

Laboratory Studies of Filter-based Aerosol Light Absorption Measurements

P. Sheridan¹, E. Andrews², J. Ogren¹ and G. McMeeking³

¹NOAA Earth System Research Laboratory, 325 Broadway, Boulder, CO 80305; 303-497-6672, E-mail: patrick.sheridan@noaa.gov

²Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO 80309

³Droplet Measurement Technologies, Boulder, CO 80301

The NOAA/ESRL Global Monitoring Division (GMD) conducts measurements of aerosol light absorption at atmospheric monitoring stations around the world. In order to better perform and reduce the uncertainty in these measurements, a new filter-based Continuous Light Absorption Photometer (CLAP), optimized for long term aerosol measurements, was designed and built by GMD personnel and deployed to stations within our federated network. Accurate measurement of the aerosol light absorption coefficient by filter-based instruments requires a number of corrections to the raw signals, and in the spring of 2012 and 2013, experiments were conducted in the GMD Aerosol Laboratory to better understand and quantify these corrections. Commercial instruments that measure the optical properties (i.e., scattering, absorption and extinction components) of test aerosols at different wavelengths and the particle size distribution were included in these comparisons with the GMD instruments. These measurements are being used to constrain a two-stream radiative transfer model of the filter-aerosol system. Tests on white, laboratory-generated salt particles permit an evaluation of instrument response when no light absorption is present. Tests on black or mixed black and white aerosols of different sizes permit other factors, including a particle size dependence, to be evaluated. Preliminary results of these studies suggest that a more robust correction scheme for the NOAA CLAP instruments should be available soon.



Figure 1. The NOAA/ESRL Continuous Light Absorption Photometer.

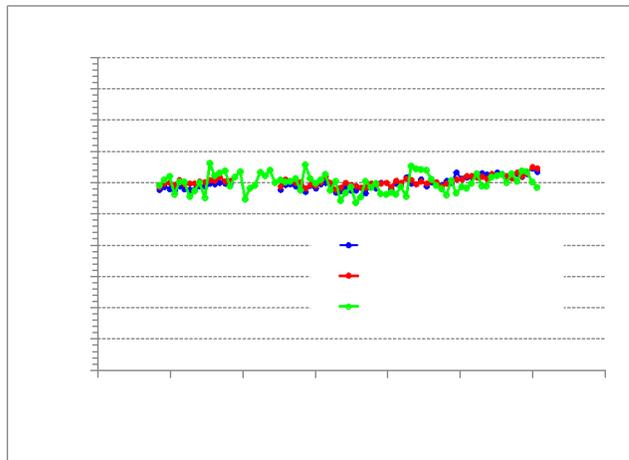


Figure 2. Light absorption coefficients (532 nm wavelength) of mixed test aerosols measured by NOAA filter-based absorption instruments and a commercial photoacoustic instrument.