(27-220414-A) **Changes in Background Southeastern U.S. Aerosol Loading and Aerosol Optical Properties and Their Seasonality Based on 12 Years of Measurements at the NOAA/NASA Monitoring Sites at Appalachian State University**

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The southeastern U.S. is home to high summertime aerosol concentrations of biogenic secondary organic aerosol and sulfate aerosol and the summer haze may have contributed to a summer cooling effect during the 20th century. Appalachian State University (APP) in the high-elevation semi-rural town of Boone, NC (36.21$^0$N, 81.69$^0$W, 1080 m asl) is home to the only co-located NOAA FAN, NASA AERONET, and NASA MPLNET aerosol monitoring sites in the U.S., with continuous datasets extending back as far as 2009. Various portions of the aerosol datasets have been used in publications to (1) study the aerosol direct radiative effect; (2) study aerosol-precipitation interactions; (3) validate MODIS satellite retrievals over Southern Appalachian Mountains; (4) study new particle formation in the eastern U.S.; and (5) examine the annual, weekly, and diurnal AOP cycles at APP and other North American continental NOAA-FAN sites**.** The NOAA-FAN dataset at APP has also been used in global studies of particle water uptake effects on AOPs and long-term global AOP trends

This presentation outlines how aerosol loading and aerosol optical properties (AOPs) have changed at APP since 2009 by examining features of their probability distributions. Aerosol visible light scattering and absorption coefficients ($\sigma_{sp}$ and $\sigma_{ap}$) and aerosol optical depth (AOD) decreased significantly up until 2016, with little overall changes since then. Similar changes in $\sigma_{sp}$ and $\sigma_{ap}$ have led to minimal changes in single-scattering albedo. While scattering Angstrom exponent (SAE) has demonstrated only very modest changes, the decreases in aerosol loading up until 2016 were accompanied by increases in aerosol hemispheric backscattering fraction (b). Since SAE is sensitive to the relative contributions of coarse and fine-mode aerosols while b is sensitive to accumulation mode aerosol (~100-300nm diameters), this indicates a potential shift toward smaller-diameter accumulation mode particles up until 2016. The above-stated changes in aerosol loading and AOPs are common to both summer and winter and to all quartiles in the probability distributions. A few exceptions include increased summer 2021 variability due to wildfire smoke and decreased loading during the summer 2020 COVID lockdown.

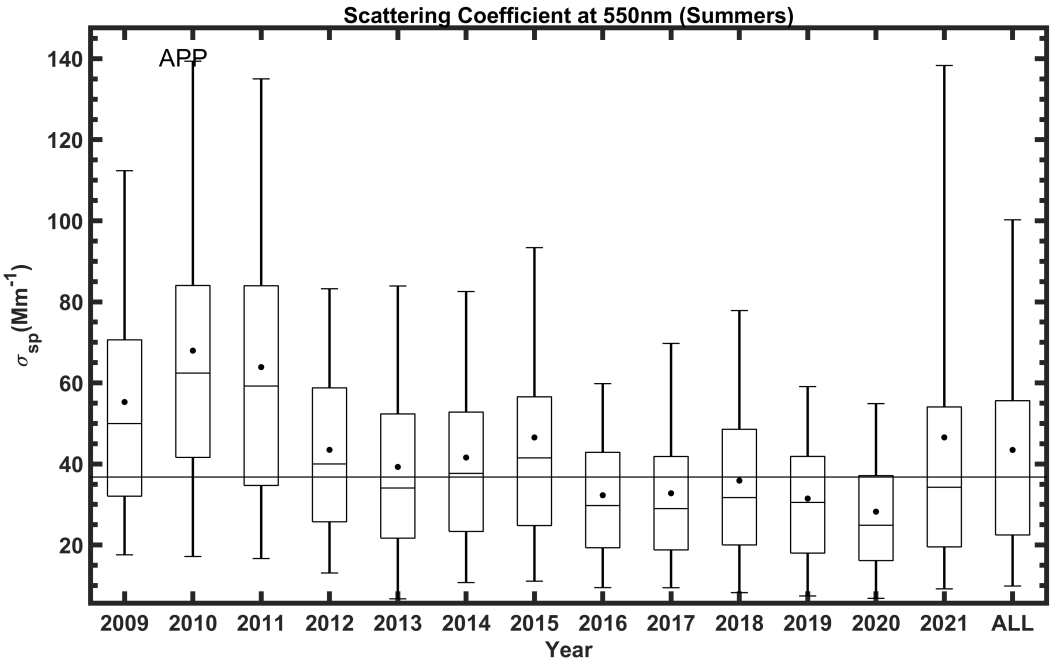


**Figure 1.** Boxplot of summer aerosol light scattering coefficient at 550nm at APP. The top and bottom whiskers extend to 95th and 5th percentiles. The whisker is 50th percentile and the dot is the mean. The box top and bottom represent 75th and 25th percentiles. The 'ALL' box is for the entire dataset (all summers).