

2.090 OH reactivity of primary tree emissions and their oxidation products using the atmosphere simulation chamber SAPHIR-PLUS.

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Abstract:

Biogenic volatile organic compounds (BVOC) contribute to about 90% of the globally emitted VOC. Intensive efforts in studying and understanding the impact of BVOC on atmospheric chemistry were undertaken in the recent years. However many uncertainties remain, e.g. field studies have shown that in forested areas, measured OH reactivity often cannot be explained by measured BVOC and their oxidation products (e.g. Noelscher et al. 2012). This discrepancy may be explained by either a lack of understanding of BVOC sources or insufficient understanding of BVOC oxidation mechanisms. Plants emit a complex VOC mixture containing likely many compounds which have not yet been measured or identified (Goldstein et al. 2007). The new extension PLUS (Plant chamber Unit for Simulation, Hohaus et al. 2016) coupled to the atmosphere simulation chamber SAPHIR provides the possibility to measure OH reactivity (LD-LIF) from complex plant emissions and to compare it with the OH reactivity calculated from the BVOC composition measured by GC-MS and PTR-ToF-MS. This comparison was

performed for both, primary emissions of trees typical of a Boreal forest environment (Norway spruce, Scots pine, Silverbirch) without any influence of oxidizing agents and using different oxidation schemes. The OH reactivity comparison was done for constitutive and stressed induced emissions for each tree species. For the trees investigated here, the overall discrepancies between measured and calculated total OH reactivity are low in the absence of an oxidizing agent while the discrepancies increase with increasing degree of oxidation. On average, signal detected with the PTR-Tof-MS but not assigned to specific BVOCs could account for the gap in OH reactivity when assuming OH reaction rates close to $1 \times 10^{-11} \text{ cm}^3 \text{ molecule}^{-1} \text{ s}^{-1}$.

Refs:

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