On-road measurement of black carbon mass, absorption, and single-scattering albedo

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Absorption and scattering of solar radiation by aerosols emitted from combustion sources can affect the earth's radiative balance and may potentially affect local and regional climate. Optical properties of aerosols emitted from mobile sources have not been thoroughly characterized, limiting the ability of models to account for the impact of these sources on climate. To address these deficiencies, a series of measurements were made with a mobile platform to assess the climate relevant properties of aerosols emitted in the on-road environment. A single particle soot photometer (SP2), a three wavelength photo-acoustic soot spectrometer (PASS-3), an aethalometer (AE-42), an aerodynamic particle sizer (APS model 3321), and an engine exhaust particle sizer (EEPS model 3090) were operated on a zero-emissions electric vehicle that was driven on roadways near Raleigh, NC in spring of 2010. The sampling vehicle also included a high-resolution global positioning system (GPS) and forward-facing webcam, allowing location and on-road traffic to be compared with the measurements. Calculations of the mass specific absorption coefficient and single scattering albedo are evaluated by driving mode (speed and acceleration) and road type (highway and arterial) to determine the influence of these factors on the emitted aerosol optical properties.