

Point-by-point responses to Referee #3

We sincerely thank Referee #3 for the time and effort devoted to reviewing our manuscript and for the valuable suggestions, which have helped improve the clarity and quality of the paper.

We also thank the Editor for their careful attention and for handling our manuscript throughout the review process.

Minor corrections:

RC1:

p.26, L11: it feels more logical to have the sunlight experiment introduced fully here, and move it up from L14-16, as it's also used in Figure 10. Suggestion to move the rest of the sentence L14-16 to L23, after the discussion of Fig 10.

AC1:

We agree with this suggestion. The paragraph has been revised accordingly and now appears on p.18, L8–20 of the revised manuscript.

RC2:

p.30, L10-11: I suggest to phrase this a little differently, to avoid confusion: ‘This is evident from relative increase of C₈H₁₂O₄ in total liquid-phase products during the experiment with pure nitrogen, where it becomes the main product, despite a much lower overall production”

AC2:

Revised as suggested. The change is reflected on p.20, L7–9 of the revised manuscript.

RC3:

p.35: the reaction scheme needs some revision:

RC3a:

- reaction (1) and (3) are wrongly depicted: 4-BBA should only be excited AFTER the arrow with the $h\nu$, next a second arrow would lead from the excited (4-BBA*) to the products. Also, reaction (1) is not equilibrated – I would suggest to start the mechanism with reaction (3) where the 4-BBA radical is created from the H-abstraction on NA.

AC3a: (p24, L3-13)

We appreciate this observation. The reaction pathways have been reordered for clarity, and the accompanying description has been updated accordingly (p.24, L3–13 in the revised manuscript).

RC3b:

- Perhaps different colours could be used to indicate which compounds have been observed and which ones are purely speculative.

AC3b:

Implemented.

RC3c:

- An alternative for the formation of C₉H₁₄O₃ and C₉H₁₆O₄ could be the RO₂+RO₂ reaction, as suggested in reaction 5, after another H-abstraction from 4-BBA.

AC3c:

Added to the text (p.25, L2–4 in the revised manuscript).

RC3d:

- Reaction (8) seems a little unlikely, but this product is a ‘far’ evolved product, for which any reaction path presented will be rather unsure.

AC3d:

As noted in the text, the unstable product, C₂₃H₂₈O₇ likely undergoes rapid intramolecular rearrangement and fragmentation. This is also illustrated in the SI.

RC4:

Conclusion: p.44, L9-10: the differences between both studies could also be due to differences in volume, notably for the gas phase and of duration of irradiation (1h in Tinel et al, 3h here)

AC4:

Sentence revised accordingly (p.26, L8-9 in the revised manuscript)

Language and editing:

RC5:

p.2, L29: ‘...relevant in aerosols formation...’ this does not seem right, as this is not specific to aerosol formation – I think the authors mean product formation?

AC5:

Corrected (p.2, L23 in the revised manuscript)

RC6:

p.5, L16: please put the reference to Dommer et al. after '35 ppt'

AC6:

Corrected (p.4, L6 in the revised manuscript)

RC7:

p.6, L5: suggestion to replace 'urgently' by 'still'

AC7:

Corrected (p.4, L25 in the revised manuscript)

RC8:

p.7, L10 : not only for aerosols, please add 'and water surfaces'

AC8:

Added (p.5, L10-11 in the revised manuscript)

RC9:

p.7, L17: suggestion to replace 'but only report...' by 'explore their...'

AC9:

We opted to retain the original wording. "Explore their impact" could give the impression that we have comprehensively addressed the impact of pH and salinity, which is not the case. We report our observations and recommend detailed future studies.

RC10:

p.10, L1: Quartz window => A quartz window

AC10:

Corrected (p.7, L1 in the revised manuscript)

RC11:

p.10, L32: Ethanol => ethanol

AC11:

Corrected (p.7, L30 in the revised manuscript)

RC12:

p.15, L15: it should read 'the latter', please correct

AC12:

Corrected (p.11, L6 in the revised manuscript)

RC13:

p.17, L4-5: please precise which figure you are discussing here

AC13:

Revised accordingly (p.12, L19 in the revised manuscript)

RC14:

p.17, L9: '...between... with... 'please replace 'with' by 'and'

AC14:

Corrected (p.12, L24 in the revised manuscript)

RC15:

p.18, L6: 'This radical play a role... ': please correct to plays

AC15:

Corrected (p.13, L13 in the revised manuscript)