1.113 Insights into the contribution of residential biomass burning to urban pollution in two Colorado cities.

Early Career Scientist

Presenting Author:
Matthew Coggon, University of Colorado, Cooperative Institute for Research in Environmental Sciences, Boulder, CO, USA, matthew.m.coggon@noaa.gov

Co-Authors:
Patrick Veres, University of Colorado, Cooperative Institute for Research in Environmental Sciences, Boulder, CO, USA
Bin Yuan, University of Colorado, Cooperative Institute for Research in Environmental Sciences, Boulder, CO, USA
Abigail Koss, University of Colorado, Cooperative Institute for Research in Environmental Sciences, Boulder, CO, USA
Carsten Warneke, University of Colorado, Cooperative Institute for Research in Environmental Sciences, Boulder, CO, USA
Karl Froyd, University of Colorado, Cooperative Institute for Research in Environmental Sciences, Boulder, CO, USA
Jeff Peischl, University of Colorado, Cooperative Institute for Research in Environmental Sciences, Boulder, CO, USA
Kenneth Aikin, University of Colorado, Cooperative Institute for Research in Environmental Sciences, Boulder, CO, USA
Thomas Ryerson, National Oceanic and Atmospheric Administration, Earth System Research Laboratory, Boulder, CO
Joost de Gouw, University of Colorado, Cooperative Institute for Research in Environmental Sciences, Boulder, CO, USA

Abstract:

Residential biomass burning is a prominent means of heating and cooking in U.S. cities; however, its emission profile is source-dependent and its contribution to urban volatile organic compounds (VOCs) remains uncertain. We report wintertime measurements of domestic burning VOCs from two Colorado cities, Boulder and Aspen, using a newly developed high mass resolution H_3O^+ chemical ionization mass spectrometer. Mobile measurements of residential biomass burning plumes demonstrated that emissions were dominated by small oxygenates such as methanol, ethanol, and acetone. Compared to other point sources such as vehicle exhaust and solvents, burning emissions exhibited unique enhancements of furan compounds such as furfural, furanone, and methyl furan. Residential burning emissions of nitrogen-containing VOCs such as acetonitrile and acrylonitrile were lower by nearly an order of magnitude when compared to controlled burning of agricultural fuels. Background acetonitrile concentrations in Boulder were high and mobile measurements demonstrated elevated concentrations downwind of commercial and academic laboratories. These point sources likely resulted from the use

of acetonitrile as a chemical solvent; consequently, acetonitrile may not be a suitable tracer for residential biomass burning emissions in urban settings such as Boulder.
In both cities, residential biomass burning was prominent in the evening hours. In Boulder, the fraction of VOCs attributed to burning emissions increased during colder nights and was most prevalent in residential areas. In Aspen, domestic burning due to residential heating and cooking was a dominant VOC source at night. When compared to emissions observed in Boulder, biomass burning in Aspen accounted for a higher fraction of nighttime VOCs.