Tests of Long-Term Stability in IMPROVE Trend Measurements

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A key objective of the Interagency Monitoring of Protected Visual Environments (IMPROVE) network is to track improvements in visibility under the U.S. Environmental Protection Agency's Regional Haze Rule. The Rule seeks attainment of natural conditions through steady improvements over the next 6 decades and requires that implementation activities be verified to yield this progress in the atmosphere as well as on paper. The particle measurements specified by the Rule must remain consistent, to within small tolerances, from decade to decade if they are to be meaningful for such verification. This absolute long-term stability is a requirement not encountered in the intensive field campaigns typically mounted to characterize particulate pollution.

This presentation assesses the temporal consistency of existing sulfate data by testing for trends in observed differences between various pairs of multi-year records from collocated and methodologically distinct measurements. Attention is focused on Shenandoah, Great Smoky Mountains, and Grand Canyon National Parks, where new samplers introduced throughout the network in 2000 were overlapped with the old versions for about a year to establish comparability. At these sites, the routine redundancy of independent sulfur (XRF on Teflon) and sulfate (IC on Nylon) determinations has also been augmented since the late 1990s by collocation of nephelometers and Clean Air Science and Trends Network (CASTNet) samplers. The hourly nephelometer data explain much of the observed difference between the 24-hour IMPROVE and 172-hour CASTNet sulfate data, enabling tighter comparisons between these two series. Our results are expressed as quantitative bounds on the trend (% yr^{-1}) uncertainty contributed by possible measurement drift.

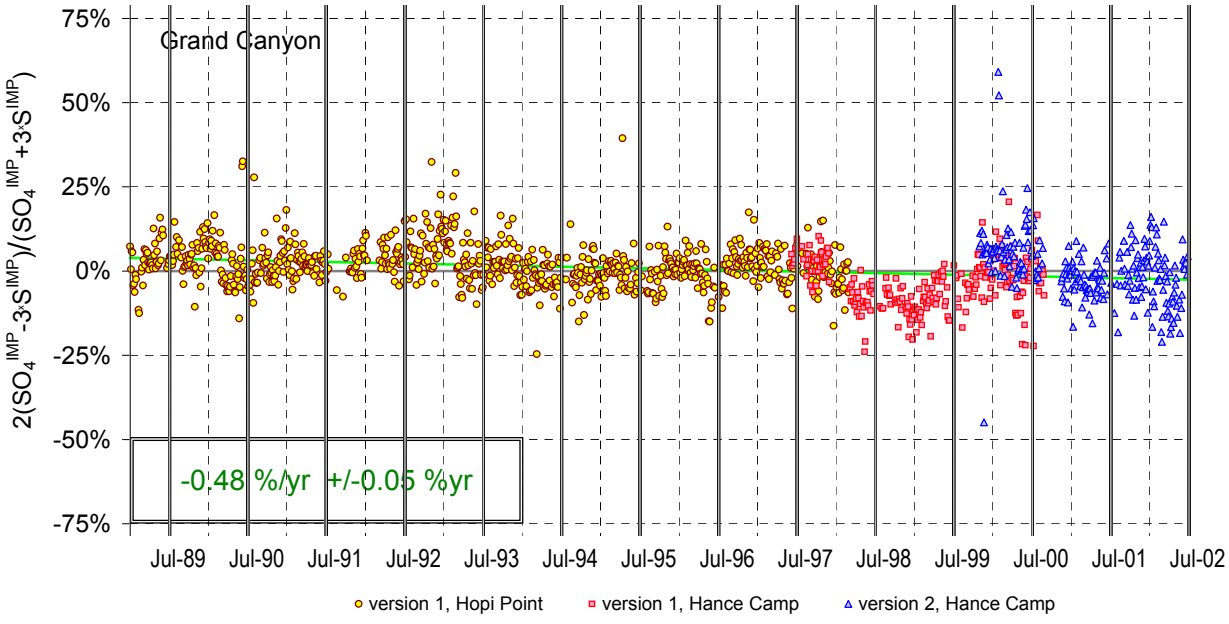

Figure 1. Thirteen-year series of errors inferred from collocated fine-particle sulfate and sulfur measurements at two locations on the rim of the Grand Canyon, in Arizona.