UC DAVIS 2021 NETWORK UPDATE

IMPROVE Steering Committee Meeting

2021.11.9 – 2021.11.10

Nicole Hyslop, Xiaolu Zhang, and the whole team

UC DAVIS
AIR QUALITY RESEARCH CENTER

We've (almost) fully moved into the new off campus location

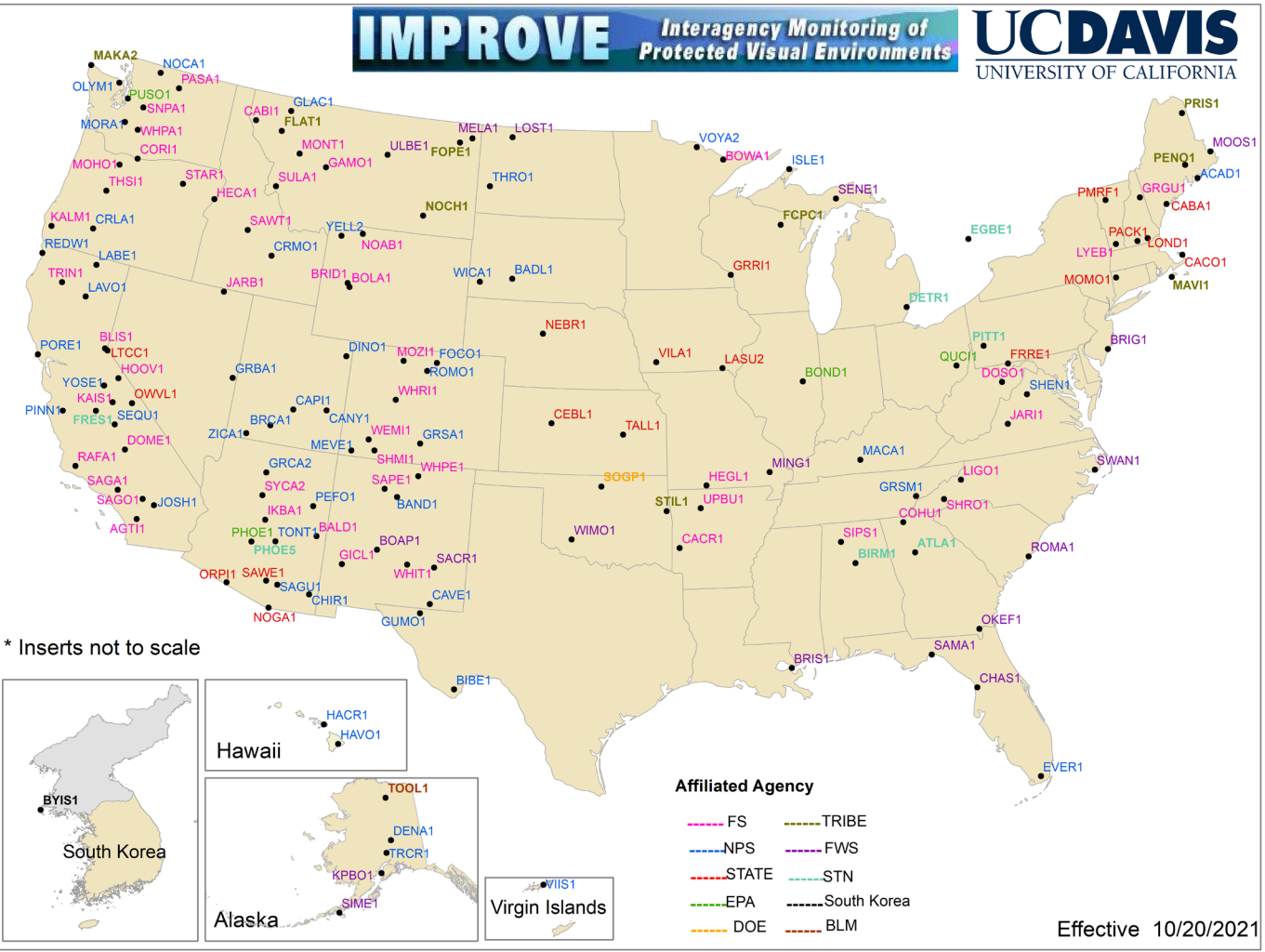

XRF lab


HIPS Lab


FTIR Lab


Sample handling lab

Break room



Total = 158 Sites

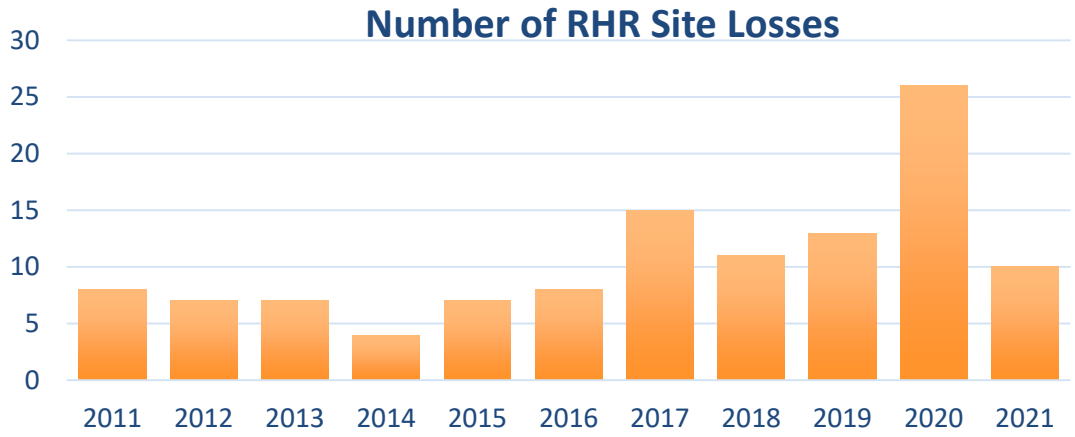
2021 Site Updates

- 2 sites terminated
  - MEAD1 (State, AZ)
  - FLTO1 (USFS, CO)
- 2 sites damaged
  - BRIS1 (hurricane)
  - NOCH1 (wildfire)
- Field Maintenance
  - Scheduled to service 88 sites in 2021 including 11 skipped in 2020
  - EGBE1 and TOOL1 skipped due to travel restrictions

Regional Haze Rule (RHR) Completeness Criteria

RHR requires for all modules:

- < 11 consecutive missed samples
- > 50% recovery in each quarter
- > 75% annual recovery

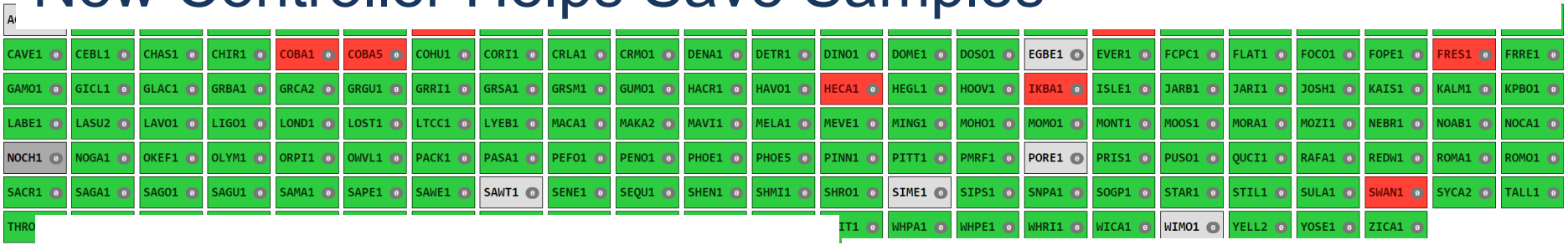


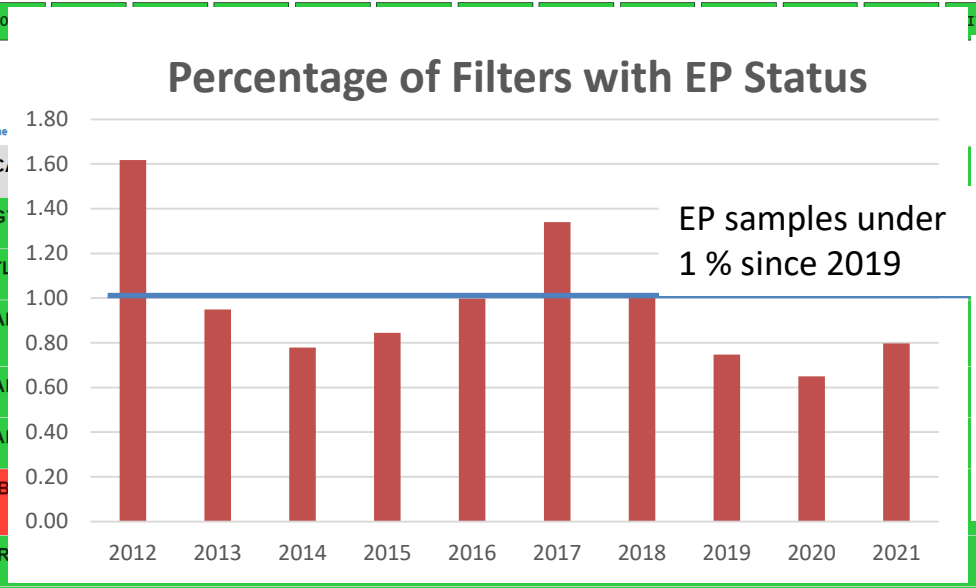
2011-2020: Final number of losses after validation

2021: Number of losses year-to-date

Site status report distributed every quarter; if you aren't on the list, let us know.

New Controller Helps Save Samples



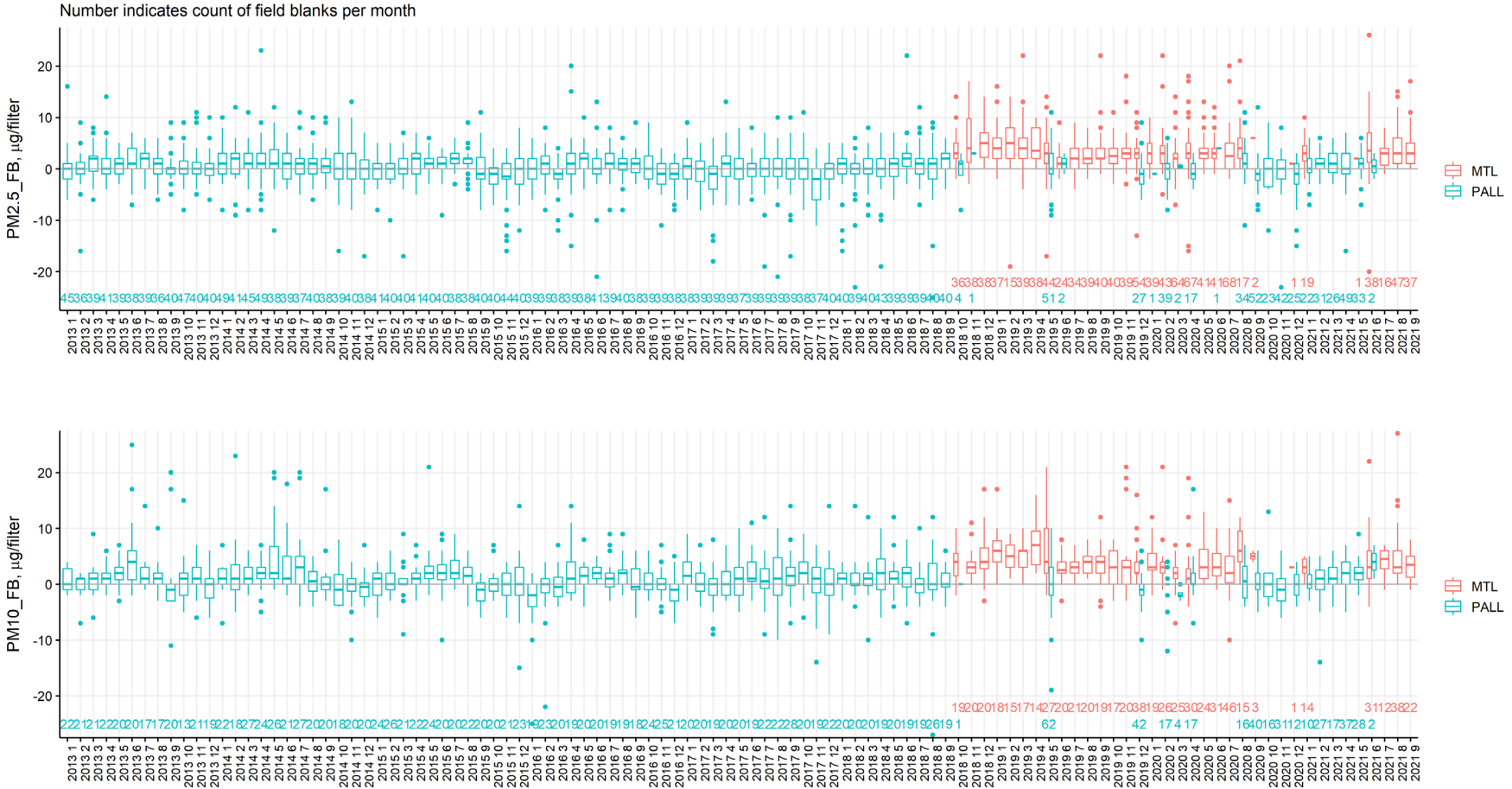


- Internet-connected new controllers have been deployed throughout the IMPROVE network since Oct. 2019
- Daily data downloads
- Fast problem identification and troubleshooting

2nd MTL Automated Weighing Chamber

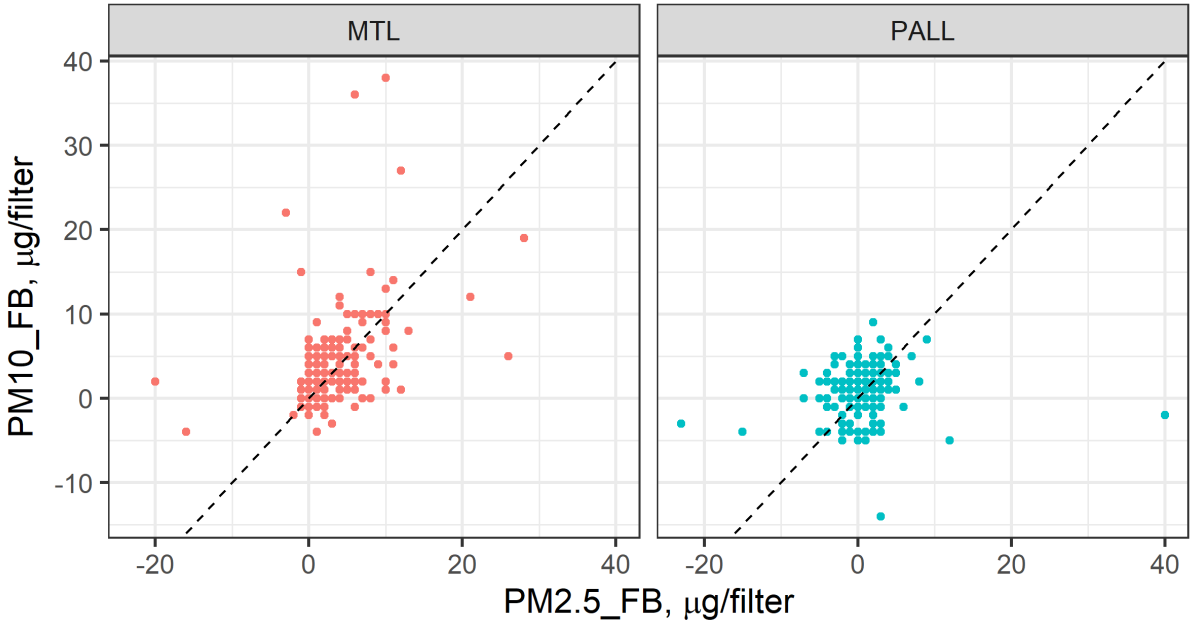
- Relative humidity set to 39% (± 0.4% with door closed); Temperature set to 21.5 °C
- First chamber “operational” since October 5, 2018; moved to new space with new ultra-balance installed on February 23,2021
- Second chamber put into routine operation on February 1, 2021
- Pre-weighing and post-weighing of a sample are now performed in the same chamber

Updates on MTL Filter Blank Mass Gain

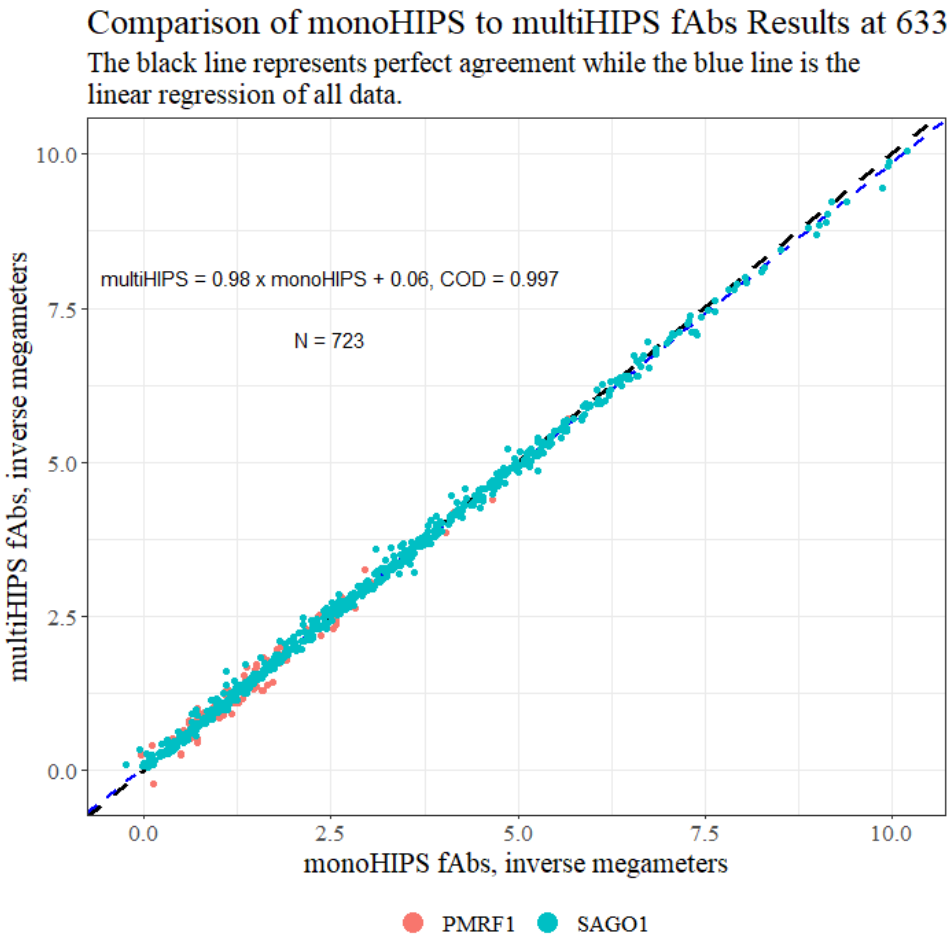


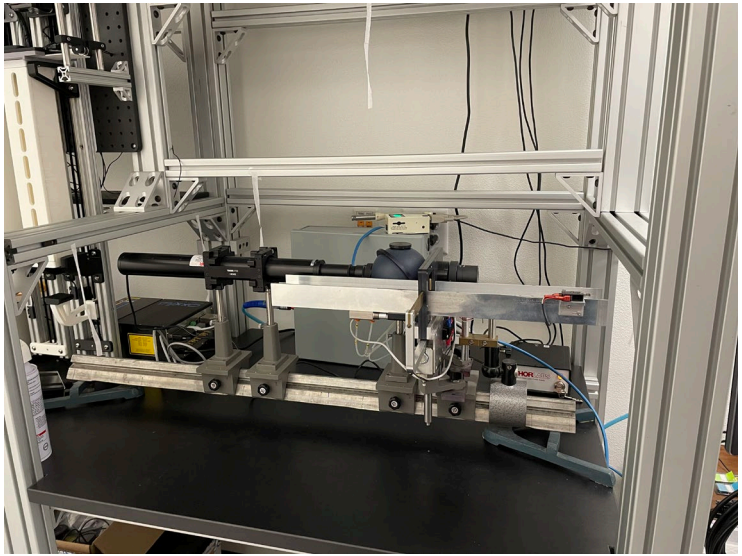
Paired $PM_{2.5}$ and PM_{10} Field blanks

- Started sending paired $PM_{2.5}$ and PM_{10} field blanks from the same manufacturer since March 2020
- $PM_{2.5}$ and PM_{10} mass from paired FB show similar MTL > PALL pattern
- Investigations ongoing including analyzing MTL FB using Gas Chromatography for organic signatures



Multiwavelength Light Absorption





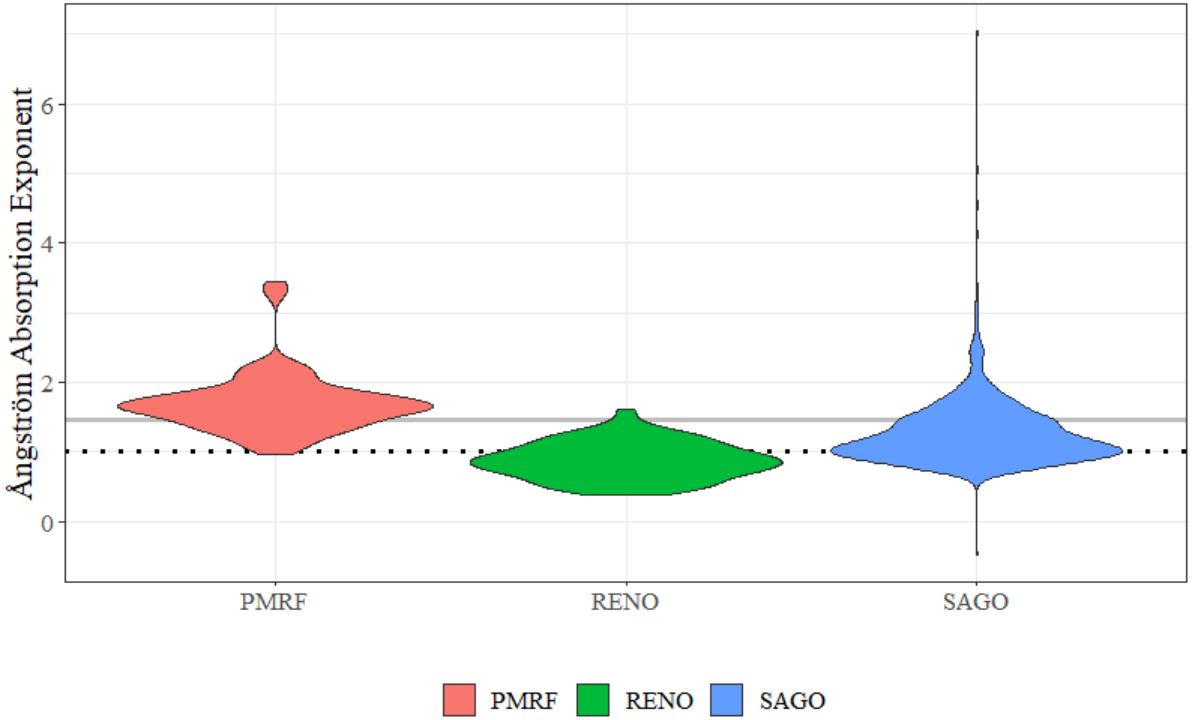
The pilot measurements

- PMRF1 – 80 samples from August 31, 2016 to April 28, 2017
- SAGO1 – 643 samples from March 1, 2003 to June 27, 2009

Full comparison will include YOSE1 and UPBU1 sites.

Distributions of Wavelength Dependence at Select IMPROVE Sites

The dotted black line indicates the theoretical AAE for black carbon.
Fossil fuels typically range from 0.8 to 1.2.
Saharan dust has been measured at 1.45 using AERONET (gray line).



The Ångström absorption exponent (AAE) is a useful optical parameter that describes the spectral dependence of light absorption by aerosols. It has been used for differentiating bulk aerosol types from both ground-based and satellite instrumentation.

The AAE is calculated from the power-law relationship of absorption to wavelength,

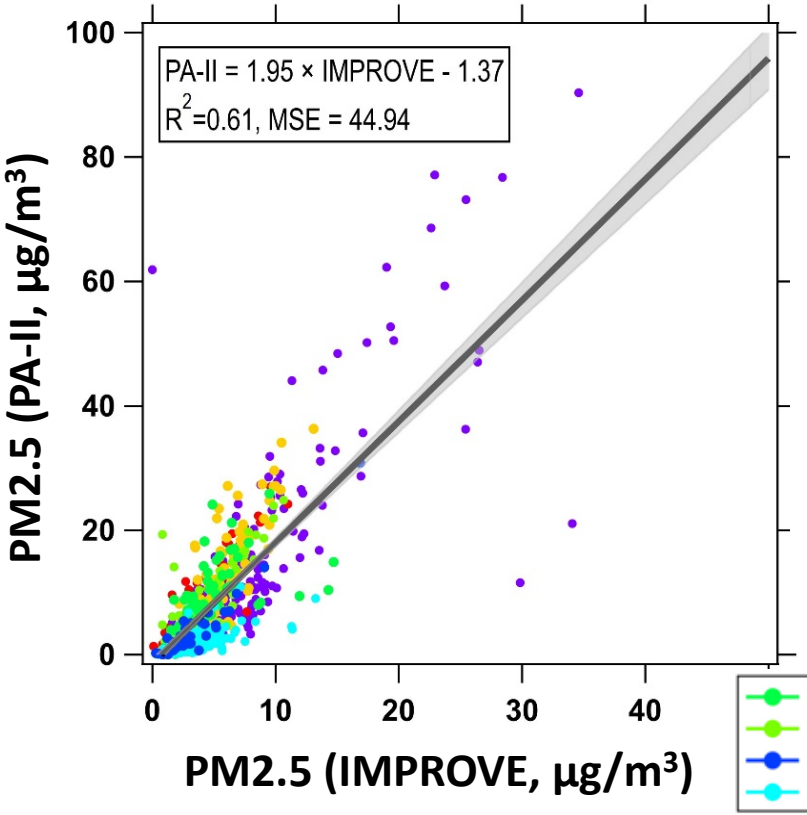
$$f_{Abs}(\lambda) \propto \lambda^{-AAE}$$

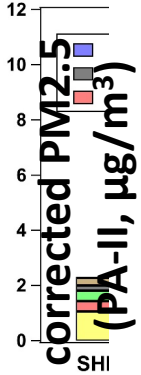
These violin plots compare the frequency distributions of the AAE across the three IMPROVE sites included in the pilot study.

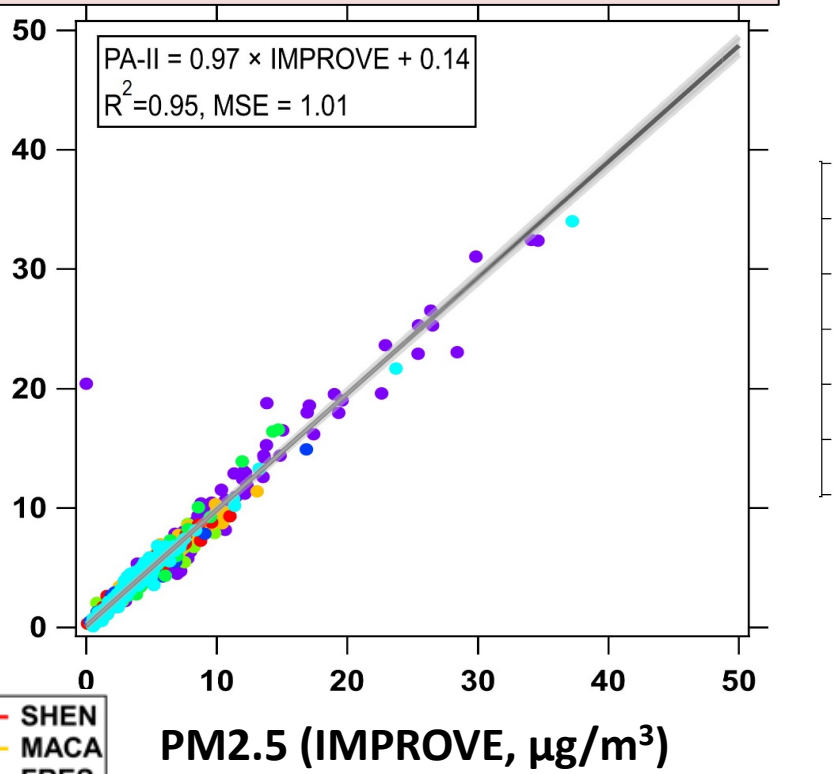
Purple Air (PA-II) Data Comparisons

PA-II sensors at 7 IMPROVE sites

PA-II (corrected) = function (Location, OC, EC, EC/TC, fAbs, Soil, Sulfate, Nitrate, Sulfate, RH)







WIMO
GRSM
THRO
MEAD
SHEN
MACA
FRES

QUALITY ASSURANCE ACTIVITIES

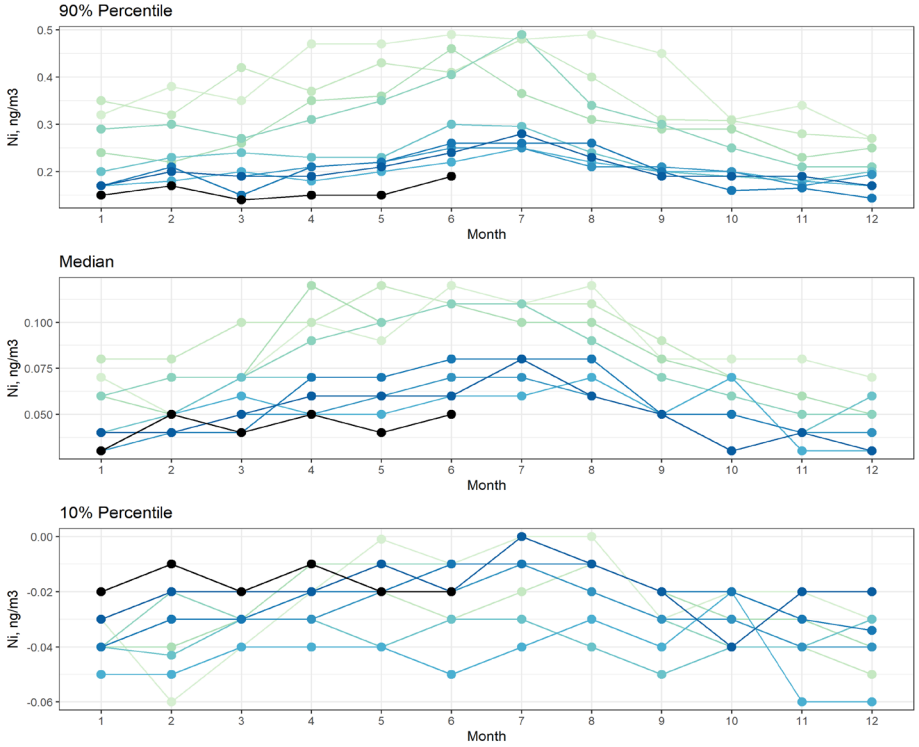
Internal Audit

- Internal audit of UC Davis IMPROVE and CSN operations performed remotely in December 2020 by T & B Systems
- Audit coincided with laboratory relocation, providing an independent check on the move
    - "*move is being conducted in an organized and orderly manner to assure continued data quality.*"
- Several action items identified requiring updates to SOPs and additional checks of source materials.
- Auditors re-emphasized position of 2019 Battelle external audit
    - "*[the data management system] is well thought out, easily accessible by all staff and allows tracking of the samples and data … it is an extremely useful system that allows the data validation team to review the various components within the system.*"

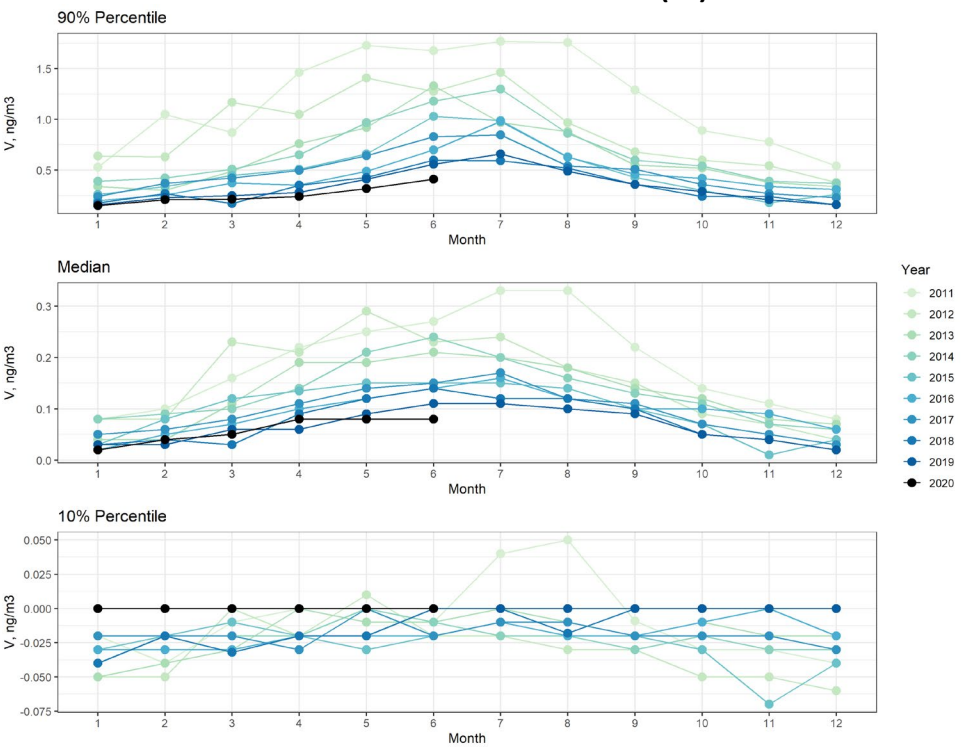
QA Report

- $PM_{2.5}$ Ni and V in May-June of 2020 are the lowest ever measured

PM2.5 Nickel (Ni)

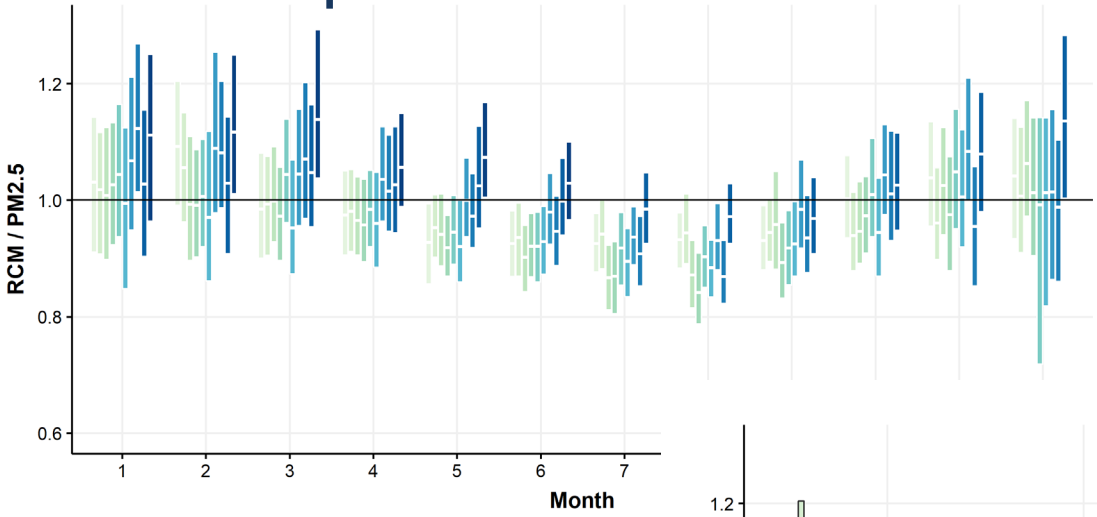


PM2.5 Vanadium (V)

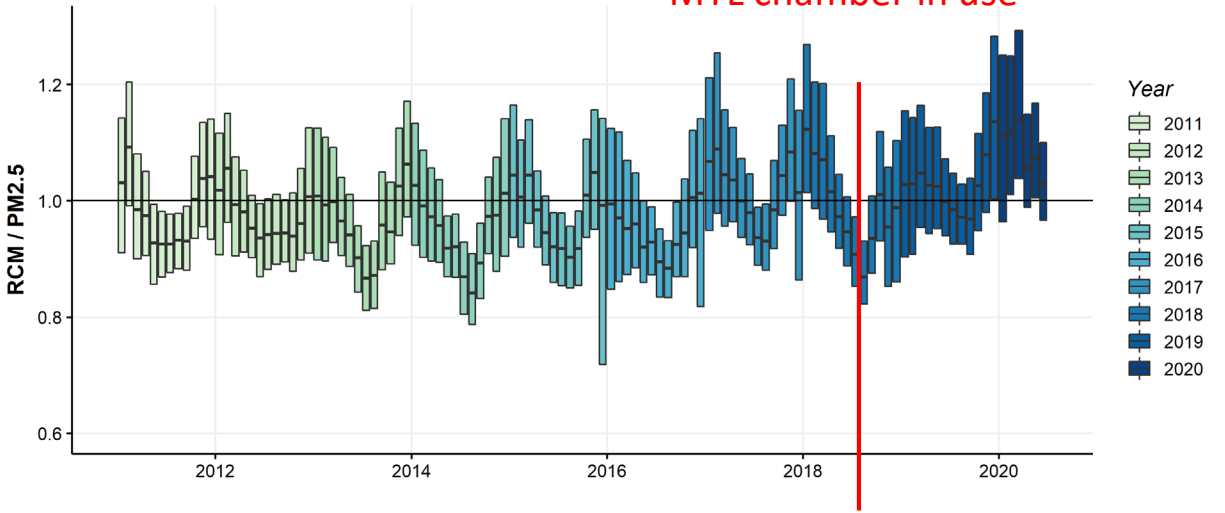


QA Report

- RCM/PM2.5 ratio continued to increase in 2019 and 2020



MTL chamber in use



Any questions?

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