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Ms. Title: Evaluation of the daytime tropospheric loss of 2-methylbutanal.

General Comments:

In the present work, the authors have thoroughly and comprehensively studied the primary tropospheric losses of 2-methylbutanal (2MB) performing precise OH (PLP-LIF method) and Cl (Relative Rate method) kinetic measurements, as well as determining the photolysis frequency, J, and the effective quantum yield, Φ_{eff}, at actinic wavelengths. As part of this work, the authors have measured the UV absorption cross-section (220 – 360 nm), they have determined Cl reaction products using GC-MS, FTIR and PTR-TOF-MS as detection techniques and they have looked into the SOA formation contribution of Cl chemistry. Using the data obtained in this work the authors have estimated the lifetime of 2MB and the daytime contribution of the three different loss processes, at Valencia (city of Spain) environment, as case study. Therefore, the present reviewer believes that the content of the present work meets the high standards of ACP. However, there are some presentation issues and a few scientific comments that authors need to address before the manuscript will be in a publishable form. Generic and specific suggestions and comments that the present author believes they will improve both quality and impact of the manuscript are given below.

Suggestion: Published after minor corrections

Specific Comments:

1. In the abstract, the authors have a typo on the rate coefficient for Cl atoms reaction with 2MB. The correct order should be 10^{-10}, i.e., k(298 K, 760 Torr) = (2.16 ± 0.16) ×10^{-10} cm^3 $molecule^{-1}$ s^{-1}.

2. Although tropospheric chemistry (OH and Cl) and photolysis are expected to dominate the atmospheric degradation of 2MB, deposition should not be neglected, especially in the case that a unique product might be formed during wet or dry deposition followed by on surface hydrolysis. It might be worth the authors to address that in the introduction.

3. The authors should give in the text the magnitude of the total corrections (in the whole course of the measurement, e.g., total reaction or photolysis time) has been made, in kinetic and photolysis measurements, due to other than the primary processes of interest. This way the

reader can evaluate the accuracy of the measurements and the potent errors that these corrections introduce.

4. As expected, OH chemistry dominates the lifetime of 2MB and thus it would have been of interest to determine OH +2MB reaction products in a chamber experiment, since PLP-LIF method would not allow that. Were there any limitations that did not allowed the authors to look into OH initiated chemistry end-products determinations?

5. Although the authors clearly report how they have estimated 2MB lifetime at Valencia atmosphere, the use of a peak Cl-concentration and treating that as a constant diurnally is deceptive, particularly since after dawn, Cl concentration is expected to be rapidly decreased. The constant [Cl] treatment leads to a unexpectedly high impact of Cl chemistry on 2MB loss especially after 18:00. It might be worth the authors to revisit their analysis and try to address that.

6. A conclusion section in which the conclusive findings of this work would be summarized is entirely missing from the manuscript and could be extremely helpful for the communication between the authors and the reader to evaluate this nice piece of work, particularly since there is quite extensive information. It is strongly recommended to be added.

Technical Corrections:

1. **Abstract, line 14**: Please correct the order of magnitude for k_{Cl} and add "respectively", at the end of the sentence, e. g., *$(2.16\pm0.16)\times10^{-10}$ cm^3 $molecule^{-1}$ s^{-1}, respectively.*
2. **Pg. 2, line 45**: Please replace "clean atmosphere" with "free-atmosphere" or even better with "NOx-free atmosphere".
3. **Pg 3. line 81**: Please add reference for U.S. Standard Atmosphere
4. **Pg 5. line 127**: Please replace "expression" with "decay".
5. **Pg 5. line 140**: Please replace "different detectors" with "a variety of detection techniques".
6. **Pg 6. line 151**: Please replace "Relative kinetics" with "Relative rate kinetics"
7. **Pg 7. line 183**: Please replace "*during 60 min*" with "*for 60 min*".
8. **Pg 7. Line 184**: Please replace "*in the 2MB*" with "*of 2MB*".
9. **Pg 7. line 187**: The phrase "*with an air flow by means a dynamic inlet…*" is not clear to the present reviewer. Please revise.
10. **Pg 8. line 211, 213 and 214**: Please delete "*…all…*", "*…of the present as…*" and "*…is…*", respectively.

11. **Pg 8. line 224-225**: Please replace "*…unknown – this work.*" with "*…unknown. It is worth to note though that in the same study, that refers to structurally similar aldehydes, e. g., pentanal or 3-methyl-butanal, the reported* Φ_{eff}*, (0.30±0.02) and (0.27±0.01), respectively, were closer to the one determined in this work*".

12. **Pg 10 line 242**: Please replace "*is the molecular one yielding*" with "*yields close-shell molecules, i.e., …*".

13. **Pg 10. lines 249 – 251**: Please rephrase the whole sentence to avoid confusion.

14. **Pg 10. lines 247 and 248**: Please replace "*as*" with "*from*" and "*were occurring*" with "*was present*".

15. **Pg 11. lines 266-267**: Please replace "*…compound, such an aldehyde or ketone.*" with "*…group, alluding to aldehydes or ketones formation.*".

16. **Pg 11. line 269**: "*Therefore, …products*" is a very generic statement. It is suggested to just say that have not been assigned to other atmospheric oxidation products.

17. **Pg 12. line 274-275**: Please rephrase to avoid confusion

18. **Pg 12. line 285**: Please replace "k_{OH}(T=263-353 K)" with "k_{OH}(T)"

19. **Pg 12. lines 287 and 288**: Please replace "*the obtained*" with "*the one obtained*" and "*relative kinetic*" with "*relative rate kinetic*", respectively.

20. **Pg 12. lines 290 and 292**: Please replace "*They used only*" with "*They only used*" and "*…, could have suffered…products.*" with "*might interfere with reaction products bands*", respectively.

21. **Pg 15. Table 4**: The quoted error limit in the average does not seem correct or the result from error propagation. If you include the extremes of the *k* measured based on the two reference reactions, k with error limits should be: $(2.16 \pm 0.32) \times 10^{-10}$ cm^3 molecule^{-1} s^{-1}, in the case you don't want to use asymmetric error limits.

22. **Pg 16. line 331**: Please replace "*time and features…subtracted.*" with "*time. The features of 2MB have been subtracted for clarity purposes*".

23. **Pg 16. lines 334-336**: It should have been possible to discriminate formaldehyde from acetaldehyde pretty easily. The features are rather discrete and IR spectra readily available. Please elucidate.

24. **Pg 16. Figure 7**: Please capitalize w in Wavenumber and check the displacement of CH_2…C(O), in the bottom panel.

25. **Pg 17. line 363**: Please replace "*with the observed after*" with "*the observed levels, after*".

26. **Pg 18-19. lines 378-381**: Rephrase to avoid confusion.

27. **Pg 19. line 382-383**: Please replace "*…as observed…. previous works.*" with "*as depicted in Fig S10b, and thus our data were not fitted with gas/particle adsorption model.*".

28. **Pg 19. line 389**: Please replace "*because*" with "*since*"

29. **Pg 19. line 394**: Please delete "*the following ones*"

30. **Pg 19. line 401**: Please replace "*checked*" with "*justified*".

31. **Pg 20. line 403 and 405**: Please replace "*of*" with "*with*", "*product was*" with "*products were*" and "*through the*" with "*via*".

32. **Pg 20. line 415 and 429**: Please replace "*(CH_3OH)*" with "*(CH_3OH) formation*" and "*OH and Cl*" with "*OH radicals and Cl atoms*".

33. **Graphs:** In all graphs it would be easier for the reader to see the units in parenthesis without math signs, e. g., instead of Wavenumber /cm^{-1}, use Wavenumber (cm^{-1}).