

Posting type	Informational
Subject	Introduction of a second copper-anode XRF system
Module/Species	A/ Na, Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe
Sites	entire network
Period	Starting 10/1/05
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Supporting information

Light-element concentrations in samples collected after 12/1/01 have been determined by XRF analysis using a Cu-anode tube as the source. Until 1/1/05, analyses were conducted at ambient pressure in a He-flushed atmosphere. That system was replaced on 1/1/05 (sample date) with a [new system](#) that operates under vacuum. A second system, with the same design, was then developed and tested for equivalence with the first. Samples collected in October 2005 are the first to be reported from the second system.

The two Cu-anode systems are designed to be equivalent and are calibrated against the same reference foils. They report concentrations for the single-element calibration foils that agree within prescribed tolerances. However, the two systems do exhibit some detectable differences for actual samples. The differences arise when inter-element interferences become important, and may be thought of as a “second-order” effect. Figure 1 compares results from both systems for Al and Si in July 2005 samples. Reported Al and Si concentrations become [unreliable](#) at high S concentrations (a condition not represented by the Al and Si foils), and the two systems respond differently in this region.

The observed differences between the systems in reported Al and Si substantially exceed reported uncertainties at high S concentrations. However, they are well within the range of variability that can be seen empirically in historical data. Figure 2 summarizes Si/Fe ratios throughout the network over time. Both Si and Fe are generally [attributed](#) to crustal sources at non-urban IMPROVE locations, and their relative proportions are accordingly expected to be fairly constant. This expectation is borne out in the months January-September 2005, all of which were reported from the original vacuum system. The October 2005 ratios reported from the second vacuum system are noticeably higher, but this difference is smaller than many of the month-to-month changes observed in previous years.

Data from samples collected after 10/1/05 will be reported with an added indicator of the Cu-anode XRF system used in analysis, the first (1) or the second (2). (All light-element data from January-September 2005 samples are from the first system.)

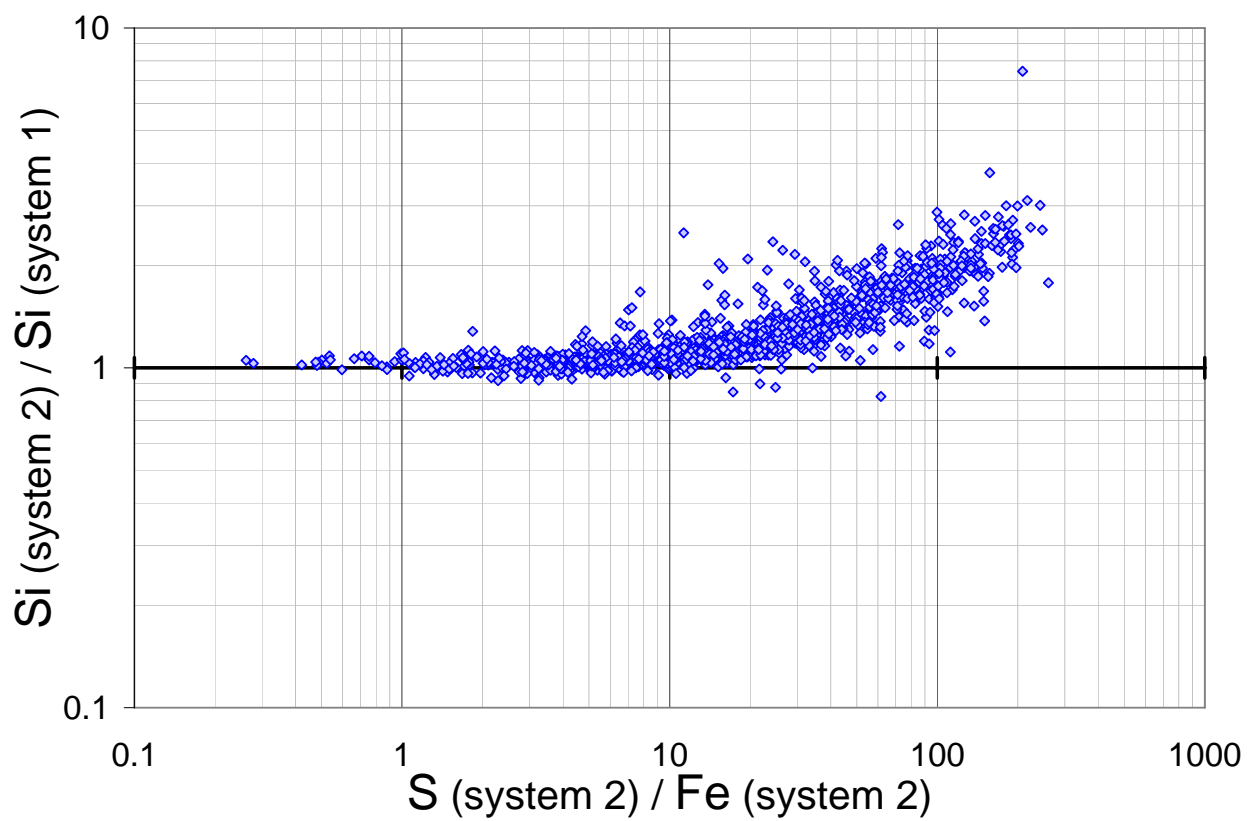
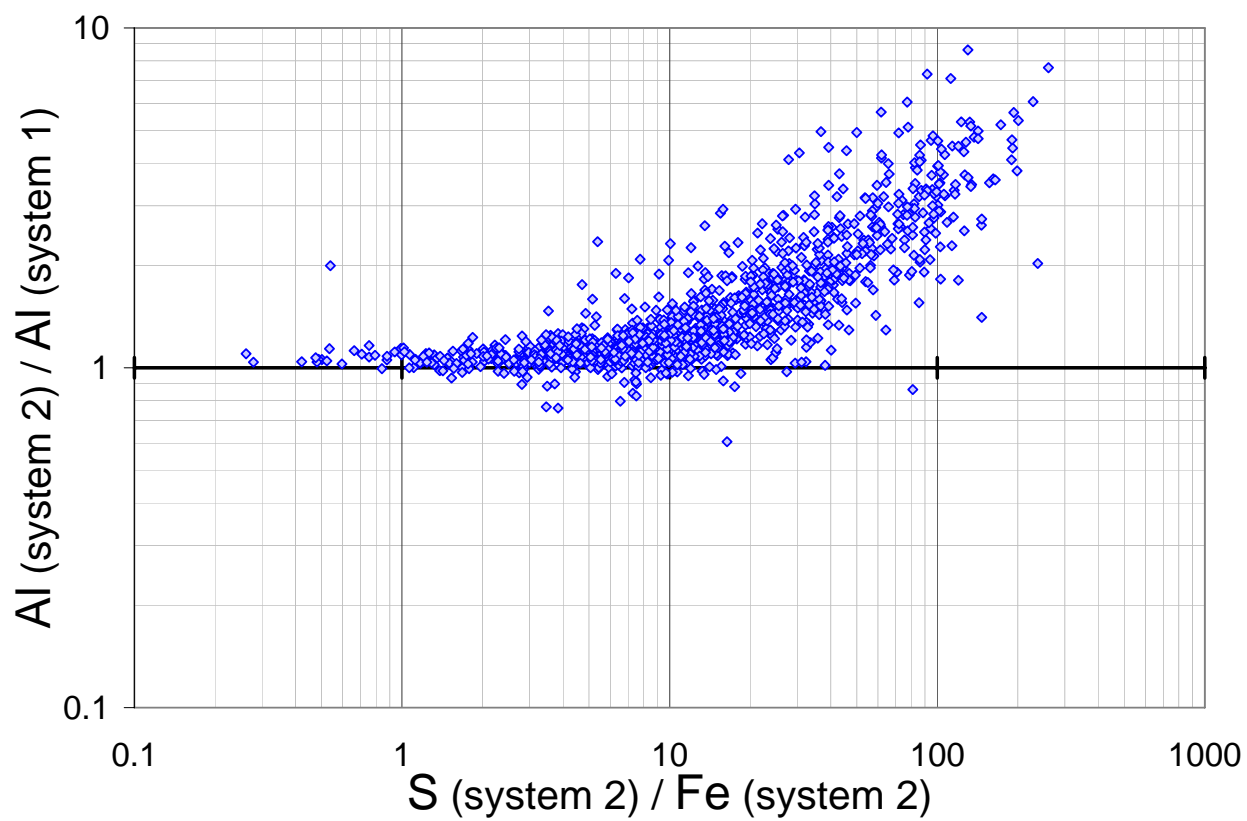


Figure 1. Intercomparison of original (1) and new (2) system for all July 2005 network samples with detected concentrations.

MEAN AND INTERQUARTILE RANGE, NETWORK

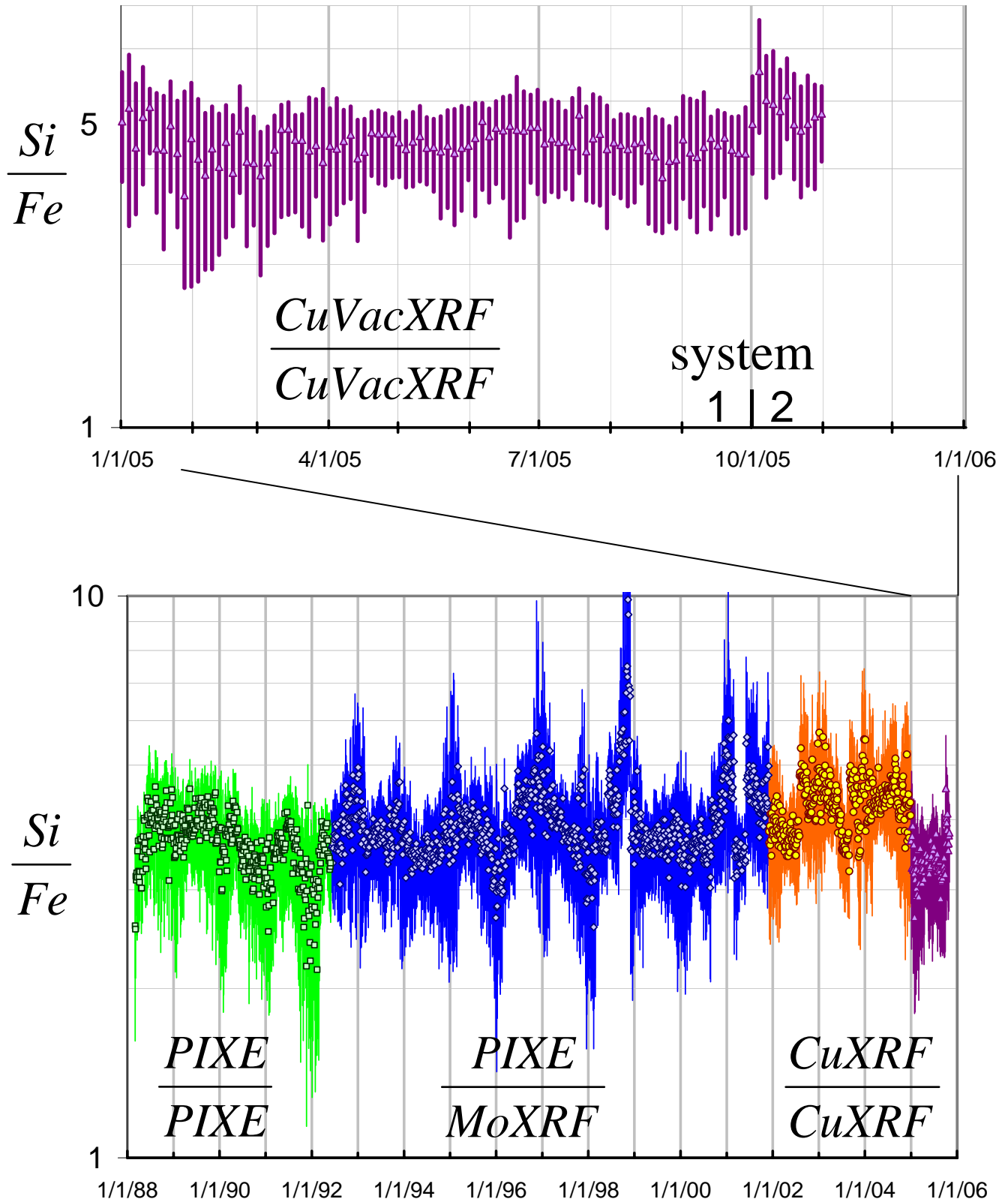


Figure 2. Network Si/Fe ratios, for all samples with detected Si and Fe. Different analytical regimes are indicated by labels and colors. For example, June 1992 – November 2001 samples were analyzed for Si by PIXE and for Fe by Mo-anode XRF.