Review of "Atmospheric impact of 2-methylpentanal emissions: Kinetics, photochemistry, and formation of secondary pollutants" - egusphere-2023-1616

This excellent paper details experimental studies of the decomposition 2-methylpentanal (2MP) in air. A variety of techniques were employed to determine photochemical parameters for 2MP photolysis, and reactions with OH and Cl-atoms. The atmospheric implications of these results have been assessed and lifetimes for the three breakdown pathways have been evaluated in different scenarios. I strongly recommend publication in ACP, subject to consideration of the following corrections / suggestions for improvement:

- Results, e.g. rate constants are presented to three significant figures throughout. Is there any justification for this degree of precision? The standard error values associated with many of these results would suggest not, e.g. line 193 (and also in table below), k_{Cl} = (2.21 +/- 0.35), whereas conventionally this would be reported as (2.2 +/- 0.4) due to the size of the standard error.
- There is some discussion in section 4 around the contribution of 2MP and its breakdown products to photochemical smog formation. Jenkin and co-workers have presented a straightforward rubric whereby these effects may be quantified via calculation of POCP estimates. https://doi.org/10.1016/j.atmosenv.2017.05.024
  Such an analysis should be done in this work and would offer the opportunity to quantitatively compare the impacts of 2MP to similar compounds.
- Conclusions mention (line 331 – 332) contributions to acid rain via HCl formation. Whilst I appreciate that HCl was detected from the Cl + 2MP experiments, I cannot imagine a real-world scenario where emission of 2MP would make any difference to HCl budgets. Any Cl-atoms would be rapidly converted to HCl via other more common VOC, whether or not 2MP was emitted. Further, the following line "regions where Cl2 emissions are prevalent" is odd. There have been many reports of ClNO2 impacting on oxidant budgets via Cl-atom formation; direct Cl2 emissions would be uncommon across most of the globe. I suggest you remove these lines from the conclusions, or back-up assertions around HCl / Cl2 with explicit referencing.

More trivial / typographical:

Abstract – I am unconvinced it was helpful to detail acronyms in the abstract. FTIR, PLP-LIF and SOA are in such common usage that I would not bother with long form "Fourier Transform…" If this contravenes editorial policy, then write the long form but drop the acronym.

Introduction line 27 should be "particulate matter" not "the particulate matter"

Line 106 title 2.2.2 – italic "T" in $k(T)$

Experimental line 121 section 2.3 title is not very descriptive – suggest "Product studies of 2MP reactions with Cl (R2) and OH (R3)

Figure 3 caption – odd formatting of ion species, with several carbon "C" symbols out of alignment with the rest of the formula.