Results from Initial-Year Aerosol Optical Property Measurements at the New NOAA ESRL Collaborative Aerosol Monitoring Station in Boone, North Carolina

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A NOAA ESRL collaborative aerosol monitoring station was established at Appalachian State University, located in Boone, NC (36.22ºN, 81.67ºW), in May 2009. Boone's mountain location (1000m above sea level) is a region devoid of major local industrial pollution sources and is home to a variety of meteorological regimes and air mass sources, facilitating regionally-representative measurements of aerosol properties originating from a variety of natural and anthropogenic sources. Initial-year measurements of size-segregated (submicron and sub-10μm) aerosol light scattering and absorption coefficients at three visible wavelengths and aerosol number concentrations will be presented, along with derived quantities such as angstrom exponent, single-scattering albedo, and backscatter fraction. The median scattering coefficient of 28Mm^{-1} at 550nm is comparable to that measured with similar instruments at the Southern Great Plains (SGP), OK station and a little lower than that measured at the Bondville (BND), IL station. The median absorption coefficient of ~2.9 Mm^{-1} at 550nm is slightly higher than that measured at the SGP and BND sites, leading to lower single-scattering albedos. These values show strong seasonal dependence, with summer months possessing much higher scattering and higher single-scattering albedo and fall and winter months possessing lower single-scattering albedo. Sub-micron particles represent approximately 90% of the total particulate light scattering and 94% of the light absorption, although strong seasonal variations were observed (markedly lower submicron fractions during winter months). The values depend significantly on aerosol source region and source-apportioned aerosol optical properties will also be presented. The above-mentioned measurements are supplemented by a co-located meteorological station and chemical composition measurements. Several new instruments will be brought online in 2010, providing an expanded suite of aerosol and radiation measurements that will facilitate calculations of direct aerosol radiative forcing and initial studies of the indirect aerosol radiative effect.

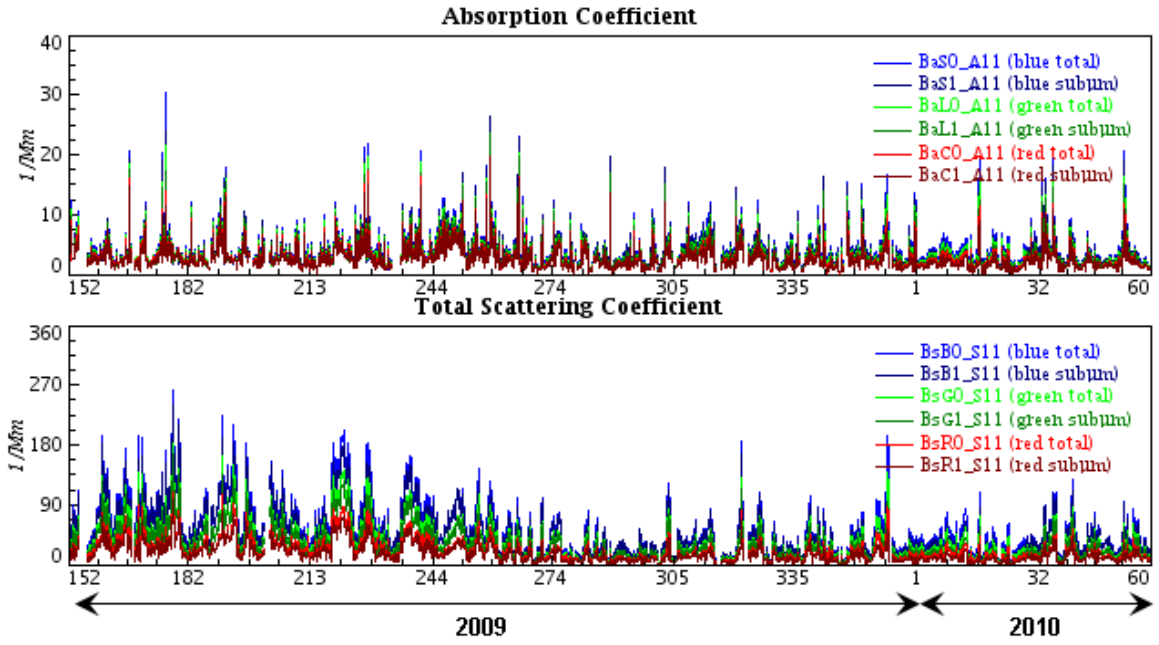

Figure 1. Time series plots of the aerosol light absorption and scattering coefficients for two size fractions at three wavelengths measured at the Appalachian Station.