is needed on the rationale or necessity of doing "Winter-to-Monsoon" and "Monsoon-to-Winter" weighing on diurnal PMF

**Figures 4,7 and 10:** Author(s) should consider combining/rearranging parts of Figures 4,7 and 10 based on if they are for Winter 2017 and Monsoon 2017. Also discussions pertaining to these figures in Section 3 can also be further synthesized to improve readability.