5.121 Evolution and removal of brown carbon in biomass burning emission.

Early Career Scientist

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Abstract:

Biomass burning emission are one of the most important sources of brown carbon, which enhances absorption at blue and ultraviolet wavelengths. However, there is significant uncertainty regarding the evolution and removal of brown carbon. This presentation will present results obtained during the Fire Lab at Missoula Experiment-4 (FLAME-4). A multi-wavelength photoacoustic absorption spectrometer was used to measure the absorption due to dry and thermally denuded (particles heated at 250^0C) fresh and photochemically aged particles. The contribution to aerosol absorption from brown carbon, black carbon and enhanced black carbon absorption (lensing) in fresh emissions was estimated in four different ways. The variations in the resulting importance of brown carbon based on each approach will be discussed. Based on twelve different chamber experiments, it will be shown brown carbon absorption decreases with time during photochemical oxidation, indicating degradation of brown carbon in photochemical processes. The relative importance of ozonolysis vs. photochemical degradation of brown carbon will also be explored along with the observation that secondary organic aerosol formed during ozonolysis of biomass burning aerosol tends to not be brown. Finally, parameterization of brown carbon degradation with the different organic mass tracers measured by the aerosol mass spectrometer will be explored.