

We thank both referees for their comments and provide here a point-by-point reply to the remarks submitted by anonymous referee 2 (in black font) in this document. Our reply is provided in blue font. Changes in the manuscript are available through the attached track-change version.

Anonymous Referee #2: General comments: The manuscript is generally well-written and straightforward to follow. It documents greater details of OA composition in “a region of scarce data availability”, so would be of value to extend available literature on BB OA in this region. After some specific comments and many technical corrections are made, the manuscript would be suitable for publication. In particular, there are lots of technical errors with figure captions and style. A major though technical suggestion would be to revise clustergram color scheme and its color scheme referenced in subsequent figures so it is red-green color blind accessible.

Reply: We thank the referee for their availability and the generally positive feedback. We have corrected the technical errors and revised the color scheme of the separation of low-, medium and high-BB days. Specific comments are addressed below.

Specific comments

1. Clustering analysis color scheme used throughout figures: The use of green and red for 2/3 clusters throughout the figures without marker type changes would be confusing for any reader with red-green color blindness. Would recommend revising the selected color scheme throughout figures and text and/or implement line type and marker type changes in figures to aid.

Reply: We changed the color scheme highlighting the different periods and added different symbols when applicable.

2. Line 270: Rephrase the part following “...volatilization,” as I think authors are trying to say that absorption leads to these compounds becoming trapped into the particle phase rather than emitted via absorption

Reply: Yes, the referee is right. We rephrased the sentence to clarify.

3. Line 341: rephrase to “...nitrophenols can rapidly form from monoaromatics photooxidation or their reactions with nitrate radicals.”

Reply: We have revised the discussion around nitrophenols further based on comments from referee 1.

4. Line 342: rephrase sentence for clarity

Reply: Done.

5. Line 344: why do the authors suggest nighttime transport here given that they state 4-NC formation is fast at night? Is there something about the back trajectories that support formation of 4-NC away from site and transported at nighttime vs daytime to sight? Seems too speculative.

Reply: We thank the referee for the comment. Generally, nitrophenols may be of primary origin, or formed as secondary compounds during atmospheric aging (see, for instance, also a recent article by Salvador et al., 2021). The atmospheric aging might be initiated during day-time (primarily through OH radicals) or at night-time (primarily through NO₃ radicals). However, their formation depends on the availability of high NO_x levels (in particular NO₂). Owing the photo-labile nature of NO₂ as well as the nitrophenols themselves, we suggested that nitrophenols during dark periods (night) might be the more prominent way of nitrophenol formation in our samples. However, as the samples

integrate over 24 hours, we cannot decisively conclude on the prominent pathway. We have revised the discussion around nitrophenols also based on comments from referee 1; please see the track-changed version.

6. Introduction and Conclusions sections: The manuscript could provide greater appreciation to readership by additional text providing recommendations on what further data/measurements are needed in this area going forward and what larger scale atmospheric problems are to be addressed here. How does BB at PDI differ from other areas impacted by high BB influence referenced throughout (tropical forests, etc).

Reply: We thank the referee for this valuable comment. We have revised Abstract, Introduction and Conclusions to address the wider impact of our results. As also highlighted in our reply to referee 1, data from PDI are particularly useful to study recurrent large-scale biomass burning (BB) on the Indochinese Peninsula. BB is a globally widespread phenomenon, and emissions characterization of high scientific and societal relevance. The fires release pollutants, which are harmful for human and ecosystem health and alter the Earth's radiative balance. Yet, the impact of various types of BB on the global radiative forcing remains poorly constrained concerning greenhouse gas emissions, BB organic aerosol (OA) chemical composition and related light absorbing properties. Fire emissions composition is influenced by multiple factors (e.g., fuel and thereby vegetation-type, fuel moisture, fire temperature, available oxygen). Due to regional variations in these parameters, studies in different world regions are needed. PDI is well suited to study the large-scale fires on the Indochinese Peninsula, whose pollution plumes are frequently transported towards the site, and, because other urban pollution is comparatively low, can be studied almost undisturbed. Please have a look at the track-change version for the updated abstract, introduction and conclusions.

Technical corrections

1. Line 51: consider rephrasing sentence; unclear

Reply: Done.

2. Line 79: change quotation to comma in population number

Reply: Done.

3. Line 180: rephrase (1) insert “than” after “less” and (2) delete “of”

Reply: Done.

4. Line 247: delete “and” before “... the most abundant...”

Reply: Done.

5. Line 273: delete “were” before “...ranged from...”

Reply: Done.

6. Line 297: insert “do” after “nor”

Reply: Done.

7. Line 322: correct spelling of “concertation”

Reply: “Concertation” was changed to “concentration”.

8. Line 333: change “are” to “of” or rephrase sentence

Reply: Done.

9. Line 347: fix figure reference to figure 6

Reply: Done.

10. Line 445: insert “respectively, ” following the concentrations of OC and EC

Reply: Done.

11. Figure 2 not referenced in main text

Reply: Figure 2 was referenced in line 145 of the article.

12. Figure 3a right axis units should be ng/m³

Reply: Done.

13. Figure 3b) caption: language in caption regarding ratio of char-EC to soot-EC reversed from figure including description of dashed lines

Reply: We changed the order of ratios inside the figure.

Figure 5 caption: says left axes in units of ug/m³, but some axes show ng/m³ levels

Reply: The caption was changed to ng m⁻³.

14. Figure 7 caption: fix cross reference to section on clustergram analysis; not Section 3.3

Reply: Done.

References

Salvador, C. M. G., Tang, R., Priestley, M., Li, L., Tsiligiannis, E., Le Breton, M., Zhu, W., Zeng, L., Wang, H., Yu, Y., Hu, M., Guo, S., and Hallquist, M.: Ambient nitro-aromatic compounds – biomass burning versus secondary formation in rural China, *Atmos. Chem. Phys.*, 21, 1389–1406, <https://doi.org/10.5194/acp-21-1389-2021>, 2021.