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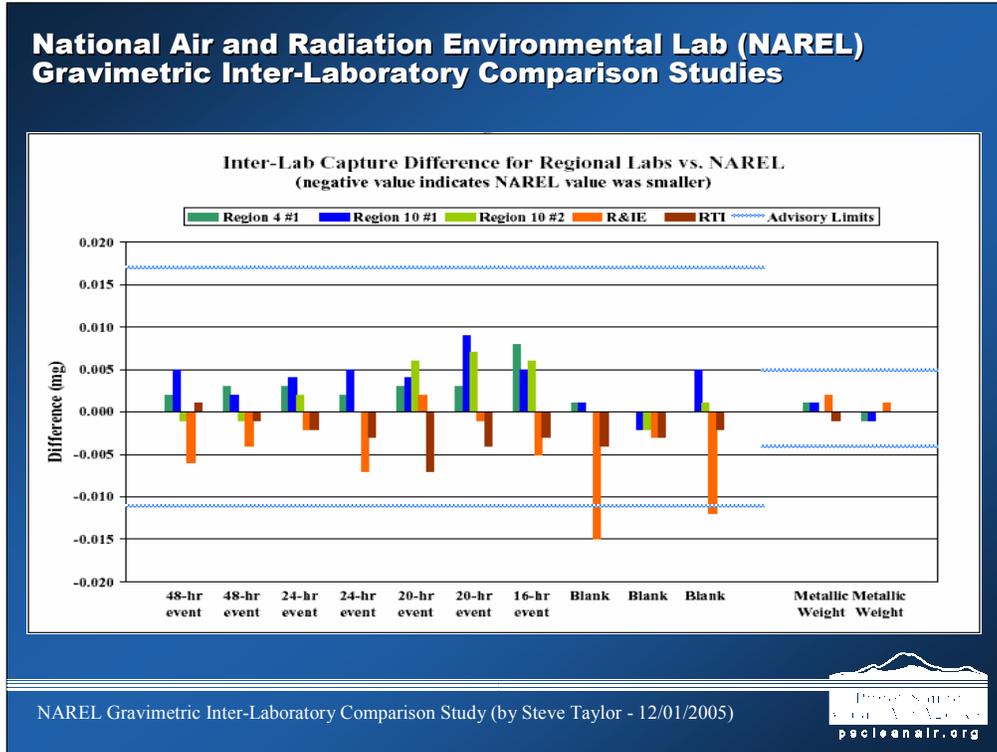


Puget Sound
Clean Air Agency
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The Affect of Microbalance Bias on Sample Bias and Precision

Puget Sound Clean Air Agency
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Participants of this study included the Region 4 Laboratory in Athens, GA; the Region 10 contract laboratory (Manchester Laboratory) in Washington; the Radiation and Indoor Environments Laboratory (R&IE) in Las Vegas, NV; and Research Triangle Institute (RTI) in Research Triangle Park (RTP), NC. The Region 4 and Region 10 laboratories provide preweighing and post-weighing of filters for the PM2.5 Performance Evaluation Program (PEP). The R&IE Laboratory provides the PM2.5 gravimetric analysis for the Tribal Air Monitoring Support (TAMS) program. The RTI Laboratory facility serves as EPA's primary contractor providing laboratory services to support the PM2.5 Speciation air monitoring network.

Calculations

- **Precision is calculated as:**

- Precision = $(PS - SS)/SS \times 100\%$, where:
 - ▲ PS = Primary Sampler
 - ▲ SS = Secondary Sampler

- **Bias is calculated as:**

- Bias = $(RS - PEP)/PEP \times 100\%$, where:
 - ▲ RS = Routine Sampler
 - ▲ PEP = PEP Sampler



Examples of Weighing Bias

- Routine Sampler:

- Mass 168 μg over 24hrs at 16.67L/min = 7.00 $\mu\text{g}/\text{m}^3$.

- Auditing Sampler:

- Mass 174 μg over 24hrs at 16.67L/min = 7.25 $\mu\text{g}/\text{m}^3$.

- Resulting Bias:

- $(7.00-7.25)/7.00 \times 100\% =$
3.6% difference

- Routine Sampler:

- Mass 840 μg over 24hrs at 16.67L/min = 35.00 $\mu\text{g}/\text{m}^3$.

- Auditing Sampler:

- Mass 846 μg over 24hrs at 16.67L/min = 35.25 $\mu\text{g}/\text{m}^3$.

- Resulting Bias:

- $(35.00-35.25)/35.00 \times 100\% =$
0.7% difference



PM_{2.5} Performance Evaluation Program (PEP)

- **Started in 1999, the PEP** *“is a quality assurance activity which will be used to evaluate measurement system bias of the PM_{2.5} monitoring network.”*¹
- **Designed to ensure data comparability in different states.**

¹ EPA OAQPS, Quality Assurance Project Plan for the PM_{2.5} Performance Evaluation Program, Section 5, page 3 (2/12/1999).



PM_{2.5} Performance Evaluation Program (PEP)

- **For the Federal Reference Method (FRM), PEP samples are collected in a collocated sampler and filters are weighed independently.**
- **Filters were weighed in Region 4 (Atlanta) and Region 10 (Washington state) labs.**
- **Washington State PEP filters are weighed in Region 4.**

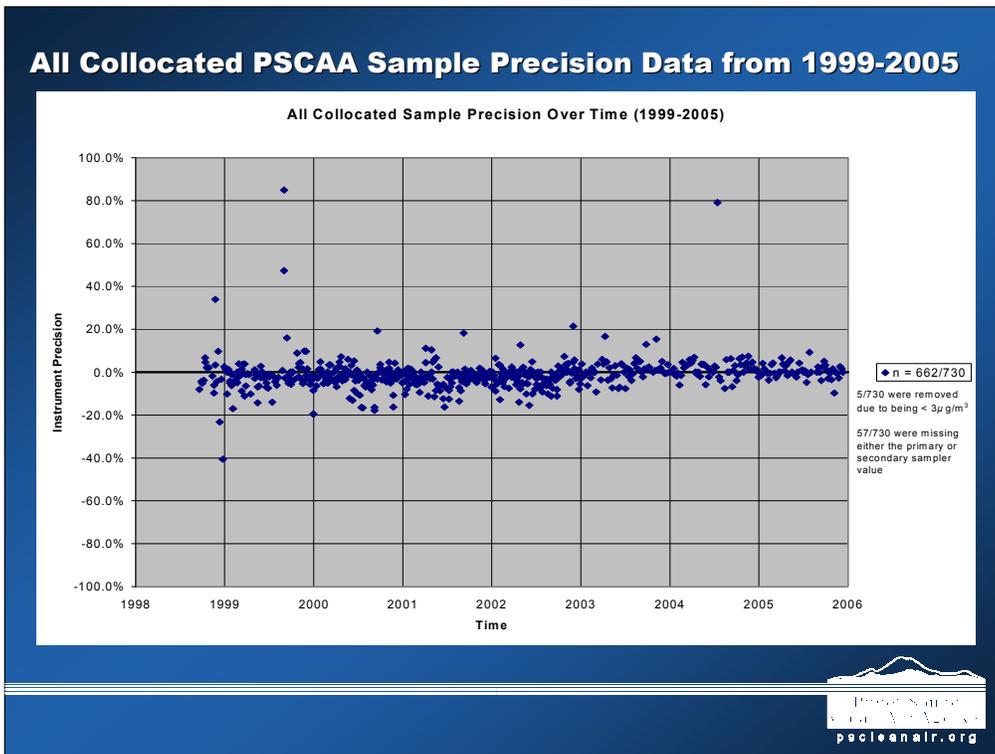
¹ EPA OAQPS, Quality Assurance Project Plan for the PM_{2.5} Performance Evaluation Program, Section 5, page 3 (2/12/1999).

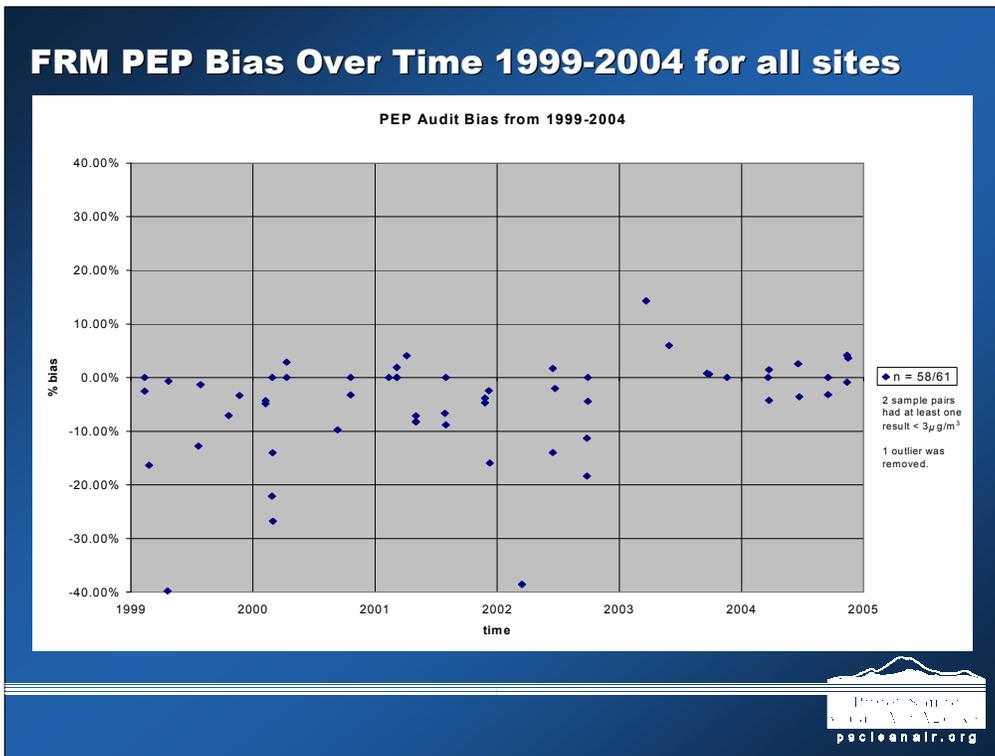


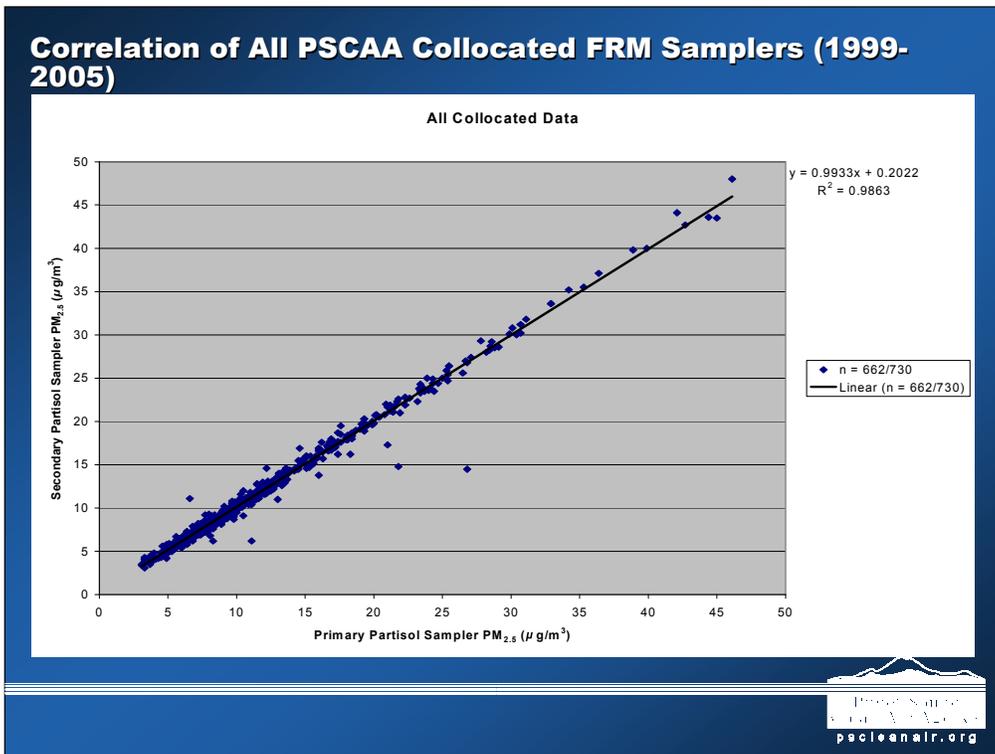
Recent Changes to CFR

- Field blanks and lab blanks will be reported to AQS.
- Now PEP filters will only be weighed in one lab.

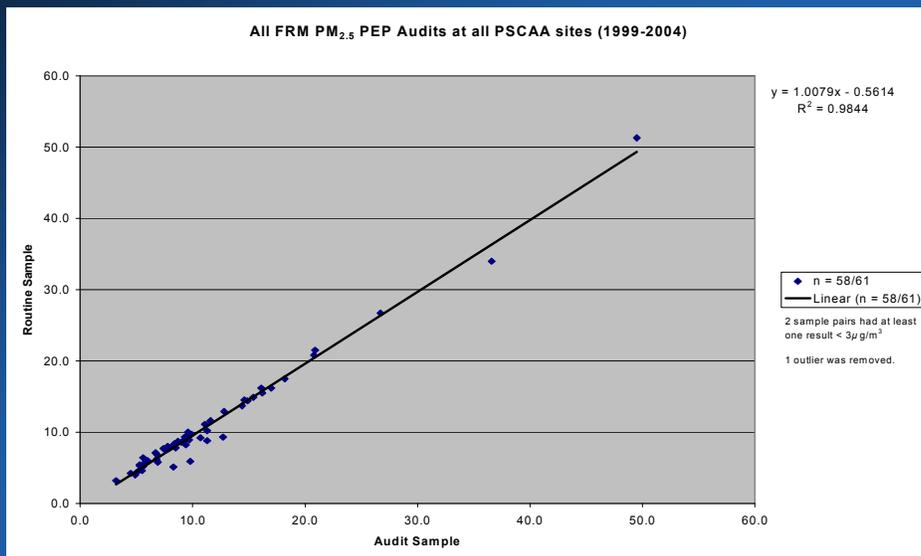


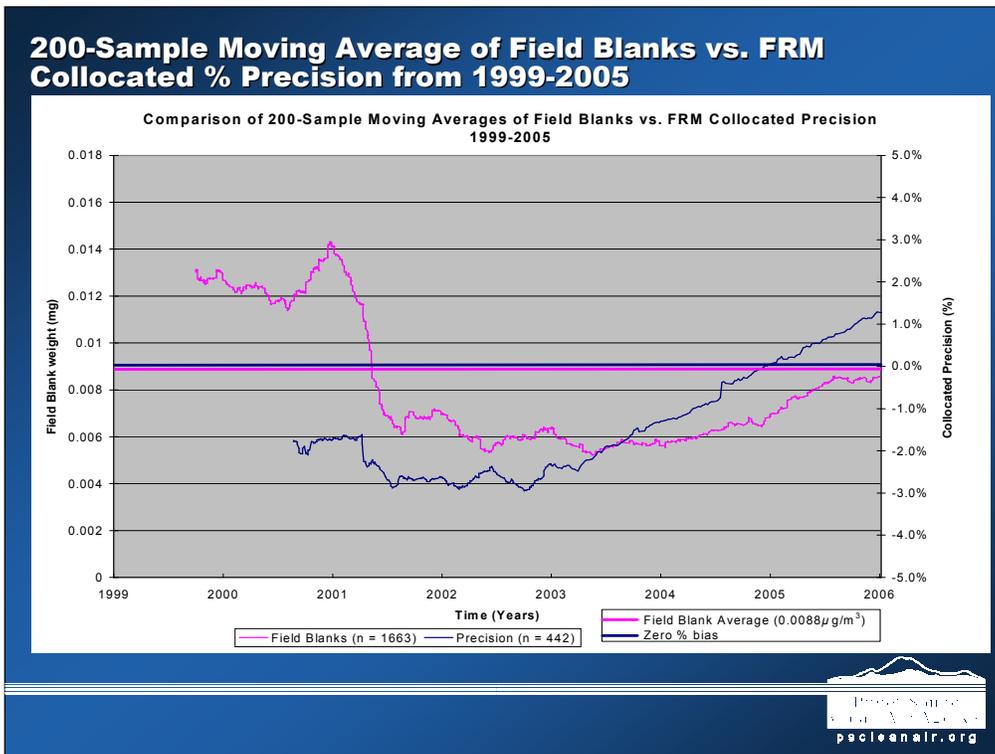


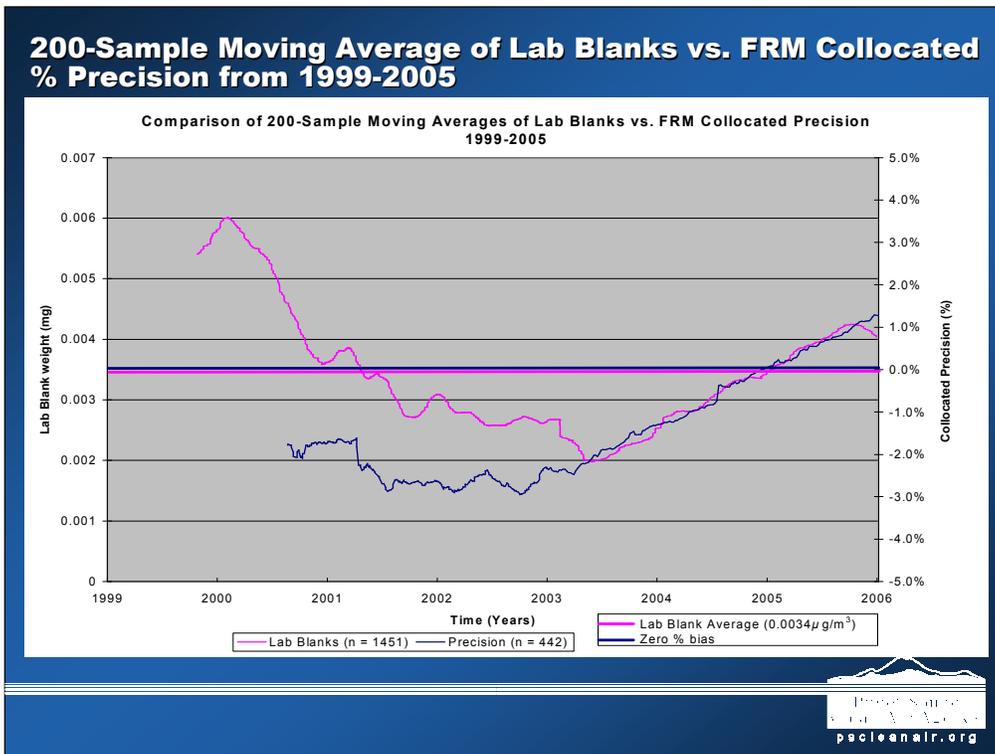


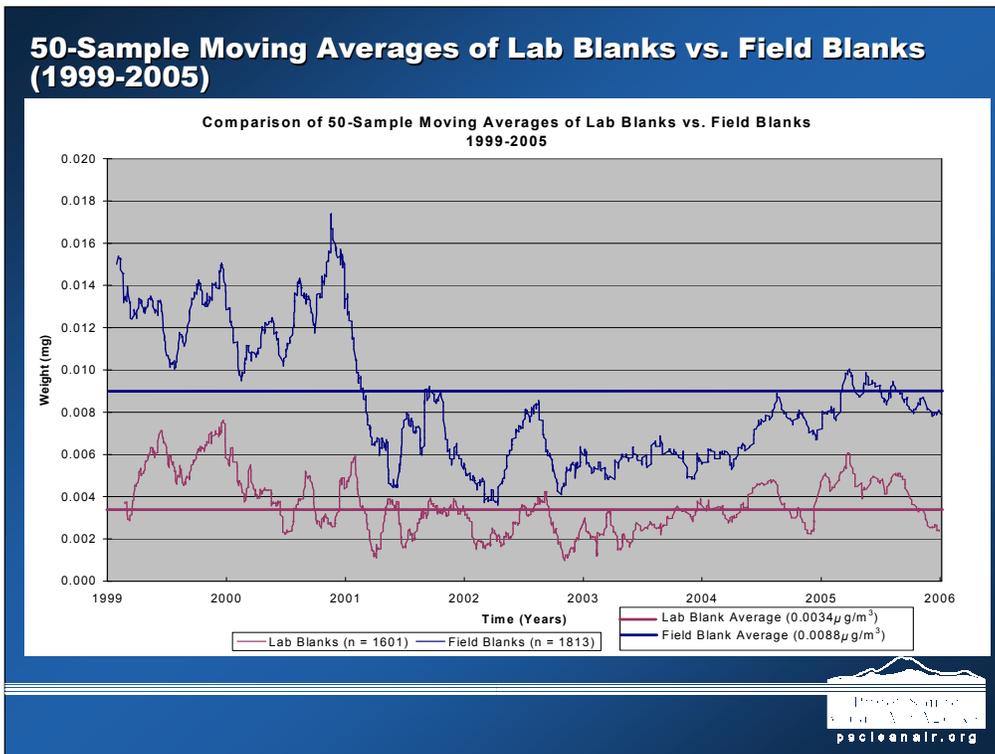


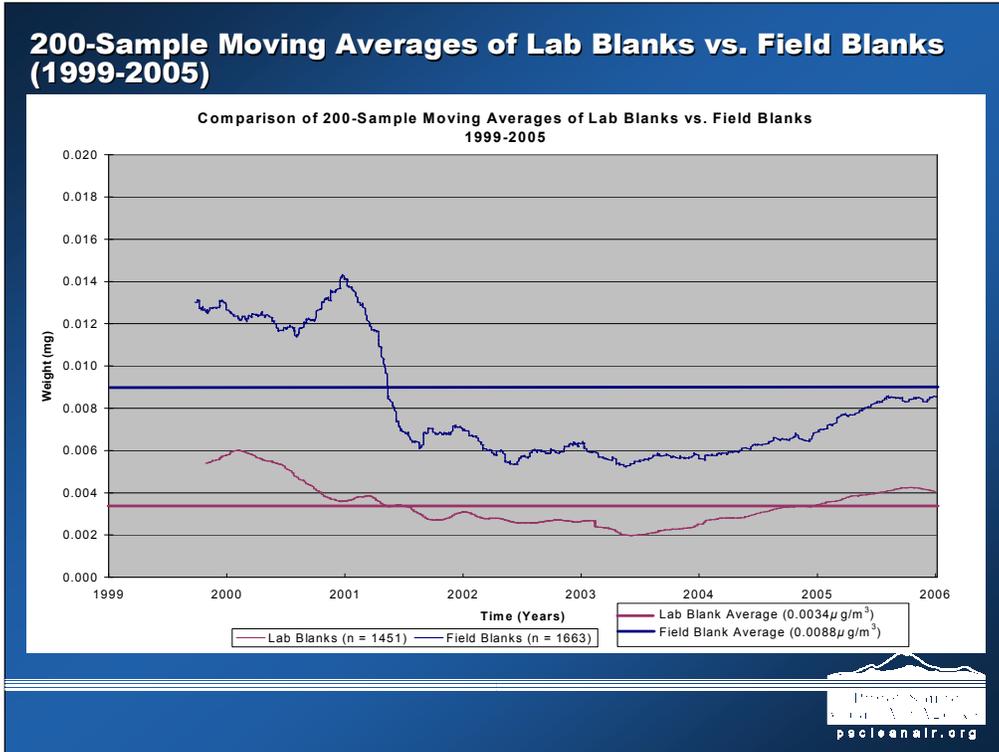
Correlation of Routine and PEP Samples 1999-2004

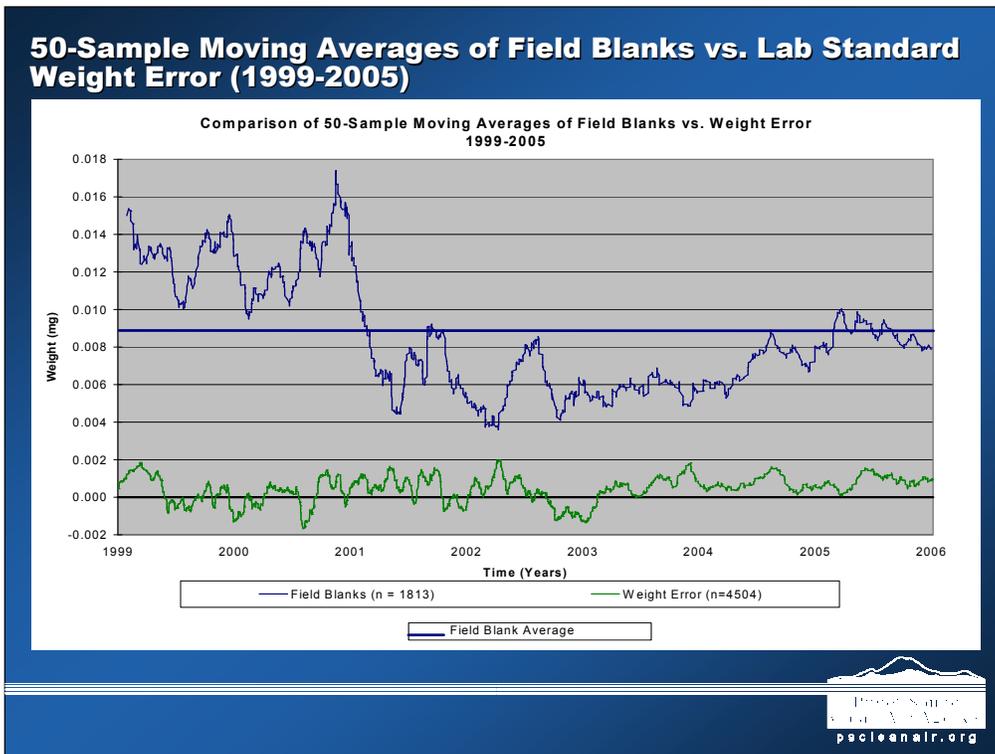


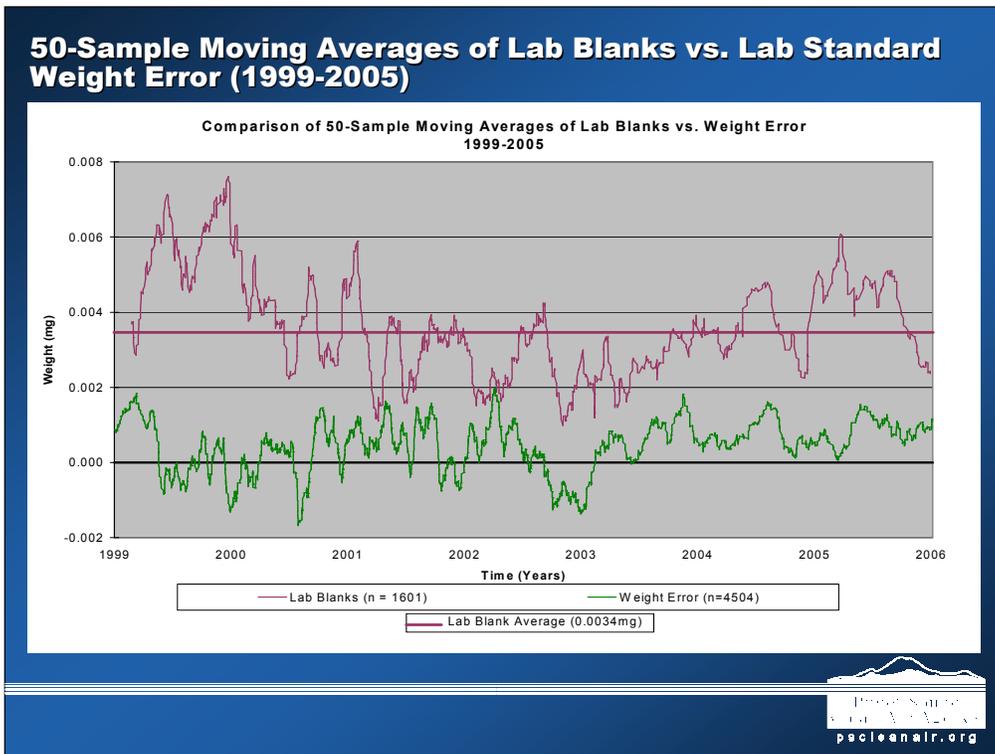


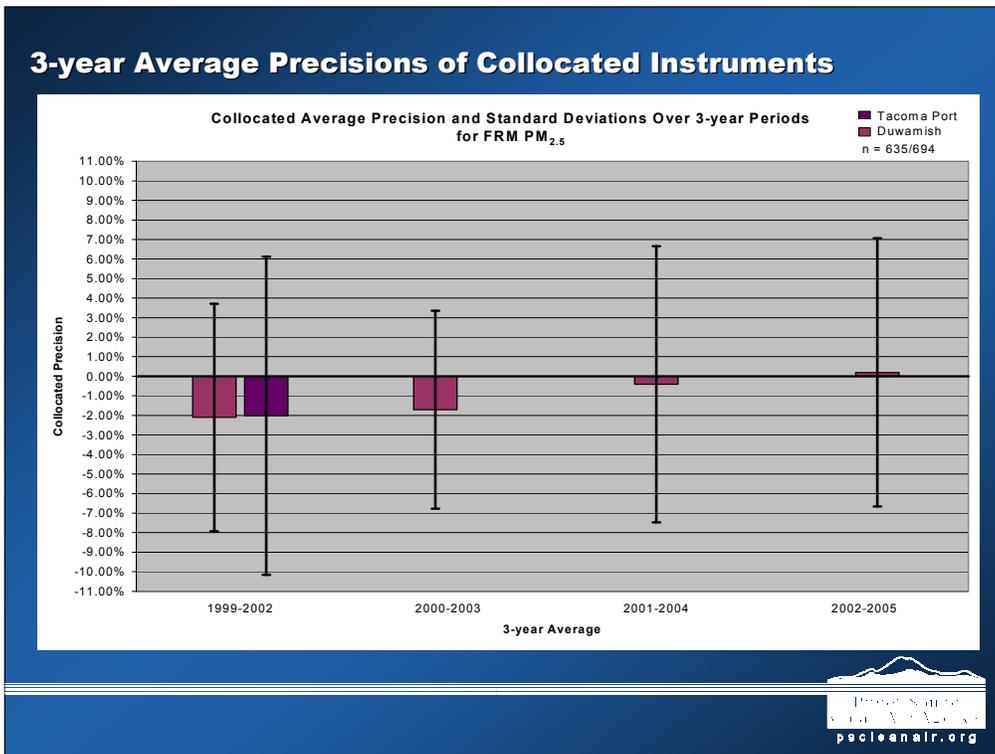


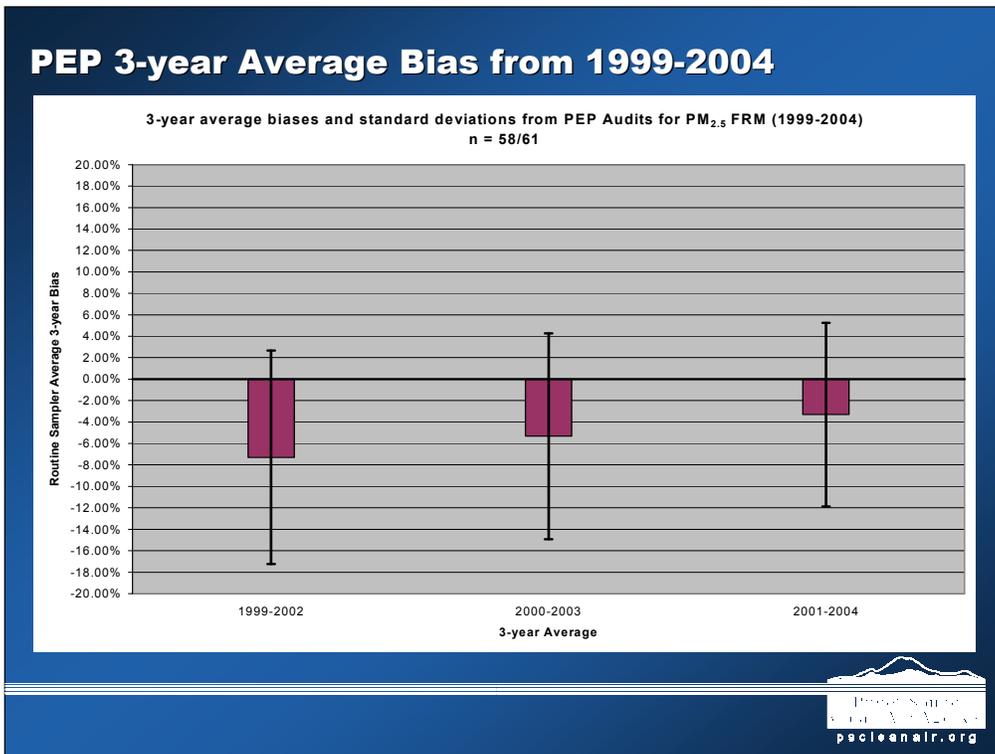


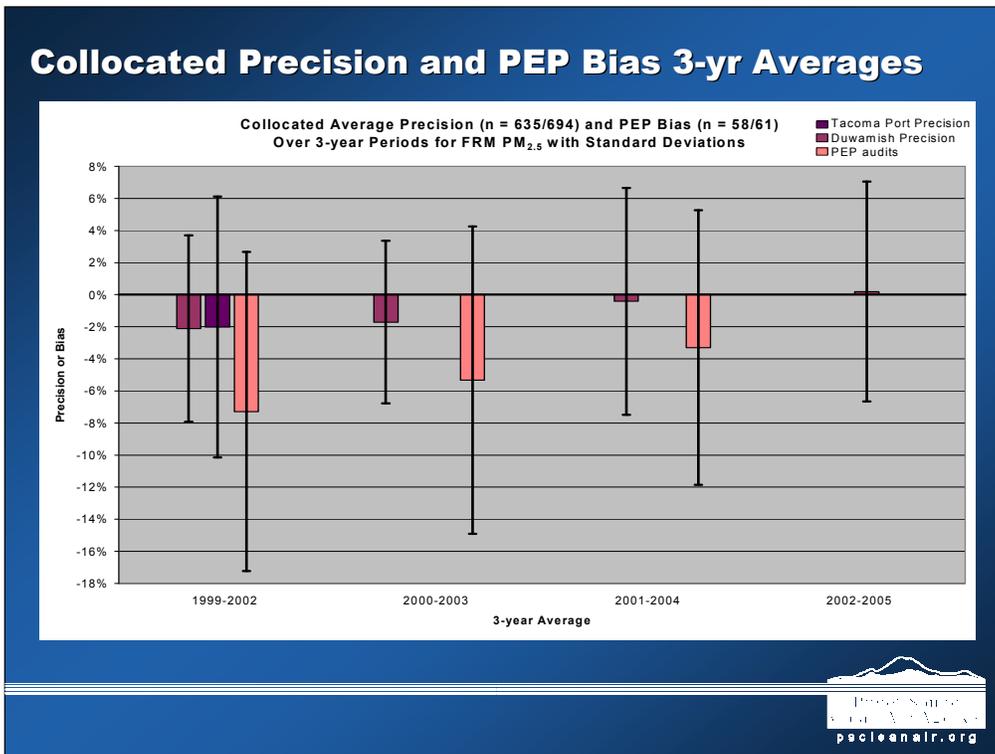












Conclusions

- The precision of the FRM and the field blanks are highly correlated to the lab blanks.
- The lab standards error was also correlated to the blanks, demonstrating the bias involved in the microbalance itself.
- PEP bias results can differ significantly from richer S/L collocated bias results.
- “Bias” should include local collocated data and blank data into the national data quality picture.

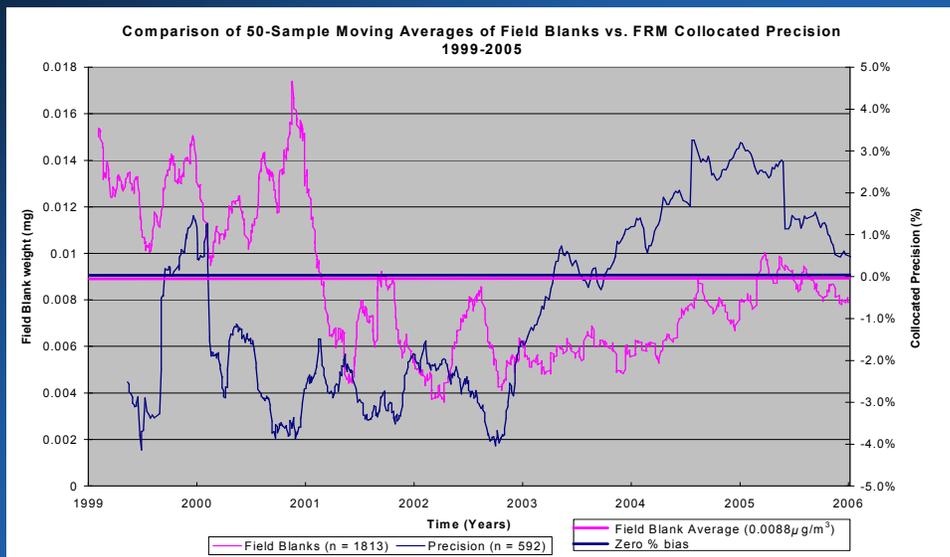


Acknowledgements

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 - Mary Hoffman
 - Greg Sandau
 - Adam Petrusky



50-Sample Moving Average of Field Blanks vs. FRM Collocated % Precision from 1999-2005



50-Sample Moving Average of Lab Blanks vs. FRM Collocated % Precision from 1999-2005

