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Understanding climate: the role of photoacoustic spectroscopy at NIST[1]

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Sophisticated climate models predict that soot aerosols have a significant impact on Earth's energy budget; however, the uncertainty of these predictions is large, in part, because soot in the atmosphere and in the laboratory is poorly characterized. In the atmosphere, soot's optical and physical properties change as it combines with water vapor and sulfuric acid. We will describe a novel photoacoustic spectrometer system that measures the optical absorption cross section of various soots as they age in diverse environments. We also measure the albedo (optical scattering) of aerosols ranging from black-carbon-like to brown-carbon-like using simultaneous photoacoustic spectroscopy and cavity ring-down spectroscopy. Lastly, we developed a photoacoustic spectrometer system that measures the concentration of carbon dioxide in atmospheric air with sub-ppm uncertainty. We will report results of field tests of this spectrometer.

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