

## 2.084 Secondary Organic Aerosol Production from Herbivore-Induced Plant Volatiles.

Early Career Scientist

Presenting Author:

**Celia Faiola**, Aerosol Physics Research Group, University of Eastern Finland, Kuopio, Finland, [celia.faiola@uef.fi](mailto:celia.faiola@uef.fi)

Co-Authors:

**Angela Buchholz**, Aerosol Physics Research Group, University of Eastern Finland, Kuopio, Finland

**Eetu Kari**, Aerosol Physics Research Group, University of Eastern Finland, Kuopio, Finland

**Jorma Joutsensaari**, Aerosol Physics Research Group, University of Eastern Finland, Kuopio, Finland

**Pasi Miettinen**, Aerosol Physics Research Group, University of Eastern Finland, Kuopio, Finland

**Kari Lehtinen**, Aerosol Physics Research Group, University of Eastern Finland, Kuopio, Finland

**Annele Virtanen**, Aerosol Physics Research Group, University of Eastern Finland, Kuopio, Finland

**Jarmo Holopainen**, Department of Environmental Science, University of Eastern Finland, Kuopio, Finland

**Minna Kivimaenpaa**, Department of Environmental Science, University of Eastern Finland, Kuopio, Finland

**Pasi Yli-Pirila**, Aerosol Physics Research Group, University of Eastern Finland, Kuopio, Finland

**Alex Guenther**, Department of Earth System Science, University of California Irvine, Irvine, CA

Abstract:

Plant emissions are a major source of biogenic volatile organic compounds (BVOCs) that lead to secondary organic aerosol (SOA) formation. Climate change impacts on BVOC emissions affect the SOA formation potential of the plant emissions, either increasing or decreasing SOA yields depending on the types of emissions that are induced or suppressed. One plant stressor known to have a significant impact on plant emissions is herbivore outbreaks. Herbivore outbreaks are expected to increase as a result of climate change, especially in boreal regions, and can contribute significantly to atmospheric aerosol mass loading. This study investigated the differences in the SOA formation of boreal forest conifer emissions under baseline and herbivore-treatment scenarios in the laboratory.

In this study, BVOC emissions from boreal forest conifers were fed into a flow tube reactor

where they were photochemically oxidized to generate SOA. Emissions from undamaged and damaged saplings were used to generate SOA and results were compared. The herbivore treatment was application of the pine weevil, *Hylobius Abietis*, a bark borer. Plant emissions were monitored continuously with a PTR-ToF-MS. More detailed chemical analysis was performed using cartridge sampling and subsequent analysis with TD-GC-MS. SOA microphysical and chemical properties were monitored with SMPS and HR-ToF-AMS. Results demonstrated that bark borers increase Scots pine monoterpene and sesquiterpene emissions by 75- to 200-fold. Furthermore, the SOA mass yields from the plant emissions were highly variable from experiment to experiment, but could be explained by the different types of monoterpenes the plant was emitting (the monoterpene emission profile). Chemically-specified terpenoid emission rates from baseline and herbivore-treated plants will be presented along with descriptions of their photochemistry and SOA-forming potentials. These results highlight that herbivore outbreaks could significantly increase SOA production in boreal forest regions in the future.