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Interactive comment on “Establishing the contribution of lawn mowing to atmospheric aerosol levels in American suburbs” by R. M. Harvey et al.

R. M. Harvey et al.

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Received and published: 9 December 2013

These preliminary experiments were carried out in a calibrated 775 L Teflon reaction chamber, which is admittedly far from ideal, but not unusual for this type of work. Throughout the literature, reaction chambers ranging from several tens of liters to hundreds of cubic meters have been used. We believe that this size chamber is suitable for these preliminary measurements.

We recognize that the ozone concentrations used in this study are not representative of ambient ozone concentrations in this area, as discussed on page 2554-2555. However,

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we chose to work under these conditions, initially, to ensure an adequately oxidizing environment to produce SOA and in order to conduct kinetic analyses (by ensuring pseudo-first order kinetics in O₃) of the SOA forming reactions. More exacting studies are being conducted with continuous exposure to lower ozone concentrations to better approximate environmental conditions. These more advanced and involved studies, we felt, were not essential to these preliminary experiments nor to interpretation of the results obtained.

As shown in Figure 2b, the grass emission profile is dominated by CHA, HXL and 1-penten-3-ol. These three GLVs also show significant consumption by ozonolysis (Fig 2a, Fig 3a and Fig 3b). This reactivity is explained by the fact that each of these compounds contains one site of chemical unsaturation with which ozone is reactive. CHA and HXL are shown to produce SOA upon ozonolysis, while 1-penten-3-ol, despite its unsaturation, demonstrated limited reactivity with ozone to produce SOA (these data are shown in Supplemental Material S3). Grass clippings were also shown to emit significant amounts of 2-pentanone, methanol and ethanol, which are not expected/shown to be reactive with ozone (due to their complete chemical saturation). Therefore, the hypothesis tested as part of this work was whether SOA production from grass clippings could be adequately modeled by these two primary reactive GLVs.

Understanding and modeling the sources of SOA has been a primary focus of atmospheric chemistry for many years and still provides (arguably) one of its greatest challenges. In fact there is a significant disparity between measured SOA levels and those predicted by current atmospheric models, which incorporate several SOA sources. Through this work, which focused on atmospheric SOA from two commonly emitted GLVs (namely, CHA and HXL), we hoped to gain a better understanding of one potential source (grass clippings) on a regionally relevant scale (the airshed). Grass clippings also represent a SOA source that could be impacted by human decision making (i.e. land usage), though changing human behavior is not the focus or goal of this work.

The aerial photographs used are the most recent available through the VT GIS net-

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work and are representative of a suburban neighborhood. Since we report potential SOA contribution as a function of grass coverage, these data could be applied to any neighborhood.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 24435, 2013.

ACPD

13, C7565–C7567, 2013

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