

Comment on amt-2021-421

Anonymous Referee #1

Referee comment on "Identification, monitoring, and reaction kinetics of reactive trace species using time-resolved mid-infrared quantum cascade laser absorption spectroscopy: development, characterisation, and initial results for the CH₂OO Criegee intermediate" by Zara S. Mir et al., Atmos. Meas. Tech. Discuss.,
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Mir et al. report the IR-spectroscopy and time-resolved detection of the simplest Criegee intermediate, CH₂OO, and the time-resolved detection of SO₃ from the reaction of CH₂OO with SO₂. These measurements have been made using a new apparatus involving a mid-IR quantum cascade laser as a tunable IR source, which enables the detection of multiple species. The new results are in accord with previous measurements in the literature, supporting the reliability of the new apparatus. This is a nice study, which is within the scope of this journal. The paper is well written, the literature appropriately cited, and the methods and analysis clearly stated. I anticipate that this new apparatus will provide novel kinetic and mechanistic insights to atmospherically important reactions. I have only a few minor comments and suggestions, detailed below.

- Fig 3: you determine that the expected change in CH₃I concentration on photolysis under your experimental conditions is 4%. It would be good to also state the percentage change that you measure experimentally.
- If I understand this correctly, noise from the Q-switch inhibits reliable measurements from -500 to +500 μs. It would be beneficial to the reader to show an example of the full kinetic trace (including this time window) in the supplementary material.
- What vapor pressure of CH₂I₂ was used in the calculation of [CH₂I₂]?
- Figs 2 and 4: I think the vertical inversion of the literature spectra make it easier for the reader to see the features of the new spectra, but it is difficult to compare the relative intensities of spectral features in the literature vs. current spectra in these plots. I suggest that in the supplementary material, the literature and current spectra are overlaid so this comparison can be more easily made.
- Fig 5: Why is the pre-photolysis signal (at least that before the Q-switch noise at -500 μs) not shown?
- I agree with reviewer #2 that it would be beneficial to show some additional examples of CH₂OO decays in the supplementary material.