**Can We Characterize Aerosol Type Using Aerosol Optical Properties?**

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Several studies have used the relationships between aerosol optical properties to identify types of atmospheric aerosols or chemical characteristics of the aerosols. Two of these papers (Giles *et al.*, 2012; Cazorla *et al.*, 2013) utilized AErosol RObotic NETwork (AERONET) data, while another (Costabile *et al.*, 2013) used *in situ* measurements from the same type of instruments operated at NOAA's federated aerosol network. The wavelength dependence of the light absorption coefficient, as expressed by the Absorption Ångstöm Exponent (AAE), was found to be useful in discrimination of dominant aerosol type. Giles *et al.* (2012) evaluated the different relationships between AAE and Extinction Ångström Exponent among sites characterized *a priori* as having one of four characteristic aerosol types (dust, urban/industrial, biomass burning, and mixed). Similarly, Cazorla *et al.* (2013) utilized AERONET retrievals to parse fossil fuel, biomass burning and dust aerosol into categories such as 'Ogranic Compound dominated', 'Elemental Compound (EC) dominated', 'Dust/EC mix', etc. AERONET measurements are made at ambient conditions and the retrievals are limited to high Aerosol Optical Depth (AOD) conditions (AOD440>0.4) so utilizing *in situ* aerosol data at controlled Relative Humidity may provide more information about the intrinsic relationships amongst different aerosol properties. Costabile *et al.* (2013) showed how *in situ* aerosol data from multiple field campaigns fit into categories similar to those used by Cazorla *et al.* (2013) by plotting Scattering Ångström Exponent (SAE) vs. AAE*dSSA, where dSSA indicates the wavelength dependence of single scattering albedo. Costabile *et al.* (2013) was somewhat limited, however, in that they only included short-term measurements at a narrow range of location types (e.g., they did not include arctic, clean marine, etc.).

Here we investigate the relationships between AAE and other simultaneously measured aerosol optical properties based on long-term measurements (>6 months) made at locations in NOAA's federated aerosol network. Some sites are relatively pristine while others have a strong anthropogenic influence and exhibit high aerosol loading. Aerosol properties at many of the sites exhibit seasonal and diurnal cycles due to large-scale air mass changes and/or source variability. Air mass trajectory clustering is used to explore the relationships between aerosol optical properties and air mass source.

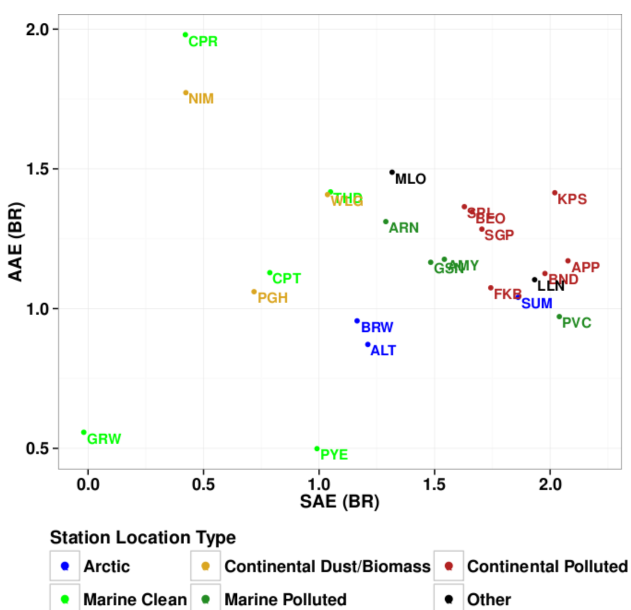


**Figure 1.** Median values of AAE and SAE at 24 sites in the NOAA network.