Qualitative Characterization and product evolution of Secondary Organic Aerosols from oxidation of Green Leaf Volatiles

Volatile organic compounds (VOCs) play a key role in determining the chemistry and composition of the lowermost atmosphere. Through reactions with the major atmospheric oxidants, VOCs can form secondary organic aerosol (SOA) that can have a significant impact on air quality and global climate. Biogenic VOCs (BVOCs) are emitted by plants and include isoprene, monoterpenes, sesquiterpenes, and their oxygenated derivatives. On a global scale, BVOC emissions contribute 90% of the overall VOC emissions, with an estimated global BVOC SOA production ranging from 2.5 to 44.5 Tg per year. Among these BVOCs are green leaf volatiles (GLVs), a family of oxygenated hydrocarbons released when plants are damaged or stressed. Two of the major GLVs emitted by cut grass are *cis*-3-hexenylacetate and *cis*-3-hexen-1-ol, both of which lead to SOA, yet the composition of these SOA is not well understood.

In this study we use an innovative, soft ionization aerosol mass spectrometer (AMS) developed in the Petrucci group to characterize SOA generated from GLV's and grass oxidation. We observed oligmer formation and uptake of gas phase products by SOA from *cis*-3-hexen-1-ol. Conversely, the acetate functionality in *cis*-3-hexenylacetate inhibited the oligmer formation. Most laboratory chamber based studies to date have considered only SOA from single GLV precursors, which does not accurately describe atmospheric conditions where multiple VOCs are susceptible to simultaneous oxidation through a number of different pathways. With continued work, we aim to determine whether any particular GLV dominates the SOA envelope generated from cut grass clipping and GLV mixtures.

To achieve this aim, major GLV's were identified from cut grass clipping. Chemical standards of these GLV's were then used either individually or together with the aim to mimic the oxidation process of cut grass clippings and different products were characterized by using soft ionization AMS. This improved understanding would be fundamental to accurately model aerosol formation in the atmosphere, and subsequently its effect on human and environmental health.