General comments:

This manuscript presents SOA formation from the reactions of BTX and related phenolic compounds. The authors have used a suite of online and offline analytical instruments to characterize the gas- and particle-phase products. Notably, the authors claim that the electrospray ionization mass spectrometry data indicates the presence of bicyclic hydroperoxides in SOA formed from the oxidation of the aromatic compounds. While these results are interesting, the chemical formulae suggested from the ESI/APCI-TOFMS data are not sufficient enough to prove the existence of the bicyclic hydroperoxides in SOA. Before this work can be published in ACP, the authors are requested to perform additional analytical work to provide much more solid evidence to substantiate the findings shown in the current version of manuscript.

Specific comments:

P2026-P2027: The last paragraph of the introduction is not well written and it does not connect well with the rest of the introduction. It is difficult for me to understand from this paragraph if the authors aim to evaluate "phonelic hydroperoxides" or simply "phenolic compounds" as intermediates for aromatic SOA formation. In my opinion, the last paragraph does not indicate the focus of the present study well.

P2026, L14: 'first possible detection'. Can the authors provide concrete evidence for the detection of bicyclic hydroperoxides? It is hard to elucidate molecular structures (not chemical formulae) simply from direct infusion ESI/APCI-TOFMS analysis. This is also the same for PTR-MS data which has much lower mass resolution than the ESI/APCI-TOFMS data. Such sentence should be reserved for those molecules that are positively identified from the comparison to authentic standard compounds or NMR analysis. MSMS, post-column derivatization or NMR data is desirable to prove the presence of bicyclic hydroperoxides.

P2027, L1: "Low NO_x conditions" should be "low NO_x and high HO_x conditions".

P2030, L1: 'achieved done' → 'achieved'

P2030, L5: What are the reasons to use mixed mode ionization? Do the authors see significantly different data from ESI/TOFMS or APCI/TOFMS data? Most of phenolic compounds can be detected using ESI/TOFMS. Since no chromatographic separation was employed before the ESI/APCI-TOFMS detection, the TOFMS data provided in this study likely suffers from the artifact formation in the ion source. How confident are the authors that the ESI/APCI-TOFMS data are free from the ion source artifacts?

P2030, L7: 'negative polarity mode' → 'negative ion mode'

P2030, L9: 'Time-of-Flight' or 'ToF' → 'TOFMS'

P2030, L9: 'a online' → 'an online'

P2030, L10: 'PILS-TOF' → 'PILS-TOFMS'

P2030, L15: 'Table 2' → 'Table 1'

P2030, L15: Experimental conditions and artifact formation. The mixing ratio of H_2O_2 is an inherited problem. Extremely high mixing ratio of HO_2 radical may steer towards the formation of peroxy compounds. The authors need to discuss a potential issue arising from high H_2O_2 mixing ratio.

P2032: The section 3 is split into a number of small subsections that are less than 10 lines. Most of these sections are rather descriptive and do not provide detailed interpretation of the data.

P2032, L12: 'studies(Table 2)' → 'studies (Table 2)'

P2032, L13: 'Boge' → 'Böge'

P2033, L13: The authors assume that the m/z data obtained from the PTR-MS is $[M + H]^+$. It is known that the proton transfer reactions in the ion source do form ions other than $[M + H]^+$ ions due to fragmentation or H_2O adduction formation. In addition, have the authors considered a potential artifact formation from the reaction of OH radicals in the ion source? It is often ignored - the formation of $H_3O^{+\cdot}$ yields an equivalent amount of OH radical in theory ($N_2^{+\cdot} + H_2O \rightarrow N_2 + H_2O^{+\cdot}$, $H_2O^{+\cdot} + H_2O \rightarrow H_3O^{+\cdot} + OH^{\cdot}$).

P2033, L15: 'A m/z 171' → 'An m/z 171'

P2034, L23: '$C_6H_8O_6$ formation' → '$C_6H_8O_6$ compound'

P2035, L7: Can the authors suggest the formation mechanisms for these compounds? It's hard to imagine OH addition for these compounds.

P2035, L9 "3.8 Implication": This section does not add much to the manuscript. I feel 'Outlook' more suitable than 'Implication' for this section. - I suggest combining this section with the conclusions.

P2042 Table 1: Please provide higher resolution images for chemical structures.

P2045 Table 3: 'Phenolicroute' → 'Phenolic route'