

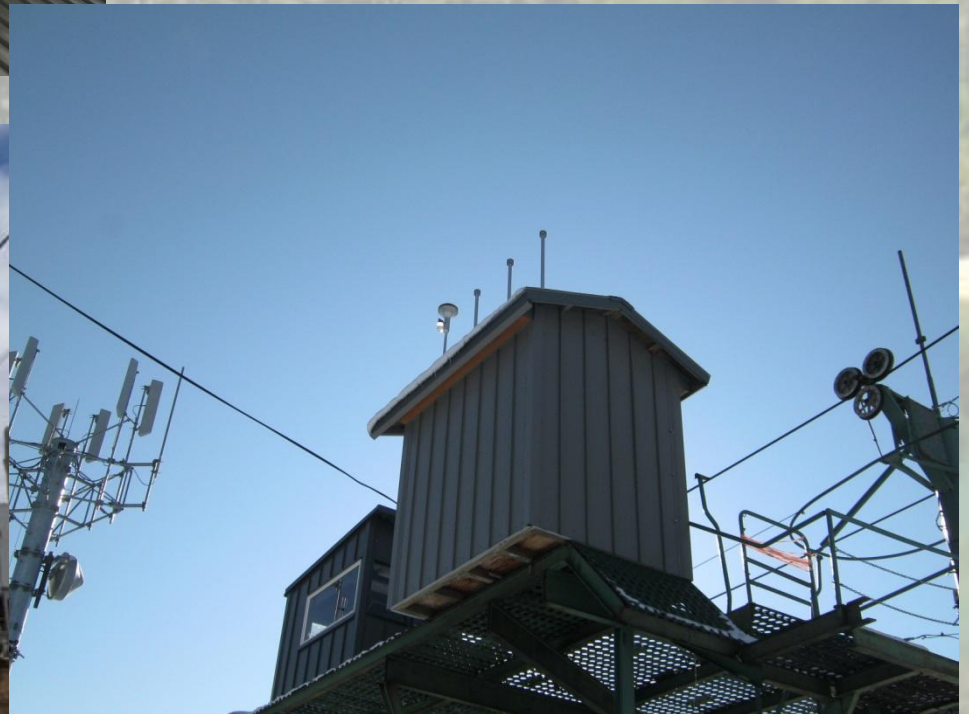
- Discussed at 2011 Steering Committee Meeting
- E-mailed to 47 recipients at the conclusion of each calendar quarter

Site Status Report																			
This sheet includes the information necessary to evaluate the first two completeness criteria: >25% quarterly completeness and <11 consecutive missed samples. The last criterion, >75% annual completeness, will be evaluated when the 2012 year is complete.																			
Sample collection performance Jan thru September 2012 Sampler names ending with "X" are collocated (duplicates)		Count of Each Status Flag												Percent Complete by Quarter 2012 (criteria 50%)				Consecutive Terminal Samples (criteria <11)	
															<75%	<50%			>7
SITE	Affiliation	PO	BI	NS	EP	XX	OL	QD	SA	NT	NM	Total	Amount Terminal	Q1 (J/F/M)	Q2 (A/M/J)	Q3 (J/A/S)	Q4 (O/N/D)	Consecutive Problems	
ACAD1	NPS	0	0	0	0	1	0	13	0	0	76	90	1	100%	97%	100%		1	
AGTI1	FS	4	4	9	0	7	0	3	0	0	63	90	24	81%	67%	74%		8	
ATLA1	STN	0	0	0	0	0	0	0	0	0	92	92	0	100%	100%	100%		0	
BADL1	NPS	1	0	0	4	0	0	17	0	0	68	90	5	100%	90%	94%		3	
BALA1	NPS	0	1	2	4	0	0	3	0	0	76	86	7	94%	87%	97%		4	
BALD1	FS	0	0	3	0	0	0	5	0	0	75	83	3	94%	97%	100%		1	
BAND1	NPS	2	0	1	3	0	0	1	0	0	85	92	6	87%	100%	94%		3	
BIBE1	NPS	3	1	0	0	2	0	3	0	0	83	92	6	87%	97%	97%		2	
BIRM1	STN	1	0	4	0	1	0	2	0	0	77	85	6	90%	90%	100%		2	
BLIS1	FS	3	0	0	0	0	0	2	0	0	87	92	3	100%	100%	90%		3	
BLMO1	STATE	4	0	1	0	0	0	7	0	0	78	90	5	84%	100%	100%		2	
BOAP1	FWS	4	0	6	7	0	0	7	0	0	61	85	17	74%	87%	84%		3	

Training Videos & Local Time

- During maintenance off-season, we will be creating an operator training video for weekly sample changes.
- Depending on the results, we may create videos for
 - Flow rate audits
 - Pump replacement
 - Ebox replacement
 - Module replacement
 - Controller replacement
- As of Fall 2012, we will begin sampling on Local Standard Time. In Spring 2012, we will remind operators not to change to Daylight Saving Time.
 - Newsletter article would be helpful

Site Safety Concerns





Crocker Nuclear Lab: News and Review

IMPROVE Steering Committee
Meeting

October 2012

Data Delivery is Back on Track!

- 2011 samples were all analyzed using the new PANalytical XRF systems
 - This change delayed data delivery
- After several months of not delivering data, we delivered
 - Jan/Feb/Mar 2011 in June 2012
 - Apr/May 2011 in July 2012
 - Jun/Jul/Aug 2011 in September 2012
 - Sept/Oct 2011 in October 2012
 - Nov/Dec 2011 will be delivered in early November 2012
 - First time in 8 years that we have delivered data within a year of sample collection!
 - We are poised to decrease the lag time over the next year.



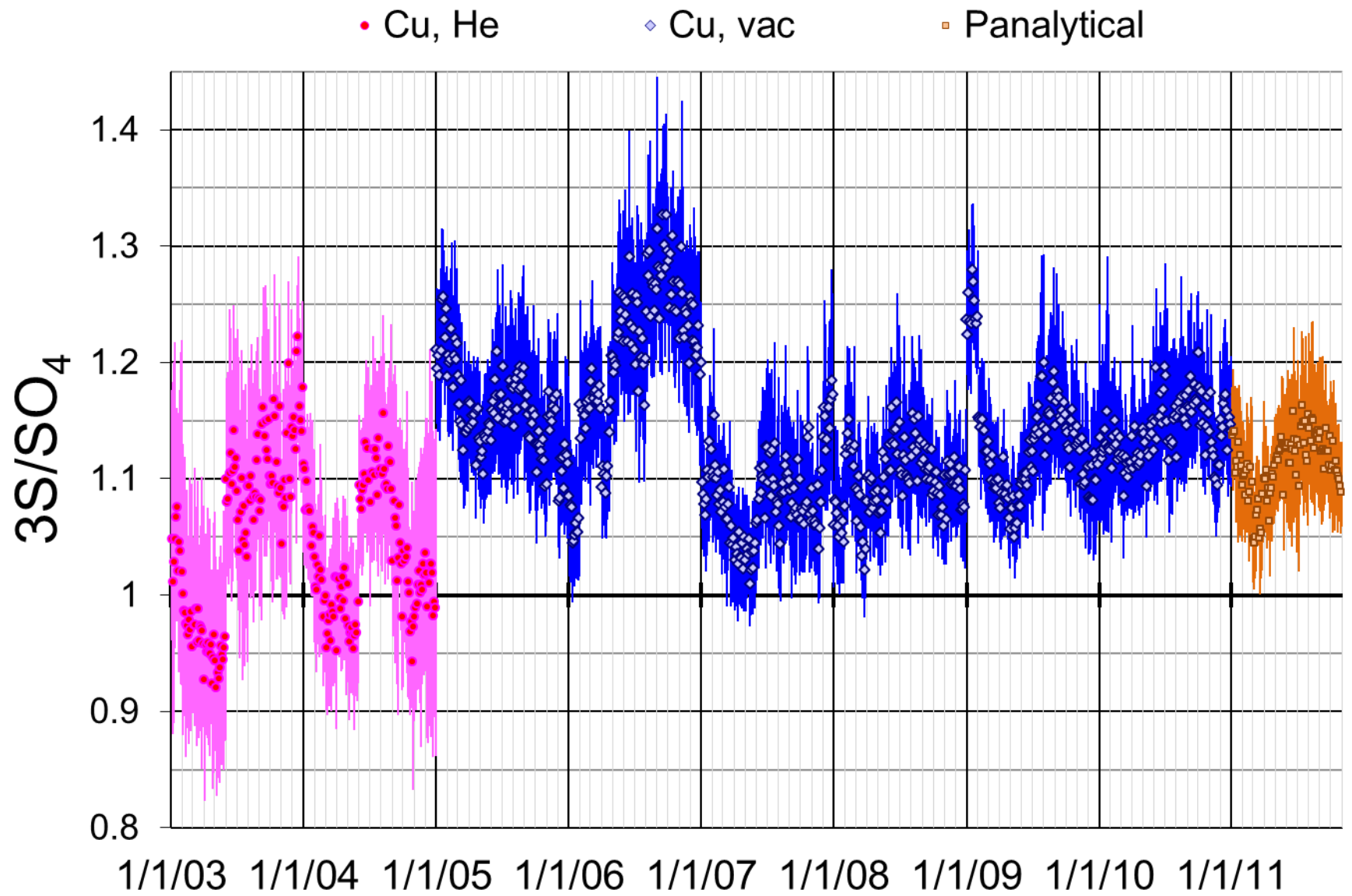
UC-Davis Operational Changes

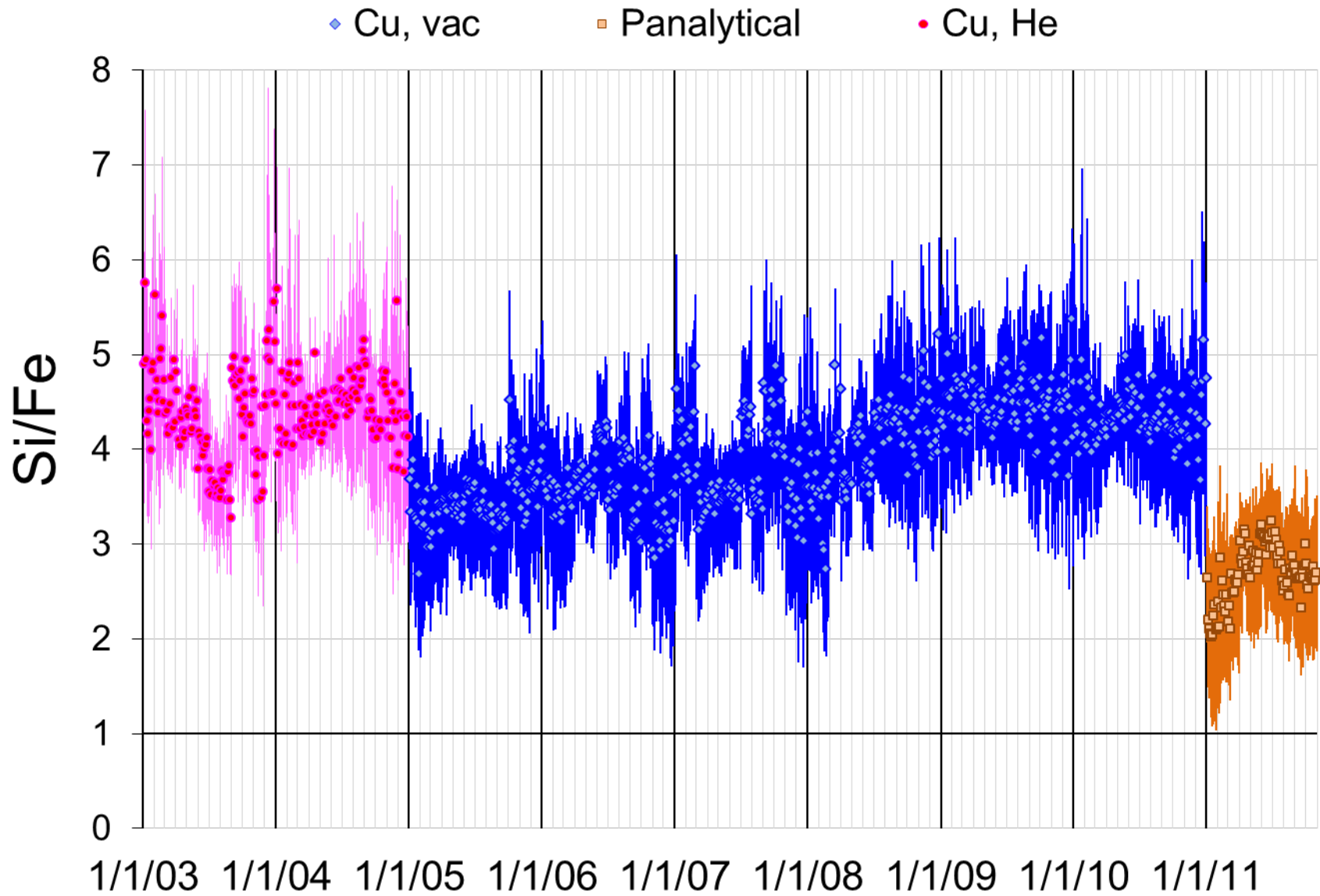
Exact Slide from 2011 Meeting

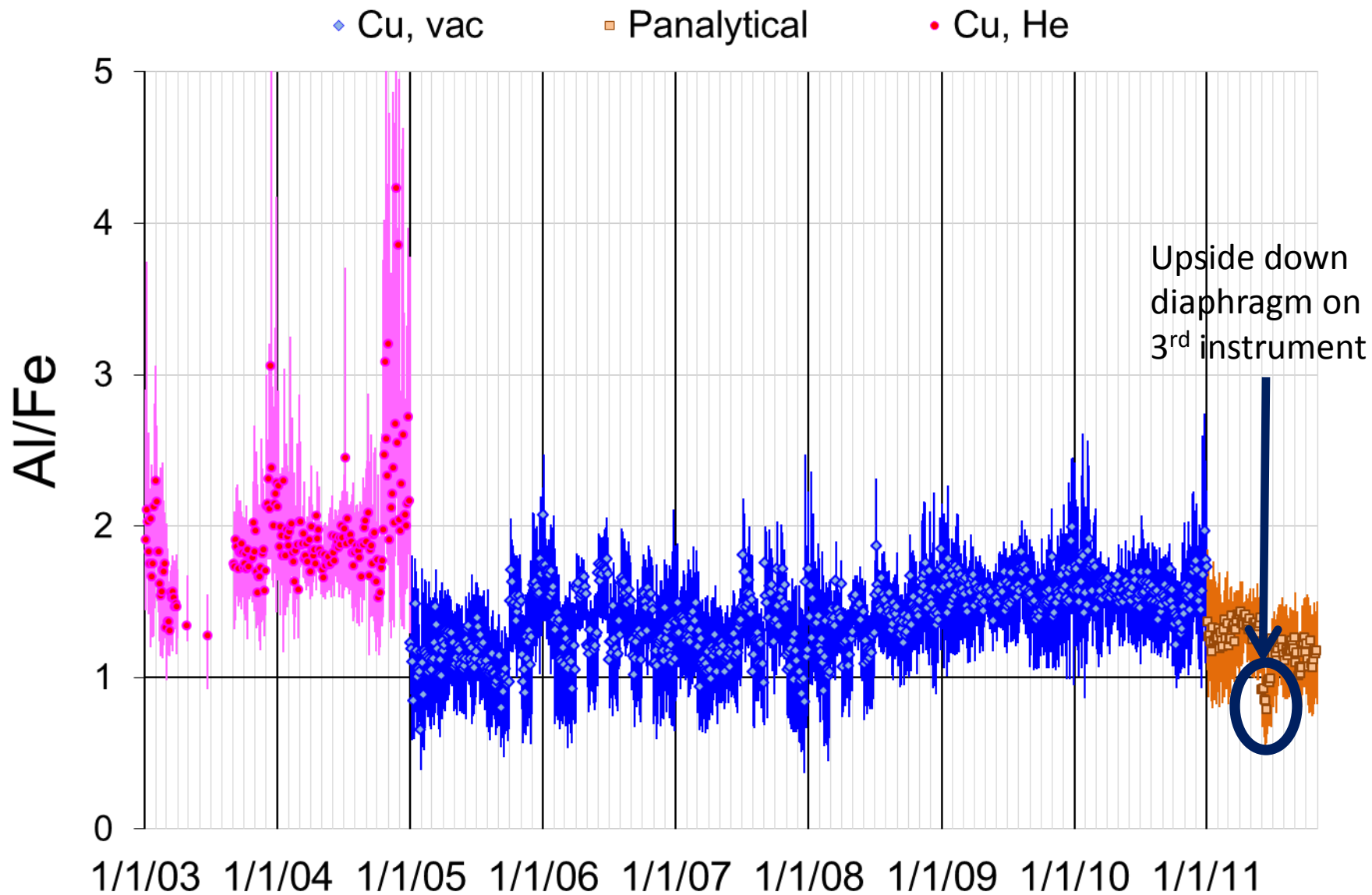
- **2010-2011**
 - ~~New laboratory location~~
 - ~~New Mettler balances & calibration protocols~~
- **2011-2012**
 - PANalytical Epsilon 5 XRF instruments ✓
 - New laboratory management software
 - New field maintenance management software ✓
 - New controller hardware & software ✓
 - PM₁₀ flow rate measurement improvement
 - Bar coded Teflon filters ✓
- **2012-2013**
 - Temperature & RH control for weighing chamber
 - Automated weighing system
 - Multi-wavelength laser absorption ✓
 - New data validation, processing & delivery software
 - New pre-cut inlets for PM_{2.5} cyclone cut-point irregularities ✓

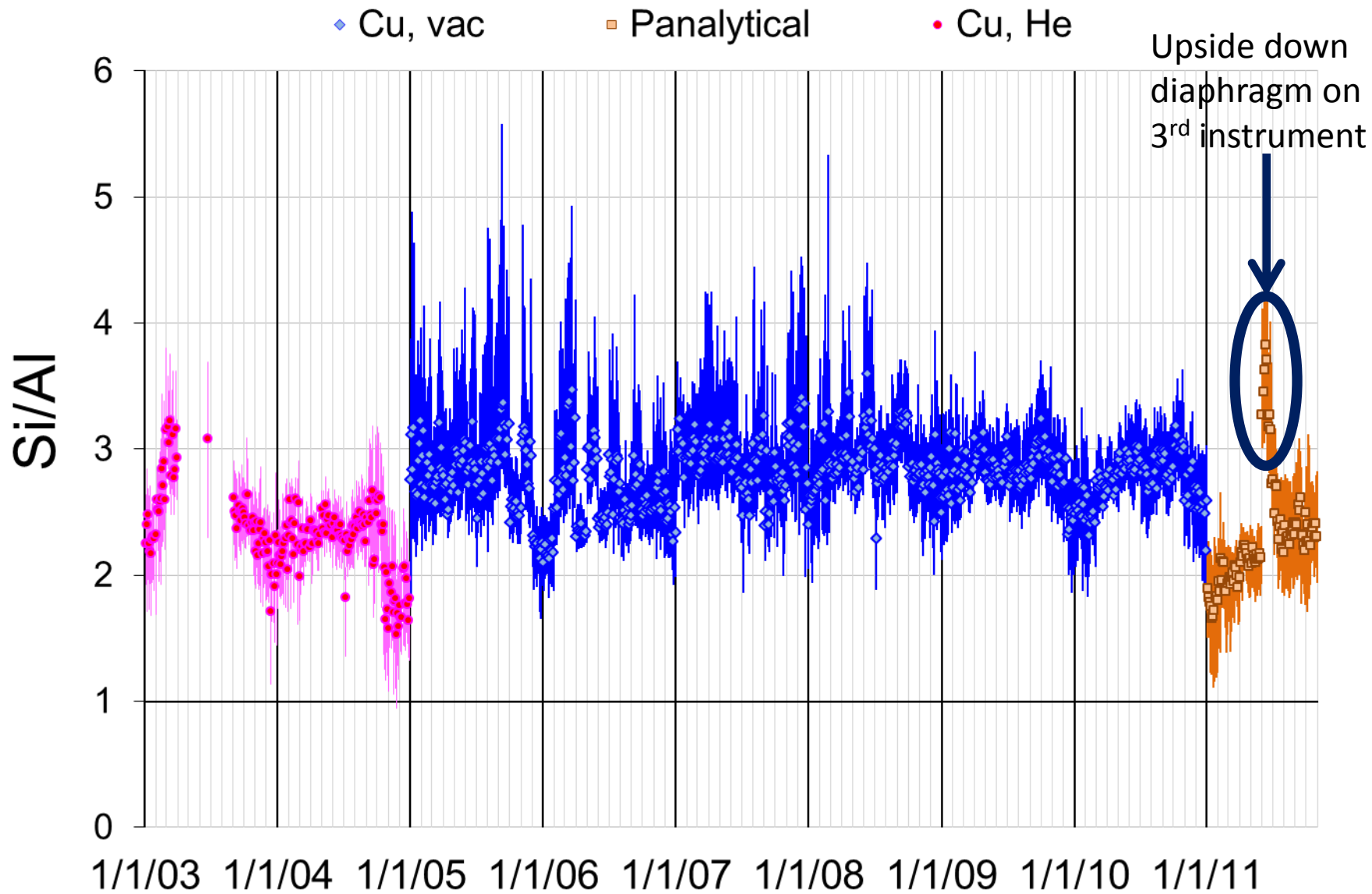
PANalytical XRF Instruments

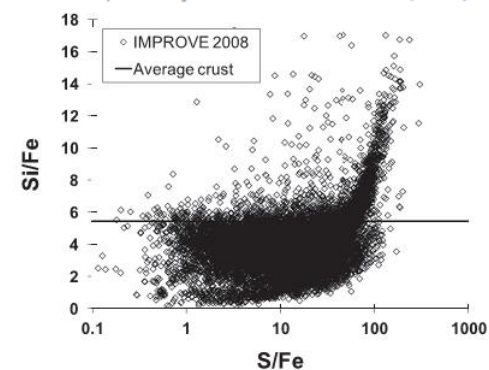
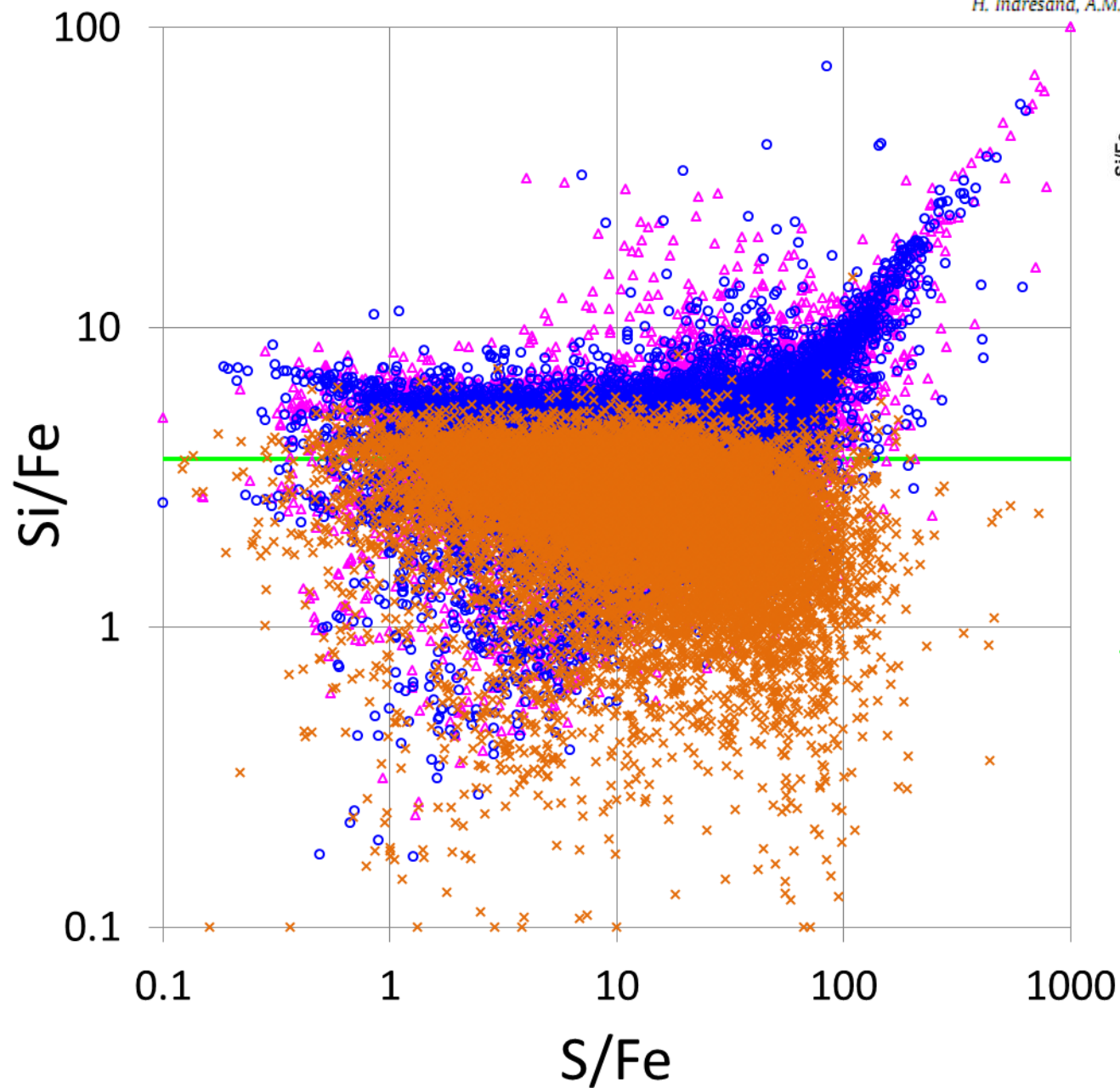
- Operating three XRF instruments
 - Running 24/7
- Working on further automation of the system to avoid weekend refills
- Blank corrections, detection limits, and uncertainties are now based on field blanks and collocated data
 - Warren will discuss in detail
- New XRF data can be compared to data from prior instruments



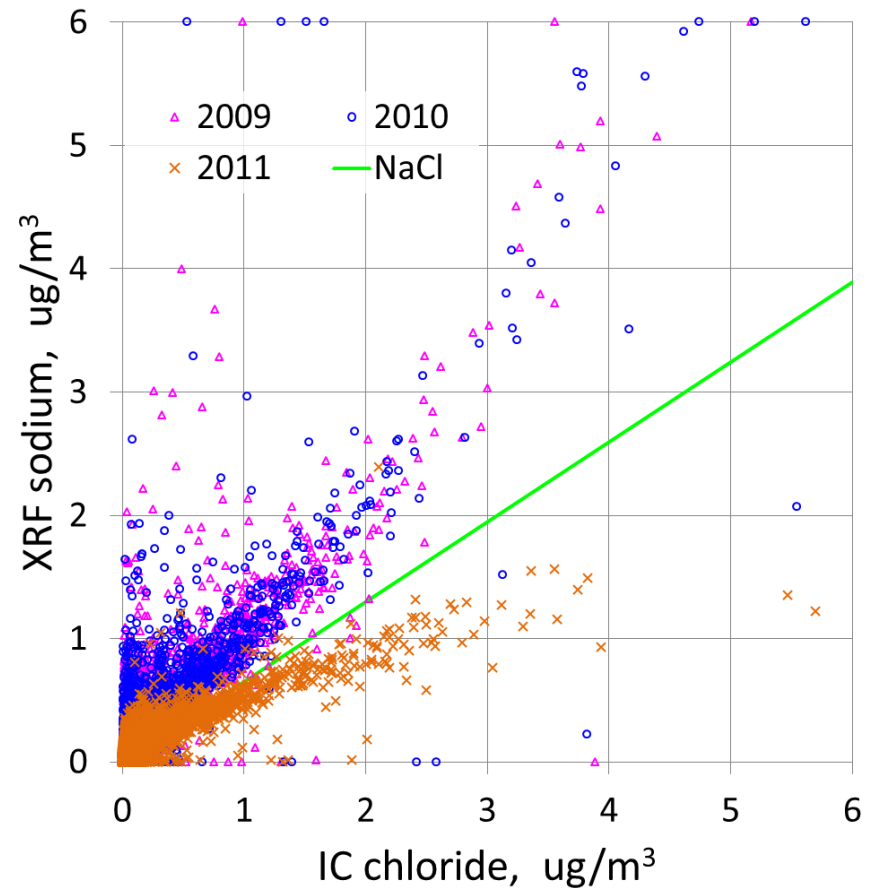
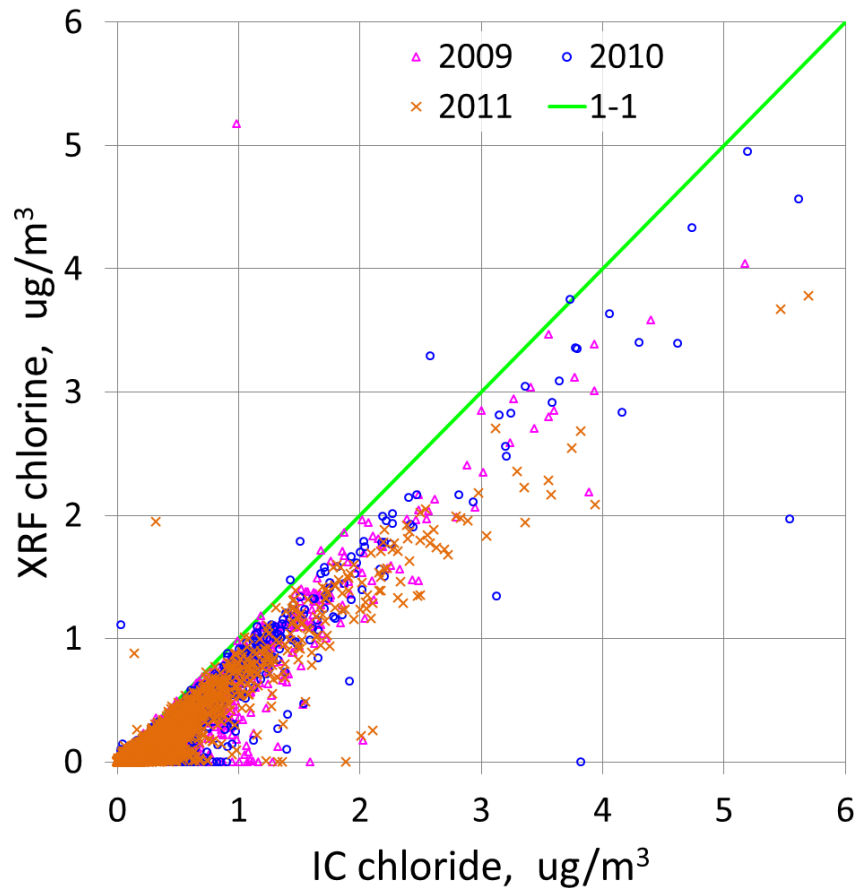




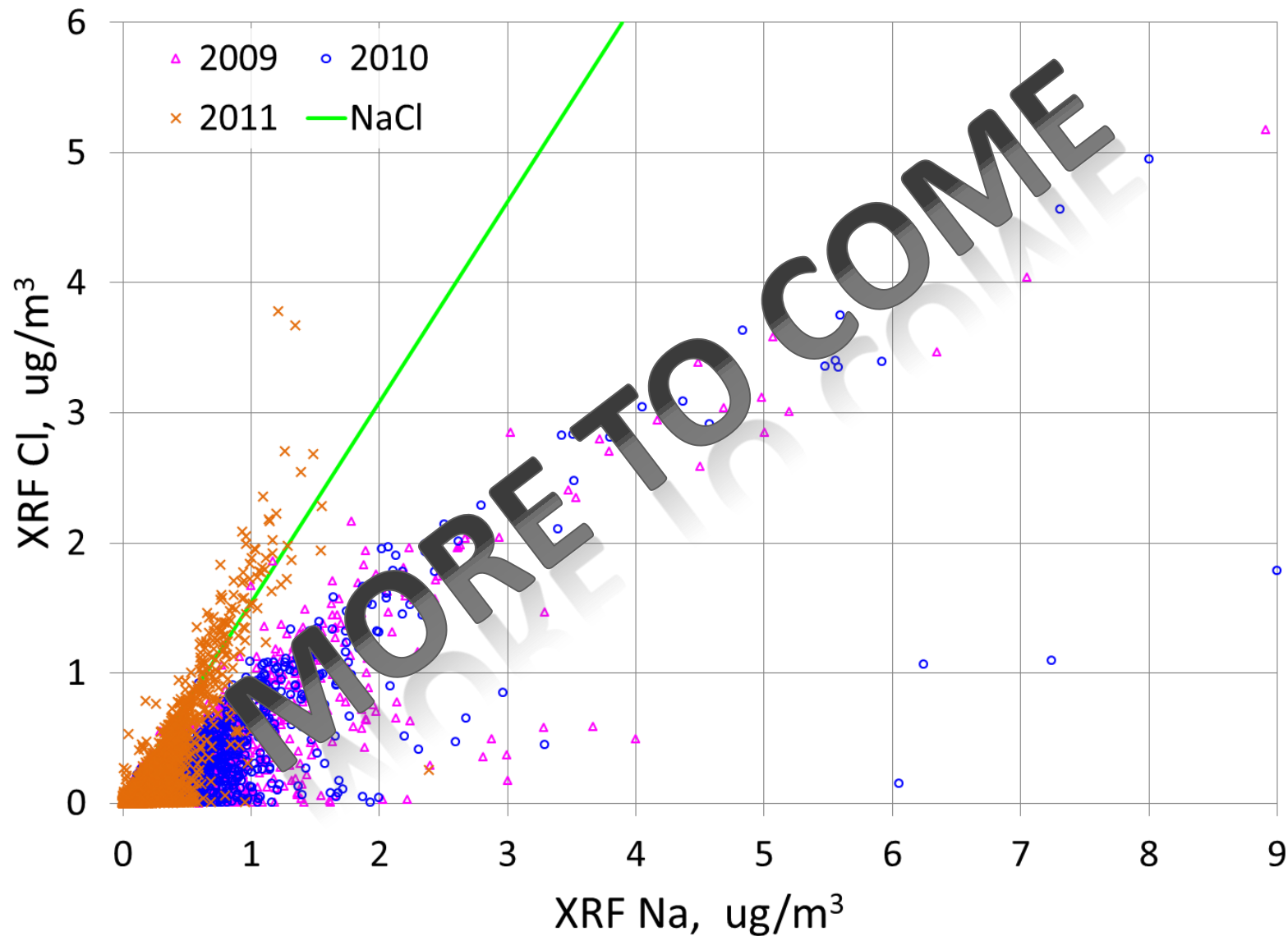




- △ 2009
- 2010
- × 2011
- Labban et al., 2004



- The chloride ion measurement is a respectable predictor of conserved sea salt markers [White (2008) *Atmospheric Environment* 42, 261–274].
- The legacy XRF data greatly over-correct for matrix attenuation of the Na signal [above right].



- The over-correction of Na creates the appearance of Cl depletion where it does not exist.

Sampler Electronics Redesign

Current sampler electronics are 13 years old

- Pressure sensors (analog devices) have been discontinued
 - Solution: Digital Sensors - smaller, more flexible
- Electrical noise - unshielded signals, long transmission distances
 - Solution: Digital sensors and transmission - immune to noise and degradation
- Limited display size forces cryptic messages to operators
 - Solution: Opportunity for larger display, improved GUI for operators
- “Sneakernet” shipping of physical data cards with sampling supplies results in 3-4 week delay before problems are detected
 - Solution: Cellular and satellite data transmission to receive performance data in real time

Sampler Electronics Redesign

Timeline

- Phase I: April to November 2012
 - Sensor Concept and Selection Proof of Concept
- Phase II: December 2012 to March 2013
 - Controller, Display, and Modem Selection and Prototype
- Phase III: April to September 2013
 - Final Development and Testing
- Phase IV: Winter 2013/Spring 2014
 - Initial Deployment to Sites

Sampler Electronics Redesign

Goals and Components

- Maximize reuse of existing hardware to minimize cost
 - Repackaging new electronics in existing ebox form-factor allows reuse of existing module hardware
- Pushing data collection to modules eboxes
 - Digitization performed at point of measurement.
 - Increases flexibility for later changes to the system including possibility of controlling flow rate
- Quake Global Q-4000 Modem
 - Fully programmable Cellular/Satellite Data Modem -selects best/cheapest available mode, sends health status and flow data back to base in real time.

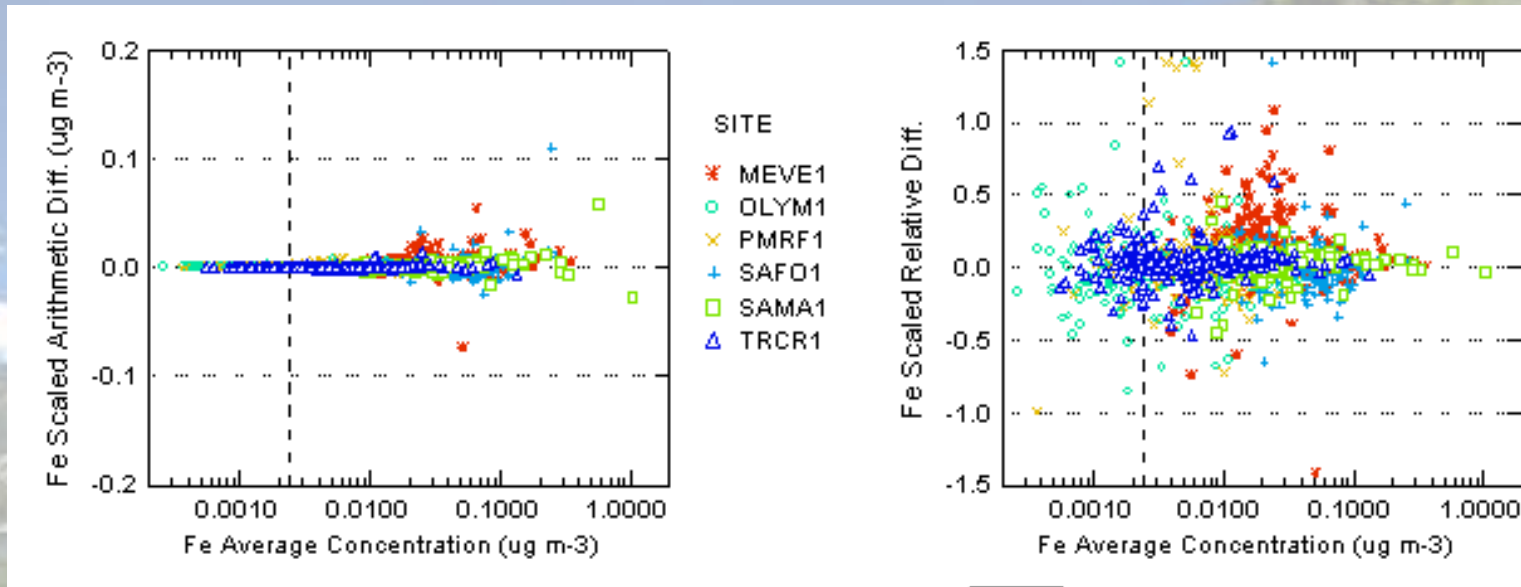
Data Management

- In the past, our Applications Development Group was not able to deliver solutions that worked
- We have a new team of developers
 - Design of the workflow and database for the whole data management system is underway
- The overall application design includes field operations, lab operations, and data processing and validation
- Consolidate all operational data into SQL Server
 - Ability to track all data manipulations and processing
- Avoid direct interaction between staff and databases
- New architecture will allow easy integration

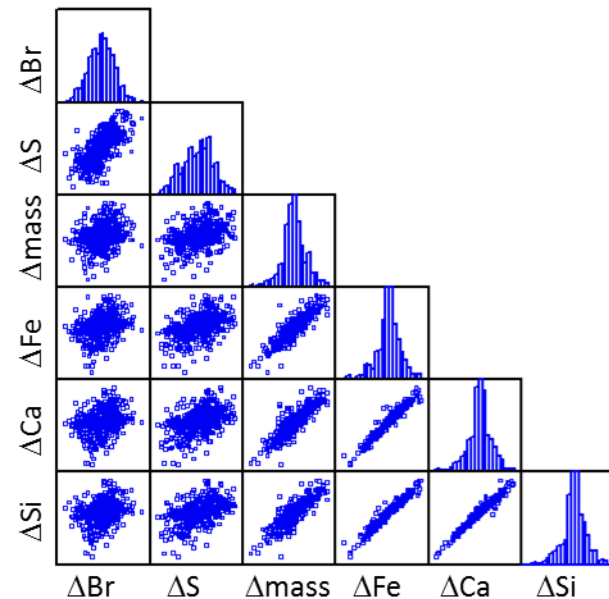
Matrix Coded Teflon Filters

- The matrix is tiny
 - Presents challenges for most code readers
- We received the code reader this summer and are working on getting the codes passed into a useable format.

PM_{2.5} Cut Point Discrepancies

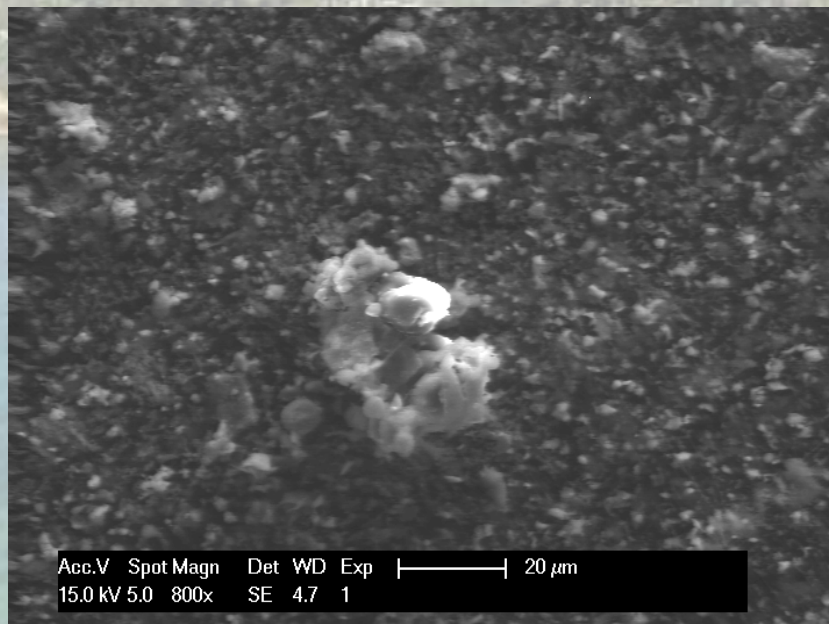


- Collocated data display much larger differences in soil-derived elements than expected



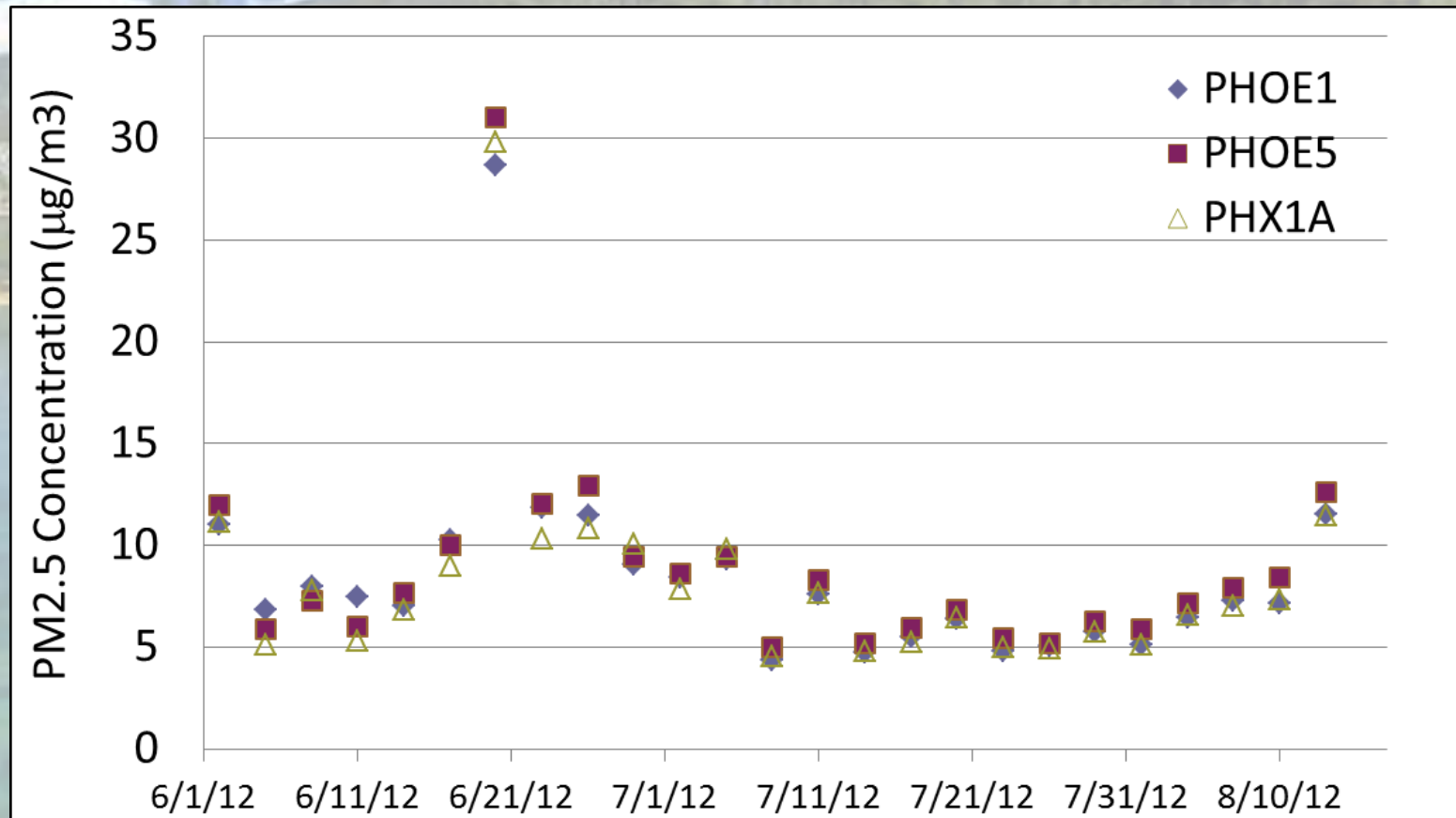
Presence of Large Particles on Filters

- PM_{2.5} cut point cyclone
- Light microscopy followed by TEM shows >2.5 micron particles, some approaching 20μm!



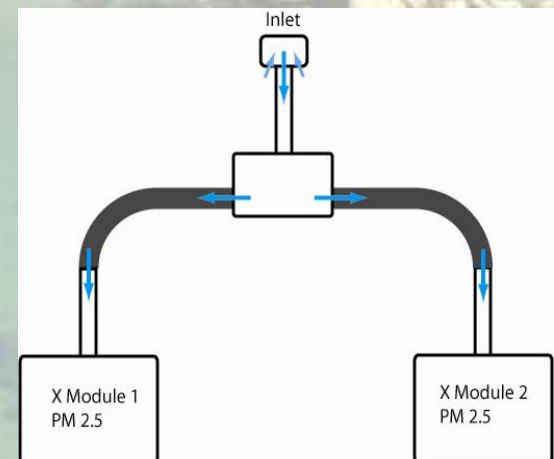
Third Vote

- Added a 3rd collocated A-type module at Phoenix, for a total of 3 collocated PM_{2.5} modules
- Observations did not suggest one module was “wrong”



Cut Point Discrepancy Tests

- Leaks?
 - Leaks could bypass the cyclone, explaining the presence of larger particles.
 - Installed HEPA filter at inlet of Phoenix 4th A module
 - No significant mass collected on samples with HEPA filter
 - Rules out post-cyclone leak, filter contamination
- Local Sources?
 - Two 'A' type modules sampling from a single sampling inlet
 - To remove possibility of local sources encountering one sampler and not another.



PM_{2.5} Cut Point Tests

- Greased cyclone tests
 - Some large particles may bounce or shatter on cyclone surface and proceed to filter
 - Differences suggest greasing makes a difference
- Pre-Cut: Testing two-cyclone system
 - Prototype cyclone designed for 5μm cut point at 23LPM
 - Fabricated on 3D printer out of cornstarch, cheap \$



UC-Davis Planned Operational Changes

- **2012-2013**
 - PANalytical Epsilon 5 XRF instruments ✓
 - Complete automation
 - New field maintenance management software ✓
 - New controller hardware & software ✓
 - PM₁₀ flow rate measurement improvement
 - Bar coded Teflon filters ✓
 - Multi-wavelength laser absorption ✓
- **2013-2014**
 - New laboratory management software
 - New pre-cut inlets for PM_{2.5} cyclone cut-point irregularities ✓
- **2014-2015**
 - New data validation, processing & delivery software
 - Automated weighing system
 - Temperature & RH control for weighing chamber