

Atmos. Chem. Phys. Discuss., referee comment RC2 https://doi.org/10.5194/acp-2021-587-RC2, 2021 © Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.

Comment on acp-2021-587

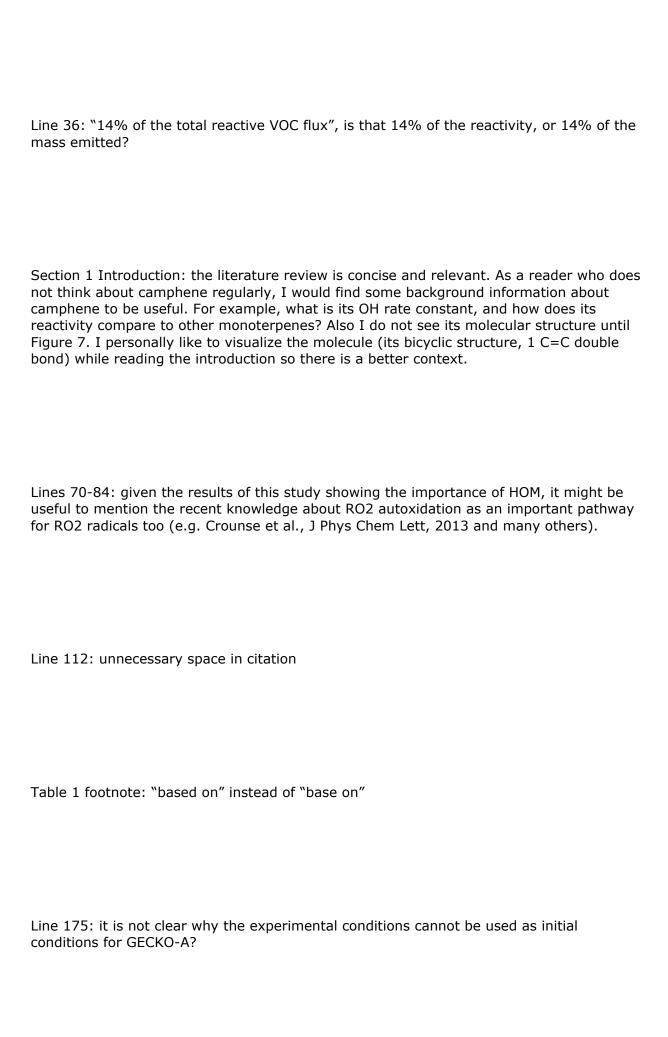
Anonymous Referee #2

Referee comment on "Secondary organic aerosol formation from camphene oxidation: measurements and modeling" by Qi Li et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-587-RC2, 2021

In this work, the authors studied oxidation of camphene and the resulting secondary organic aerosol (SOA) formation. Most studies have shown that monoterpene SOA yields decrease with increasing NOx, but this study shows the opposite for camphene. To understand this trend the authors combined chamber experiment results with detailed gasphase (SAPRC) and aerosol formation (GECKO-A). They showed that NO increases the formation of radical intermediates that can isomerize rapidly to form highly oxygenated molecules (HOMs) which have very low volatilities. This study is beautifully done and provides an elegant explanation to a complex phenomenon. I am particularly impressed with how the authors integrated modeling with experimental results and provide a fundamental understanding of this system. I highly recommend publication, after addressing the following minor comments:

The only overall question that I have is how this can be generalized to other systems. What is unique about camphene that NO actually increases the formation of HOMs? We tend to think that NO and HO2 promotes termination reactions, but in this case NO turns the radicals into an "isomerizable" form. Is this unique to camphene, or should we start looking for these pathways in other systems? Could this happen to, for example, sesquiterpenes, which may be an alternate explanation to the higher yields under higher NOx?

Line-by-line comments:



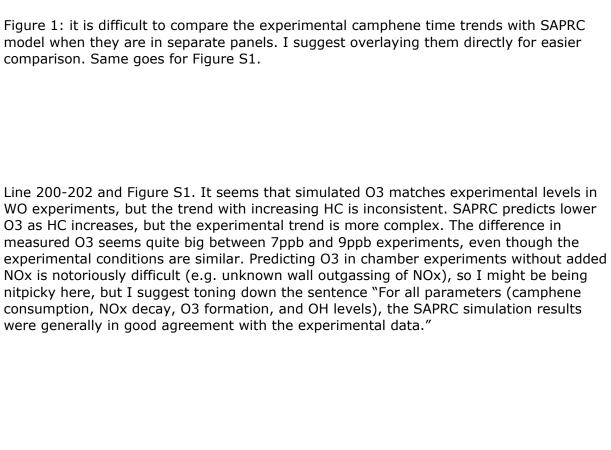


Figure 7 and Figure S4: After OH addition, the diagram shows that the alkyl radical with a resonance structure (the lone electron is spread over 3 carbons), but I don't think that is true. It is just a tertiary radical.

Table 4. VBS parameters: the c^* are presumably the c^* , not the log of c^* (which would be -1,0,1...) If that is the case, the 2^{nd} row should be $c^* = 1$ ug/m3 (not 0)

Section 4.2 This is a really well written section that shows the most interesting results. It is also nice to see that the change in c^* can also be reflected in the VBS parameters. This might be coincidental, but one can see a single alpha of no added NOx at c^* of 10 ug/m3, suggesting dominance of semivolatile material. With NOx, there is a significant amount of nonvolatile material ($c^* = 0.1$ ug/m3), and these trends are consistent with the predicted vapor pressures from GECKO-A.

