Quantifying Exposure to Biomass Combustion Sources in The Presence Of Environmental Black Carbon via Dualspot® Corrections to Microaeth Data in Chamber Experiments

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Ultraviolet active particulate matter (UVPM) include emissions from combustion of biomass sources such as woodsmoke, crop residues and tobacco smoke and can be measured by multi-wavelength absorption techniques such as microAeth Monitors. Here we investigate measurement issues of UVPM through chamber experiments of second-hand tobacco smoke (SHS) and black carbon (BC), which are associated with an array of adverse health and climate effects making them important measurements in health and environmental studies. Multi-wavelength absorption methods of integrative filters collected over days to weeks have been promoted but are significantly impacted when moderate to elevated BC loadings are present. Originally formed through the incomplete combustion of fossil fuels, biofuel, and biomass, BC is found to suppress the UVPM signature of the biomass combustion. The multi-wavelength microAeth® MA350 (AethLabs, San Francisco) includes the option for carrying out DualSpot® loading corrections on each wavelength-based absorption on highly time-resolved data. DualSpot® corrections for black carbon have been evaluated through comparison to *in situ* BC methods such as photoacoustic extinctiometers (PAX). As far as we are aware, no prior work has evaluated DualSpot® applicability under controlled conditions for biomass smoke sources such as SHS. Here we use chamber experiments that mix SHS from a cigarette machine with ethylene-based BC soot from an inverted flame source to characterize the loadings necessary to suppress the uncorrected UV signature. Then DualSpot® corrected data are compared to uncorrected data to evaluate the correction under controlled conditions of near-constant inputs of SHS and BC over time. Black Carbon presence significantly suppresses the uncorrected SHS signal starting at around 2 IR ATN units, reaching a suppression of ~40% by 8 IR ATN units. DualSpot® correction appears to completely remove the loading effect of BC on the optical signature of SHS as long as the unit has good flow control, with flow on spot 1 (100 ml/min) needing to be 2.0 times that of the flow on spot 2 (i.e. 50 ml/min). Future work should focus on gravimetric calibration of the ΔUVPM signature of SHS and other biomass sources through collection of filters.