

Comment on amt-2022-76

Anonymous Referee #3

Referee comment on "Source apportionment resolved by time of day for improved deconvolution of primary source contributions to air pollution" by Sahil Bhandari et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-76-RC2>, 2022

General Comments:

The manuscript by Bhandari et al. presents an innovative application of the PMF for long term and highly time resolved datasets. The fact that various sources influence a site at specific hours throughout the day, running PMF at different time of the day appears to be a logical approach, as it also allows for more MS variability. The application of this time-of-day PMF on a long term ACSM dataset (Delhi, winter and monsoon 2017) improved the source apportionment of OA, by further separating source-specific POA compared to results obtained with standard seasonal PMF. This paper is clearly written and relatively well structured. Some minor comments need to be addressed before being accepted.

Minor Comments:

- "Results from PMF analysis for all times of the day are presented in a companion paper (Bhandari et al., 2022)." I find that at least a brief overview of the different factors observed for all time-of-day results should be described in the supplement. Indeed, the change in POA factors from non sequential time-of-day, here 11am-15pm and 23pm-3am, is possible assuming dilution, atmospheric processing, or drastic change in air masses influencing the site. While, for time-of-day following one another (e.g. 11am-3pm and 3pm-7pm), I wonder if POA factors and their concentrations show a decrease before disappearing at a later timing (e.g after 7pm). Reconstructing the diurnal profiles of all POA and SOA of all time-of-day results compared to seasonal one could support the advantage of the new approach.
- Table S2: how do you explain the differences in term of mass concentrations for OOA during W172303 even though similar factors are identified with both PMF type?

- Page 7 line 215: You mentioned that focusing on the 11am-15pm time of day “we expect to see more oxidized aerosols”. Two SOA were identified regardless of the type of PMF applied. Is the ACSM mass resolution limiting further separation or could it be that some of the seasonal SOA are identified as oxidized POA in the time-of-day PMF (e.g oxidized BBOA)?
- Page 7 line 222: “Future work should investigate the optimal length of the time window to sufficiently represent the diurnal variations in mass spectral profiles while managing computational burden”. I also think that more explanations should be provided regarding your choice of using a 4 hours window and to focus on 11-15 and 23-03.
- Adding the F44 vs F43 diagram could help segregating the different type of OA.
- Figure 3 and later: keep consistent writing of the unit “ $\mu\text{g m}^{-3}$ ” in text/captions/figures (main text and SI).
- Lines 389-390: change “at” to “in the afternoon”.
- I think that the different MS identified for the time-of-day PMF would add more value to the discussion and would be more useful in section 3.2.1 and 3.2.2 instead of having them in the SI.

Supplement:

- Page 3 line 32 and 35: Please, correct the reference and add punctuation “Fig. S2a–S” and “Fig. S3a–S”
- Fig S14 and Fig S15: I suggest to put in parallel day (a,c,e) and night (b,d,f) time-of-day results for easier comparison.