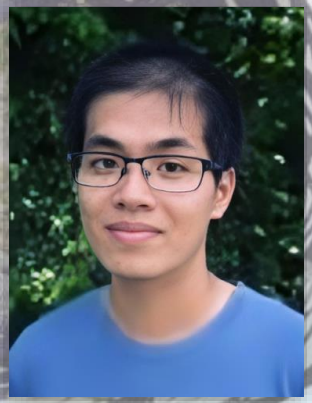
Measuring Radicals in the Troposphere. How Much Do We Know About the Chemistry of the Atmospheric Oxidation of Plant Emissions?



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Zoom Link (Mixed-mode)

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Air pollutants such as ozone are produced from the oxidation of volatile organic compounds (VOCs). The oxidation process involves radical chemistry and is highly dependent on NO mixing ratios. Therefore, the oxidation chemistry of VOCs can be drastically different between a NO_x-polluted region (e.g., urban environment) and a region with low NO_x mixing ratios (e.g., remote forests).

To understand the radical chemistry of the gas-phase oxidation of VOCs, limonene oxidation experiments were conducted in the Simulation of Atmosphere Photochemistry in a Large Reaction Chamber (SAPHIR). SAPHIR is a large outdoor chamber designed for emulating atmospheric-relevant conditions. Radical (OH, HO_2, and total RO_2) concentrations and the lifetime of OH radicals were measured in the chamber with laser-induced fluorescence (LIF) instruments, which can be used for the evaluation of the radical budgets. The comparison between box model simulations and chamber measurements suggested that the current state-of-the-art oxidation mechanism cannot reproduce the radical chemistry at sub-ppbv level of NO mixing ratios, consistent with the field observations in pine forests that are dominated by monoterpene emissions. The chemistry behind the model-measurements discrepancy and the current research on the impacts of plants on air quality will be discussed.

EARTH AND ENVIRONMENTAL SCIENCES PROGRAMME

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