# Measurement of light absorption in the IMPROVE aerosol monitoring network

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The IMPROVE network (Interagency Monitoring of Protected Visual Environments) has collected 24h $PM_{2.5}$ samples on PTFE filters since 1988, at a sustained frequency of twice a week or every third day. The network now includes about 170 sites, 70 having operated continuously since 1995. The PTFE $PM_{2.5}$ samples are weighed for total mass, analyzed by XRF for elemental concentrations, and analyzed for light absorption. Light absorption is measured at 633 nm with the U.C. Davis Hybrid Integrating Plate/Sphere (HIPS) system.

HIPS directs a diffused laser beam at the back side of the filter, recording both back-scattered and transmitted light intensity. Backscatter from the "clean" side of the filter is collected with an integrating sphere, and transmission through the filter and sample deposit is collected with an integrating plate. The backscatter is used to estimate the transmission of the unexposed ("clean") filter; the ratio of that reference to the observed transmission then yields a measure of absorption by the deposited sample. Because it employs the same sample used for XRF analysis, HIPS delivers an absorption measurement that is accompanied by relevant information on chemical composition. The measurement is also somewhat unfamiliar, as the thin membrane filters optimal for XRF are quite unlike the optically thick fiber filters widely used in aethelometers and other dedicated real-time monitors.

Previous analyses have exposed deficiencies in the calibration historically used to report absorption data from HIPS. This paper summarizes recent work to place the calibration of HIPS on a sounder foundation. Improved long-term stability is demonstrated for historical data reprocessed with the new calibration, together with an improved relationship of absorption to carbon fractions and fine soil dust.

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