Establishing the Contribution of Lawn Mowing on Atmospheric Aerosol Levels in American Suburbs

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The mowing of turfgrass releases a complex mixture of biogenic volatile organic compounds (BVOCs), which are primarily responsible for its characteristic smell. These BVOCs are often termed green leaf volatiles (GLVs) and in addition to having interesting roles in plant protection and communication, they actively take part in atmospheric chemistry by forming secondary organic aerosol (SOA) in the presence of common atmospheric oxidants, impacting climate patterns and human health. The role that GLVs play in air quality in the urban/suburban landscape may be especially important, where oxidative species can exist at elevated concentrations and where dynamic interactions with anthropogenic VOCs can occur. Despite recent advances, our understanding of the dynamic interactions and roles that GLVs and oxidants have in atmospheric SOA production remains limited. The primary goals of this research were (1) to characterize the GLVs emitted by freshly mowed grass, identifying those with the greatest potential to contribute to SOA, and (2) to show that GLVs emitted by turfgrass represents a potentially significant source of SOA in the presences of ozone, especially at the urban/suburban landscape interface.

Thermal desorption gas chromatography mass spectrometry (TD-GC/MS) was used to characterize and quantify the GLV emission profile of mowed grass (genera *Festuca*, *Lolium* and *Poa*), which consisted predominantly of (Z)-3-hexenyl acetate and (*Z*)-3-hexenol. SOA evolved as a result of the ozonolysis of grass clippings and GLV standards was continuously measured using a scanning mobility particle sizer while gas-phase products of this reaction were quantified using TD-GC/MS. Geographic Information Systems (GIS) was used to determine the area of a typical urban/suburban landscape occupied by turfgrass, while measured GLV emission rates and aerosol yields were used to establish the potential contribution that lawn mowing in American suburbs has on atmospheric SOA levels.