Answers to Editor

First of all, the authors would like to thank the editor for the suggestions. We have carefully replied to all its comments and the paper has been improved following its recommendations. Answers have also been provided for all comments and changes have been performed accordingly. Please find below the answers to the comments:

Line 175 : "nitrogen"

It has been corrected (L.176)

Figure 5 : It would be nice to have the literature data (Fry et al., 2014; Wu et al., 2021) for comparison in the plots.

The figure has been modified to show SOA yields taken from Wu et al., 2021; Jaoui et al., 2013 and Fry et al., 2014. The following sentence has been added in the caption of Fig. 5: "**For β-caryophyllene literature values are presented by squared marks.**"

Comment : Please discuss the findings by Wu et al., ACP, 2021 in comparison with your results.

The author want to thank the editor for this suggestion. The following discussions have been added :

"**Finally, Wu et al., 2021 studied the impact of photolysis on NO_3-generated SOA for β-caryophyllene. They measured a final SOA yield (110%) and provided particle-phase composition analysis, showing a major impact of organic nitrates. No yield plot was provided and β-caryophyllene concentration could not have been monitored using quadrupole-PTR-MS, due its m/z ratio outside of mass transmission range.**" (L. 69-74)

"**Finally, Wu et al., 2021 studied the photolytically induced ageing of NO_3-initated SOA. To do so, they first have generated SOA by reacting β-caryophyllene and NO_3. Experiment was conducted with 50 ppb of precursor, and a final SOA yield of 110 % is calculated. Two issues are pointed out: first, they could not monitor β-caryophyllene with a quadrupole-PTR-MS, because it was out of the mass transmission range for quantitative measurement. The method used to calculate its concentration is then not explained, but it is probably associated with a larger uncertainty. Second, a concentration of more than 200 ppb of N_2O_5 is injected during approx. 10s. As explained before, it can lead to an overestimation of SOA yield, and thus explain the observed difference. Nevertheless, the mean diameter of size distribution measured in this study is between 229 and 266 nm, which is in good agreement with the one measured here (between 225 and 246 nm in the end of the oxidation). This study showed no evaporation of SOA during a dark ageing, which confirm the fact that SOA concentrations are stable here, after the oxidation. They showed a major impact on SOA composition of photolysis in the case of β-caryophyllene, but, no photolysis was conducted in our study.**" (L. 409-421)

"**The study of Wu et al., 2021 carried out an identification of SOA composition. Hundreds of molecular compositions were identified using both FIGAERO-CIMS and EESI-TOF techniques, including a large majority of organic nitrates. C15 monomers are major products, as shown also in our study. C30 dimers have also been detected, but they are heavy products and out of the range of PTR-ToF-MS used in our study. In addition, the amount of dimers detected in particle phase can be explained by the reaction of hydroxynitrates with carbonyl compounds, via an acid-catalyzed particle-phase reaction leading to the formation of acetal dimers and trimers, as shown in Claflin and Ziemann, 2018.**
This study is in good agreement with the determination of organic nitrates in particle phase: a large amount of organic nitrates was detected, which confirm their prominence in SOA formation for β-caryophyllene + NO_3 system. Most of the products were too heavy to be detected in our study, but two major ones are $C_{15}H_{24}O_2$

(MW=236 g/mol) and $C_{15}H_{25}NO_5$ (MW=298 g/mol). They have been identified here as opening ring products. It confirms the importance of these two products in β-caryophyllene + NO_3 chemistry." (L. 634-645)

The following references have been added :

"**Claflin, M. S. and Ziemann, P. J.: Identification and Quantitation of Aerosol Products of the Reaction of β-Pinene with NO3 Radicals and Implications for Gas- and Particle-Phase Reaction Mechanisms, J. Phys. Chem. A, 122, 3640–3652, https://doi.org/10.1021/acs.jpca.8b00692, 2018.**"

"**Wu, C., Bell, D. M., Graham, E. L., Haslett, S., Riipinen, I., Baltensperger, U., Bertrand, A., Giannoukos, S., Schoonbaert, J., El Haddad, I., Prevot, A. S. H., Huang, W., and Mohr, C.: Photolytically induced changes in composition and volatility of biogenic secondary organic aerosol from nitrate radical oxidation during night-to-day transition, 21, 14907–14925, https://doi.org/10.5194/acp-21-14907-2021, 2021.**"