

Atmos. Chem. Phys. Discuss., referee comment RC2  
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## Comment on acp-2022-376

Anonymous Referee #2

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Referee comment on "Oligomer formation from the gas-phase reactions of Criegee intermediates with hydroperoxide esters: mechanism and kinetics" by Long Chen et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-376-RC2>, 2022

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This paper has investigated the oligomerization mechanisms and kinetics of distinct stabilized Criegee intermediates with HCOOH and their products using quantum chemical and kinetics modeling methods. Also, the effect of methyl groups on the oligomerization were discussed.

However, a deeper discussion is required for the data in this paper. For example, in lines 263-266 "At room temperature,  $k_{\text{tot}}$  is estimated to be  $3.6 \times 10^{-10} \text{ cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$ , which is greater by a factor of  $\sim 3$  than that reported by Welz et al. (2014) ( $[1.1 \pm 0.1] \times 10^{-10} \text{ cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$ ), Chung et al. (2019) ( $[1.4 \pm 0.3] \times 10^{-10} \text{ cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$ ), and Peltola et al. (2020) ( $[1.0 \pm 0.03] \times 10^{-10} \text{ cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$ )". What is the reason for the difference of the  $k$  value about three times?

Furthermore, this paper should also exhibit some extended discussions about atmospheric implications of these reactions and their products. For example, what is the role of the formed oligomers on the atmosphere? It follows in the requirements of ACP journal "The journal scope is focused on studies with important implications for our understanding of the state and behavior of the atmosphere. Articles with a local focus must clearly explain how the results extend and compare with current knowledge".

Hence, as a quick assessment, some deeper and extended discussions should be required and strengthened, such as the nature of the reactions, the detailed atmospheric implications, if this paper is published in the ACP journal.