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Atmospheric Measurement Techniques Discussions

Interactive comment on "Production of highly oxygenated organic molecules (HOMs) from trace contaminants during isoprene oxidation" *by* Anne-Kathrin Bernhammer et al.

Anonymous Referee #2

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Summary

This short work examines isoprene precursor purity during recent CLOUD campaigns at CERN. The authors detect monoterpenes during what were intended to be pure isoprene experiments. They propose that reactions in the PTR3 instrument source account for 2/3 of the detected monoterpene, and the remaining 1/3 to Diels Alder cycloaddition of the gas-phase isoprene cylinder.

The results in this manuscript are technically solid, and it is well-written. But it does not seem to be a completely fleshed out manuscript, and I have reservations about how relevant the research is to the greater atmospheric science community

Major comments

The authors make an excellent summary point: that scientists conducting laboratory experiments should control the purity of their precursor. But I find that the example used in this manuscript is a specific situation of limited importance. Bernhammer et al., claim here that 2/3 of the monoterpene formed from isoprene is due to the unique high pressure (∼80 mbar) of the PTR3 drift cell. But the vast majority of PTR instruments maintain a drift cell ∼ 2 mbar (de Gouw and Warneke), which would make this in-source reaction a consideration only to the 3 PTR3 instruments in existence. Furthermore, the authors (and references therein) suggest that the remaining 1/3 of the observed monoterpenes form directly from the isoprene isoprene precursor in the gas-phase and not the condensed phase. But many isoprene laboratory experiments, particularly in "batch" mode, are conducted by evaporating liquid-phase isoprene (Paulot et al.) into a chamber.

While the CLOUD experiments are influential and important, the authors leave the effects of this work on previous CLOUD results totally unexplored. It is interesting to see that HOMs formed from the contaminants, but how has that affected other CLOUD nucleation studies? Are there other isoprene works that have suffered from this contamination? Why is this specific issue one of interest to the general community. This work would be much stronger if the authors could explore the atmospheric implications of their results.

Minor comments/typos

Figure 1: The pink and purple traces are very difficult to distinguish. Could you please change the color of one of them? P1L13: Should be "these signals: first secondary" P1L29: "have also been" P3L21 "respectively" is unnecessary here P4L4 "to freeze out possible lower volatility contamination" P7L14 comma after "bonds"

References:

de Gouw, J. & Warneke, C. Measurements of volatile organic compounds in the earth's atmosphere using proton-transfer-reaction mass spectrometry. Mass Spectrom. Rev. 26, 223–257 (2007). Paulot, F. et al. Unexpected Epoxide Formation in the Gas-Phase Photooxidation of Isoprene. Science (80-.). 325, 730–733 (2009).

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