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Atmospheric Measurement Techniques Discussions

Interactive comment on "Comparison of OH reactivity measurements in the atmospheric simulation chamber SAPHIR" *by* Hendrik Fuchs et al.

Anonymous Referee #1

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This paper presents measurements of a comprehensive intercomparison of several instruments that measure total OH reactivity inside the SAPHIR chamber. The instruments included three Comparative Reactivity Measurement (CRM) instruments, four Laser Photolysis-Laser-Induced Fluorescence (LP-LIF) instruments, one Flow Tube Laser-Induced Fluorescence (FT-LIF) instrument, and one Flow Tube Chemical Ionization Mass Spectrometry (FT-CIMS) instrument. Experiments were conducted under a variety of conditions, including varying concentrations of CO, CH4, NOx, ozone, isoprene and its oxidation products, monoterpenes, and an urban VOC mixture. In general, the measured OH reactivity by the different instruments agreed reasonably well with each other and the expected OH reactivity. However, measurements by the

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Discussion paper

LP-LIF, FT-LIF, and FT-CIMS demonstrated higher precision and accuracy compared to the CRM measurements. The accuracy of the CRM instruments varied depending on the chemical conditions, especially when sampling terpene compounds, perhaps due to sampling losses of compounds of low volatility. The results of this study should help to improve these instruments.

The paper is well written and suitable for publication in AMT after the authors have addressed the following comments.

1) In Table 4, the corrections for non-pseudo first-order conditions for the CRM instruments is given and appear to depend only on the overall reactivity. However, as discussed in Michoud et al. (2015), the correction also depends on the reactivity of the individual VOCs. It appears that the instruments always used an average correction factor for a range of reactive VOCs based on laboratory calibrations regardless of the VOC mixture in the chamber. This should be clarified. Could an inappropriate correction factor explain some of the discrepancies in the CRM measurements when specific VOCs were added to the chamber, such as the terpene mixture?

2) For the FT-LIF instrument, it was found that the measurements displayed greater deviations for more chemically complex mixtures, and the authors suggest that issues related to this particular flow tube instrument configuration may be responsible. What aspects of this particular instrument and its operation were significantly different from the normal PSU instrument?

3) Two of the LP-LIF instruments observed bi-exponential behavior due to misalignment of the photolysis laser. How sensitive is the observed decay to the laser alignment? Is this sensitivity common to all LP-LIF instruments?

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