Chemical Speciation Network: Update and Discussion

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NACAA Monitoring Steering Committee Meeting

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Thinking about the Future of CSN

Goal: Given increased CSN costs, method challenges, and potential $PM_{2.5}$ NAAQS revisions, get feedback on monitoring agencies' priorities so that we can develop options for the future of CSN.

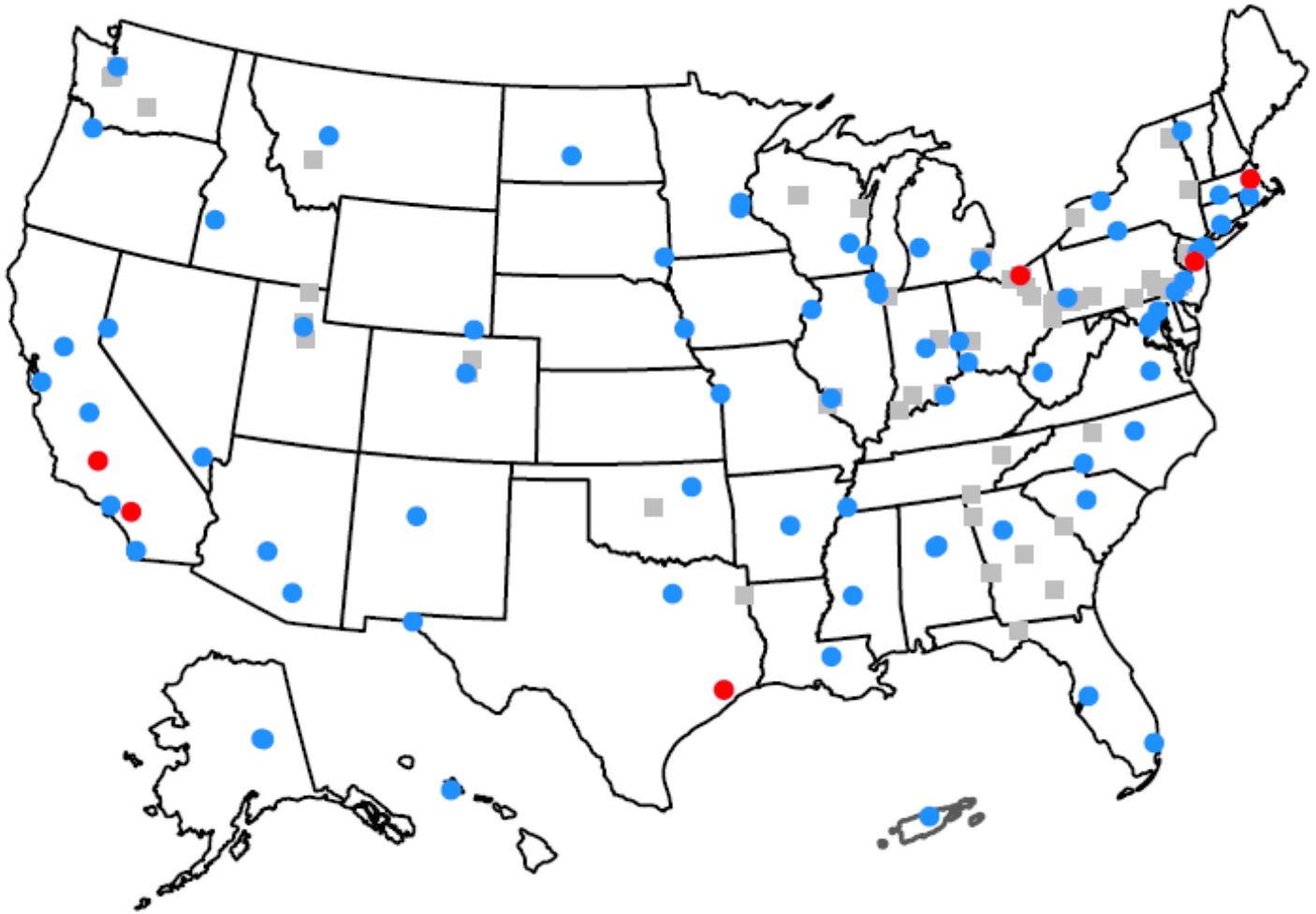
- CSN Background
- Increased National Contract Costs
- Increased Shipping Costs
- Method Challenges and Potential Improvements
- Potential $PM_{2.5}$ NAAQS Reconsideration Impacts
- Discussion

CSN is a Required, Regulatory-support Network

- 40 CFR Part 58 **requires** the operation of:
  - Speciation Trends Network (1-in-3)
  - CSN sites at NCore (1-in-3)
- 1-in-6 sites/supplemental are not required but supported based on local air quality needs
- "Data are needed to characterize $PM_{2.5}$ composition and to better understand the sources and processes leading to elevated $PM_{2.5}$ concentrations." 62 FR 38778 (July 18, 1997).

- **Regulatory-support**:
  - CSN supports activities related to the $PM_{2.5}$ standards
    - Photochemical model evaluation
    - Health studies
    - Informing emission control strategies
    - Source apportionment/characterizations
    - Exceptional event demonstrations
    - Future projections for implementation plans
    - Trends

Current Network Supported by the Contract



- 1-in-6 site
- 1-in-3 site
- Collocated site

142 Total Sites

79 1-in-3 (required, either as STN or NCore)

63 1-in-6 (supplemental and 6 collocated sites)

Network Challenges: National Contract Costs

- **March 2023:** 5-year contract awarded to UC Davis with RTI as a subcontractor for the shipping, handling, and receipt lab and ion analysis.
- **Increased costs:**
  - National contract costs increased 25% (~$1M) in year 1, with ~5% cost increases each year.
- **Current situation:**
  - Covering the initial months of increased costs with leftover funds and a small increase to the PM STAG budget. Increased costs are not covered for FY25.
  - Need to address future network sustainability.

PTFE Filters

X-Ray Fluorescence

Elements
S, K, Cl,…

Soil (*Fe, Al, Si,…*)

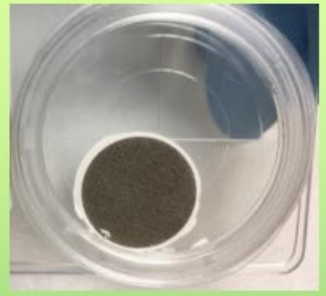
Metals (*Ni, V, Mg,…*)

Nylon Filters

Ion Chromatography

Ions
Ammonium, sodium, potassium, nitrate, sulfate, chloride

Quartz Filters



Thermal/Optical Analysis

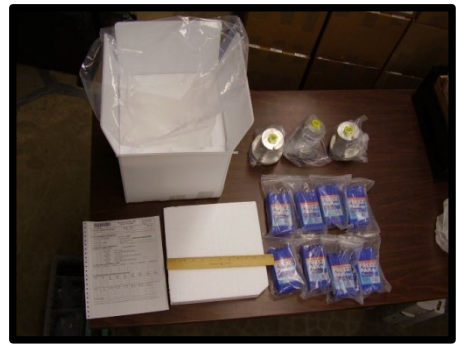
Organic Carbon

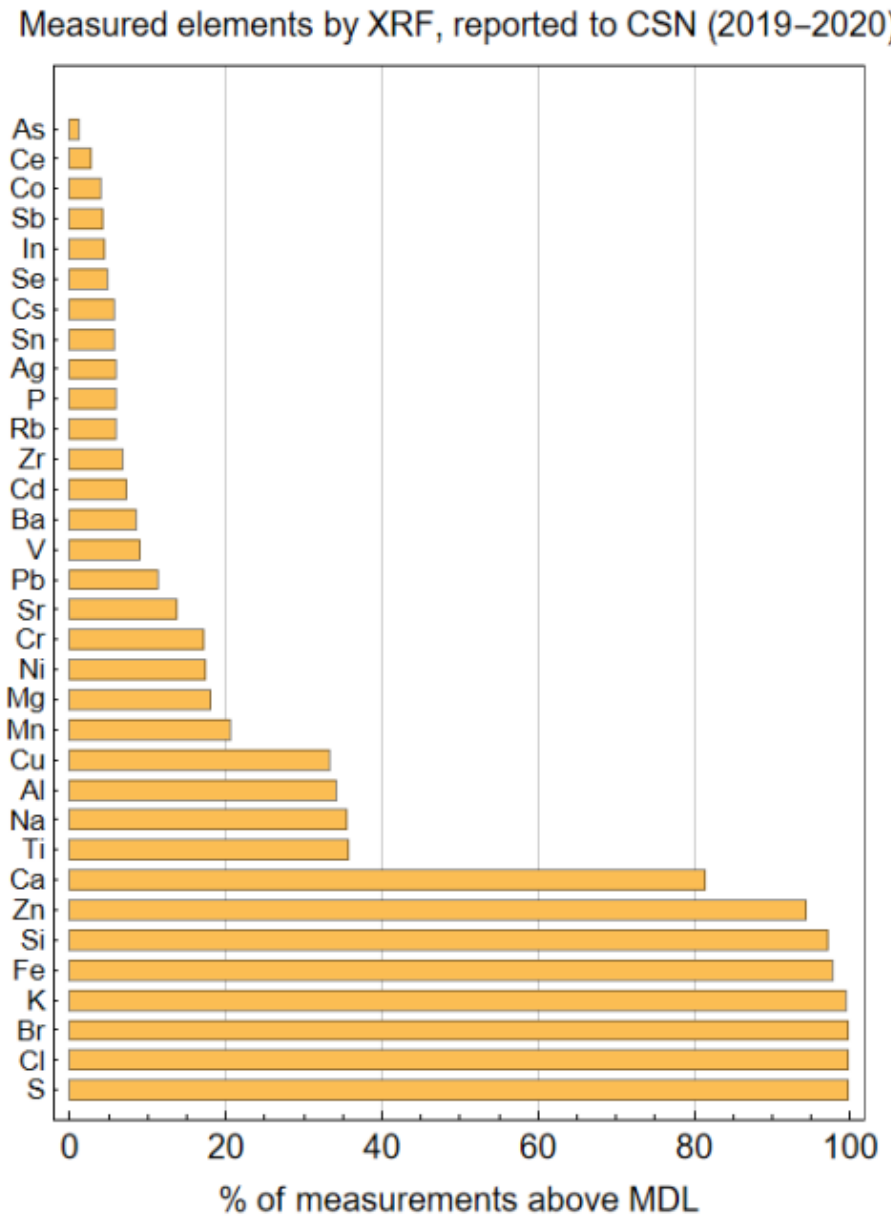
Elemental Carbon

Fractions

Network Challenges: Shipping Costs

- Shipping contract costs have doubled (increased by ~$400K/year) due to a mandatory source and contract type change.
- CSN currently ships sampled filters chilled, requiring the use of:
  - ~4lbs of freezer packs
  - Overnight shipping
- Aligns with QA Guidance Document 2.12 for $PM_{2.5}$ Regulatory Samples to maximize time to post-weigh filters and reduce volatilization.
- Note, IMPROVE does not ship cold.
- Estimate that shipping costs could be cut by ~50% if we move to lighter, 2-day shipping.
- Changes to shipping would take some time for contractors to implement (i.e., additional sets for 1-in-3 sites will be needed).

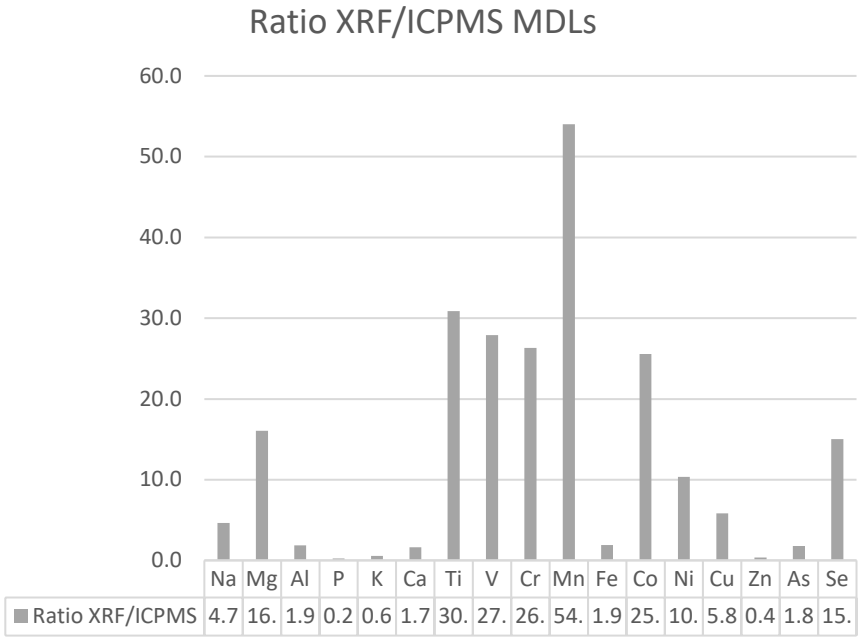


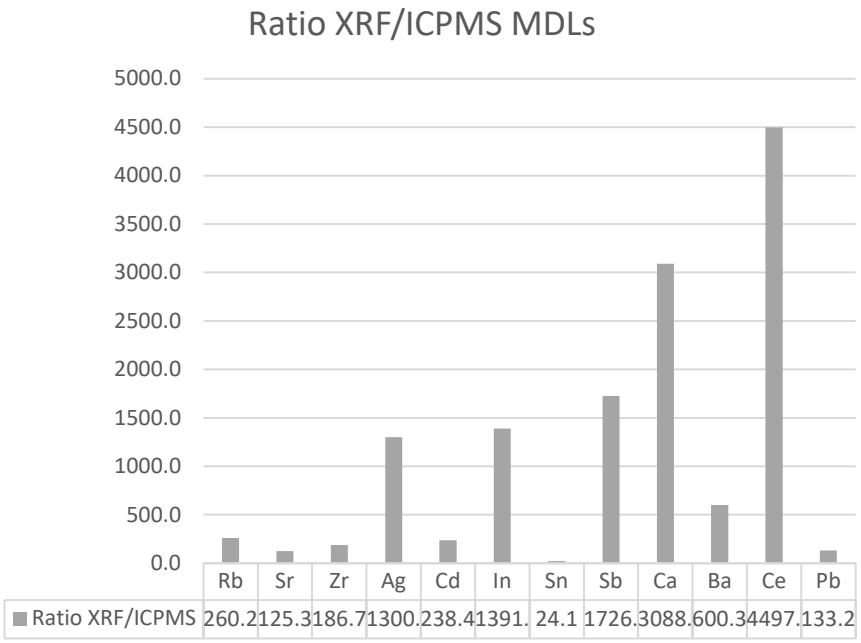


Network Challenges: Method Detection Limits for Elements

- Soil/Crustal Elements(Fe, Si, Ti, Ca, Al) are regularly detectable.
- However, trace element concentrations are often below the MDL for many sites in the network, though data are still reported to AQS.
- Overall, trace elements are a small fraction of the mass.
- Declining $PM_{2.5}$ concentrations over time create challenges for the measurement methods.

Network Challenges: Method Detection Limits for Elements (XRF vs ICP-MS)





- XRF MDLs are high compared to most elements measured by ICP-MS
- ICP-MS cannot measure all 33 elements (Si, S, Cl, and Br)
- ICP-MS analysis is 5x cost of XRF, but costs have come down considerably over the last decade
- Using 25mm filters also helps (factor of 3), but still some development work needed

Additional Network Challenges: Potential $PM_{2.5}$ NAAQS Revision

- Any potential $PM_{2.5}$ NAAQS revision does NOT require new CSN sites; there MAY be interest in new sites by agencies with potentially newly violating monitors.
- CBSAs without speciation sites (CSN or IMPROVE) based on T640 adjusted 2020 – 2022 Annual $PM_{2.5}$ Design Values (DVs); some may be affected by exceptional events.
  - 15 CBSAs with DVs ≥10.0 µg/m^3
  - 12 CBSAs with DVs between 9.0 µg/m^3 and 10 µg/m^3
  - 91 CBSAs with DVs between 8.0 ug/m^3 and 9.0 µg/m^3 [not listed here]

Hanford-Corcoran, CA	16.6
Modesto, CA	14.3
Yuba City, CA	13.8
Medford, OR	13.5
Madera, CA	13.2
Merced, CA	12.3
Spokane-Spokane Valley, WA	11.6
Chico, CA	11.6
El Centro, CA	11.1
Kingsville, TX	10.3
McAllen-Edinburg-Mission, TX	10.1
Laredo, TX	10.1
Missoula, MT	10.1
Prineville, OR	10.0
Texarkana, TX-AR	10.0
Red Bluff, CA	9.9
Ukiah, CA	9.6
Gardnerville Ranchos, NV	9.6
Shreveport-Bossier City, LA	9.6
Vallejo, CA	9.4
Austin-Round Rock-Georgetown, TX	9.3
Harrisburg-Carlisle, PA	9.2
Brownsville-Harlingen, TX	9.1
Nashville-Davidson--Murfreesboro--Franklin, TN	9.1
South Bend-Mishawaka, IN-MI	9.0
Ponca City, OK	9.0
Hattiesburg, MS	9.0