Volatile Hazardous Chemical Profiling of Post-Wildfire Urban Landscapes using an Advanced UAV-Based Hyperspectral Imaging System: Abstract

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This investigation uses advanced drone-based hyperspectral imaging to assess hazardous air pollutants (HAPs) in communities impacted by the 2025 Eaton and Palisades wildfires. The research focuses on identifying and speciating harmful gases, airborne particles, and toxic metals released from burned homes, commercial buildings, vehicles, and other debris materials. Two complementary analytical workflows will be developed and applied to derive pixel-level gas concentrations, vertical column densities, and emission fluxes: (i) quantitative differential optical absorption spectroscopy (QDOAS) for gaseous organics, and (ii) hyperspectral reflectance analysis (HRA) for volatile inorganics. The research team plans to evaluate spatiotemporal variabilities in pollutant concentrations and emissions across property, neighborhood, and census block scales. Results will be validated using available air and soil monitoring data collected after the fires to ensure hyperspectral measurement reliability. Expected outcomes of this project will include detailed datasets, contamination maps, and a technical summary report to inform public health risk assessments, guide debris management and cleanup strategies, and support future studies on environmental and community impacts following large wildfire disasters.