THE DIFFERENT SHADES OF ATMOSPHERIC CARBONACEOUS AEROSOLS AND THEIR OPTICAL PROPERTIES

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Carbonaceous aerosols emitted from biomass and biofuel burning have been implicated in rapid global warming, accelerated melting of glaciers, changing monsoon patterns, and degradation of human health and the environment. They contribute to a large uncertainty in current estimates of climate forcing, which is primarily attributable to poor understanding of the particle microphysical properties and their parameterizations in models and satellite retrieval algorithms. In recent years, researchers have made thorough efforts to characterize these properties for black (BC) and brown carbon (BrC) aerosols emitted from both small-scale, controlled combustion systems (e.g. prescribed/slash burns and cook stoves) and large-scale wildfires as a function of various process parameters such as fuel type, fire phase, environmental conditions driving the combustion process, and interrelationships of these parameters.

In this talk, I will report my recent findings on the different morphologies and intensive optical properties of BC and BrC aerosols observed from burning of biomass and biofuels during laboratory experiments and field-campaigns. In particular, the morphology and spectral optical properties of a hitherto unrecognized form of BC "superaggregates" and aggregated BrC "tar balls" emitted from flaming and smoldering wildfires, respectively, will be presented. I will end my talk with a discussion on the potential impact of these aerosols on direct radiative forcing, and the need for better particle characterization tools and techniques.

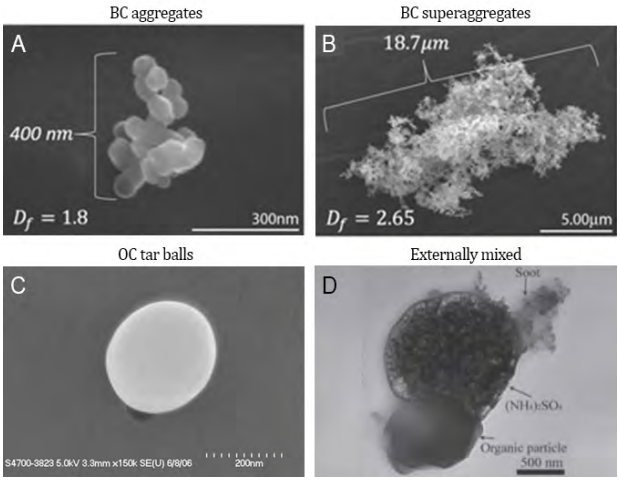

Figure 1: *Representative electron microscopy images of carbonaceous aerosol types occurring from biomass burning. (A) Freshly-emitted, fractal-like black carbon (BC) aggregates emitted from controlled, small-scale flaming biomass burning. (B) freshly-emitted BC superaggregates emitted from large-scale wildfires (C) Spherical organic "brown" carbon particle (tar balls) emitted from pure smoldering fires. (D) Externally mixed particle constituting encapsulated BC aggregate, organic carbon particle and inorganic matter.*