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OH Reactivity and Potential SOA Yields from Volatile Organic Compounds and Other Trace Gases Measured in Controlled Laboratory Biomass Burns

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A comprehensive suite of instruments were used to characterize volatile organic compounds (VOCs) and other trace gases (e.g., CO, CH₄, NO₂, etc.) emitted from controlled burns of various fuel types common to the Southeastern and Southwestern United States. These laboratory-based measurements were conducted in February 2009 at the U.S. Department of Agriculture's Fire Sciences Laboratory in Missoula, Montana. An on-line GC-MS provided highly speciated VOC measurements of alkenes, alkanes, oxygenates, aromatics, biogenics, and nitrogen-containing compounds during the flaming or smoldering phases of replicate burns. The speciated GC-MS "grab" samples were integrated with fast-response gas-phase measurements (e.g., PTR-MS, PTR-IT-MS, NI-PT-CIMS, and FTIR) in order to determine VOC emission ratios and the fraction of identified vs. unidentifiable mass detected by PTR-MS. Emission ratios were used to calculate OH reactivity, which is a measure of potential ozone formation, as well as potential secondary organic aerosol (SOA) yields from the various fuel types. Small oxygenated VOCs had the highest emission ratios of the compounds observed. Alkenes dominated the VOC OH reactivity, which occasionally exceeded 1000 s⁻¹. Calculated SOA yields from known precursors were dominated by aromatic VOCs, such as toluene, naphthalene (C₁₀H₈), and 1,3-benzenediol (C₆H₆O₂, resorcinol). The contribution of several compounds not typically reported in ambient air measurements, such as substituted furans (C₄H₄O), pyrroles (C₄H₅N), and unsaturated C₉ aromatics (C₉H₁₀), on OH reactivity and SOA yields will be discussed.

Keywords: [0315] ATMOSPHERIC COMPOSITION AND STRUCTURE / Biosphere/atmosphere interactions, [0365] ATMOSPHERIC COMPOSITION AND STRUCTURE / Troposphere: composition and chemistry



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