

Evolution of Near Field Biomass Burning Aerosols

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During the summer and early fall of 2013, the Atmospheric Radiation Measurement (ARM) program of the U. S. Department of Energy (DOE) sponsored an aircraft-based field campaign to study the near-field evolution of particulate emissions from biomass burning. Key scientific objectives for the Biomass Burning Observation Project (BBOP) were to 1) quantify the downwind time evolution of microphysical, morphological, chemical, hygroscopic, and optical properties of aerosols generated by biomass burning, 2) use the time sequences of observations to constrain processes and parameterizations in a Lagrangian model of aerosol evolution, and 3) incorporate time evolution information into a single-column radiative transfer model for determining forcing per unit carbon burned. The campaign involved 120 hours of flight time of the G-1 aircraft, and in total, 17 wildfires in the Pacific Northwest, approximately 35 agricultural burns in the Mississippi River Valley in the central U.S., and 7 urban plumes were sampled, providing a spectrum of fuel sources.

Rapid increases in the coating thickness of refractive black carbon (rBC) particles, organic aerosol/rBC ratio, scattering/CO ratio, and aerosol size distributions were observed during the first hour of the plume age, both for wildfires sampled in the Pacific Northwest and in controlled agricultural burns in the south-central Mississippi Valley.