Title
Molecular Control of SOA Formation and Yield in Plant Volatile Systems

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Abstract:
Green leaf volatiles (GLVs) are a class of wound-induced volatile organic compounds emitted by several plant species. Turf grasses emit a complex profile of GLVs upon mowing, some of which are oxidized in the atmosphere to contribute to secondary organic aerosol (SOA), a main contributor to atmospheric particulate matter.

Freshly cut grass was carried out in experimental chambers and was found to emit a complex mixture of GLVs, dominated by *cis*-3-hexenyl acetate (CHA) and *cis*-3-hexenol (HXL). Upon ozonolysis, we monitored the consumption of CHA and HXL and the production of SOA. CHA and HXL were found to have aerosol yields of 1.2 (+/- 1.1) % and 3.3 (+/- 3.1) %, respectively, which were used along with CHA and HXL emission rates to predict SOA evolution by ozonolysis of grass clippings. Interestingly, the **measured** SOA mass produced from the ozonolysis of grass clippings exceeded the predicted amount, by upwards of ~150%.

Geospatial analysis was used to determine turf grass coverage in a typical suburban neighborhood and the measured SOA production rate (as a function of grass mowed) to determine that lawn mowing has the potential to contribute 47 $\mu g/m^2$ SOA per mowing event, which could not be modeled solely by the ozonolysis of CHA, HXL or a representative mixture of the two.

We also characterized SOA generated from the ozonolysis of CHA, HXL, and grass clippings. Though we found that no single GLV or two-component mixture modeled SOA **mass** evolution, we did determine that **chemically**, HXL-derived SOA more closely represents mow-induced SOA than CHA. The temporal evolution SOA was also used to deconvolute the chemical mechanisms leading to SOA formation and tentatively identify chemically aged species.

In this work, we present key results that have allowed us to:

1) Characterize the GLV emission profile of cut grass and establish the SOA yield of cut grass by ozonolysis.

2) Determine whether a single GLV or two-component mixture of GLVs can be used to model the SOA yield of grass by ozonolysis

3) Determine which oxidation pathways drive GLV-derived SOA growth and ageing