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Carbonaceous aerosol absorption changes due to photochemistry in Mexico City.

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Carbonaceous aerosols emitted from megacities, in particular black carbon, can play a major role in regional climate due to their radiative forcing effects. Fresh black carbon soots can be oxidized during transport and can also act as surfaces for condensation of photochemical reaction products. These processes lead to the formation of organic aerosols that contain more carbonyl, nitrate, and peroxy functional groups, which can all act to enhance light absorption at shorter wavelengths relative to that due to the primary soot aerosols. By examining the morning to afternoon differences of the short and long wavelength absorption by the carbonaceous aerosols one can evaluate the photochemical production of secondary organic aerosols (SOA) and aged soots, and their impacts on the aerosol radiative forcing.

Measurements of the aerosol absorption at seven wavelengths were obtained using an aethalometer in Mexico City during April of 2003 and March of 2006 as part of the Mexico City Metropolitan Area 2003 (MCMA 2003) and the Megacity Aerosol Experiment – Mexico City (MAX-MEX) 2006 field studies. Comparison of the 370/880 nm ratio was used to evaluate the changes due to photochemical activity. Enhanced afternoon short wave absorption was seen during both studies that indicate that substantial absorption enhancement can occur due to aging of the soots and SOA formation. This SOA contains many humic-like substances (HULIS) and is consistent with the anticipated formation of carbonyl functional groups.

These results will be discussed in terms of the regional impacts of carbonaceous aerosols on radiative forcing. This work was supported by the U.S. Department of Energy's Atmospheric Science Program.