U.S. EPA
OFFICE OF AIR QUALITY PLANNING AND STANDARDS
EMMISIONS, MONITORING & ANALYSIS DIVISION

$PM_{2.5}$ Speciation Network Newsletter

Issue 3 May 2005

Special points of interest:

- **Manufacturer defect found on Teflon filters**
- **First performance evaluation of Sunset continuous monitor completed**
- **RTI's semi-annual data summary reports available**

Inside this issue:

Newsletter Purpose

The objective of this newsletter is to inform the EPA Regions, States, Local and Tribal air monitoring agencies of recent program developments and activities, and to facilitate the communication of information to site operators, data analysts and policy makers regarding the performance of the speciation monitoring network and resulting data quality.

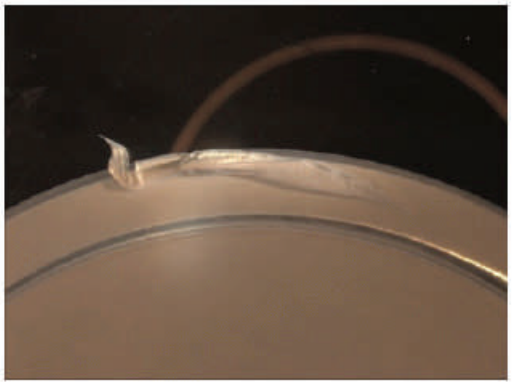
Manufacturer Debris on Teflon Filters

Due to manufacturing debris on the Teflon filters used by RTI to support the speciation program, 6000 filters have been returned to the manufacturer. A subset if filters from this lot were used to collect samples during late March and early April of 2005. The filters had debris that caused an increase in the variability of blank filter weights. Corrective actions taken by RTI have limited the impact of this problem on the speciation gravimetric data reported. A small fraction of the filters were used for ion analysis. No evidence of elevated ion levels and no evidence of contamination for any of the trace elements has been found. RTI will revise the criteria for accepting new Teflon filter lots and will add criteria for enhanced visual inspection in RTI's optical microscopy lab. RTI has also increased the frequency of replicate re-weighing in the gravimetric lab. A detailed analysis of how gravimetric results are affected is being prepared to identify suspect filters and specific sampling dates. Additional information will be posted on the AMTIC web site at the end of June and data will be flagged in AQS to alert data users.

Program Objectives

The characterization of $PM_{2.5}$ species plays a key role in policy decisions and health effects research. The main objectives of the speciation program are to provide data for:

- supporting the development of modeling tools and the application of source apportionment modeling for control strategy development in support of the National Ambient Air Quality Standards (NAAQS);
- assessing the effectiveness of emission reductions strategies through the characterization of air quality trends;
- supporting programs aimed at improving environmental welfare, such as the regional haze program; and
- supporting health effects and exposure research studies.



Example of manufacturing debris on filter

Special Feature—Speciation Data Analysis

The Air Quality Data Analysis Group (AQDAG) in OAQPS is tasked with providing analyses of air quality data generated by our ambient air monitoring networks, including speciation. This group has recently completed the **Particle Pollution Report: Current Understanding of Air Quality and Emissions Through 2003,** which covers a range of topics related to particle pollution. The following is an excerpt from that report which can be found at: http://www.epa.gov/airtrends/pm.html

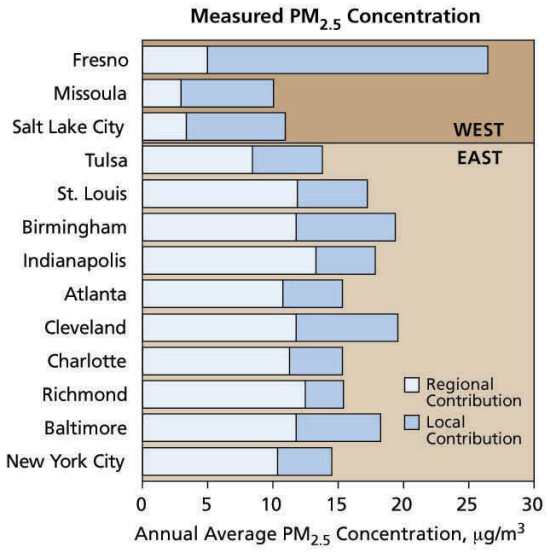
Local and Regional Contributions to $PM_{2.5}$

Data from the urban speciation and rural IMPROVE networks were used to provide insight on the local and regional contributions to $PM_{2.5}$. Both local and regional sources contribute to particle pollution. Figure 1 below shows how much of the $PM_{2.5}$ mass can be attributed to local versus regional sources for 13 selected urban areas (arranged west to east). In each of these urban areas, monitoring sites were paired with nearby rural sites. When the average rural concentration is subtracted from the measured urban concentration, the estimated local and regional contributions become apparent. In the East, regional pollution contributes more than half of total $PM_{2.5}$ concentrations. Rural background $PM_{2.5}$ concentrations are high in the East and are somewhat uniform over large geographic areas. These regional concentrations come from emission sources such as power plants, natural sources, and urban pollution and can be transported hundreds of miles. For the cities shown in Figure 2, local contributions range from 2 to 20 micrograms per cubic meter (µg/m3), with the West generally showing larger local contributions than the East. In the East, local contributions are generally greatest in cities with the highest annual average $PM_{2.5}$ concentrations. Figure 2 shows the local and regional contributions for the major chemical components that make up urban $PM_{2.5}$: sulfates, carbon, and nitrates. In the eastern United States, the local contribution of sulfates is generally small. Most sulfates in the East are converted from regional SO_2 emissions and are transported long distances from their sources. Carbon has the largest local contribution of the three major chemical components. These local emissions come from a combination of mobile and stationary combustion sources.

The regional contribution, which varies from 30% to 60% of the total carbon at urban locations, is from rural emission sources such as vegetation and wildfires, as well as region-wide sources such as cars and trucks. Nitrates represent only about 10% to 30% of annual average $PM_{2.5}$, and urban concentrations are higher than the nearby regional levels. This is likely due to local nitrogen sources such as cars, trucks, and small stationary combustion sources.

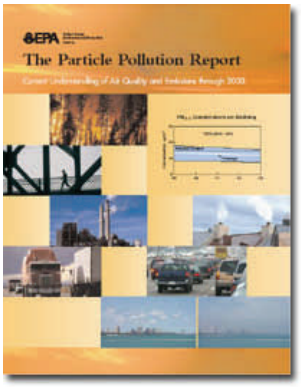
In the East, regional pollution contributes more than half of total $PM_{2.5}$ concentrations and local contributions are generally greatest in cities with the highest annual average $PM_{2.5}$ concentrations

Figure 1. Local and regional contribution to urban $PM_{2.5}$.



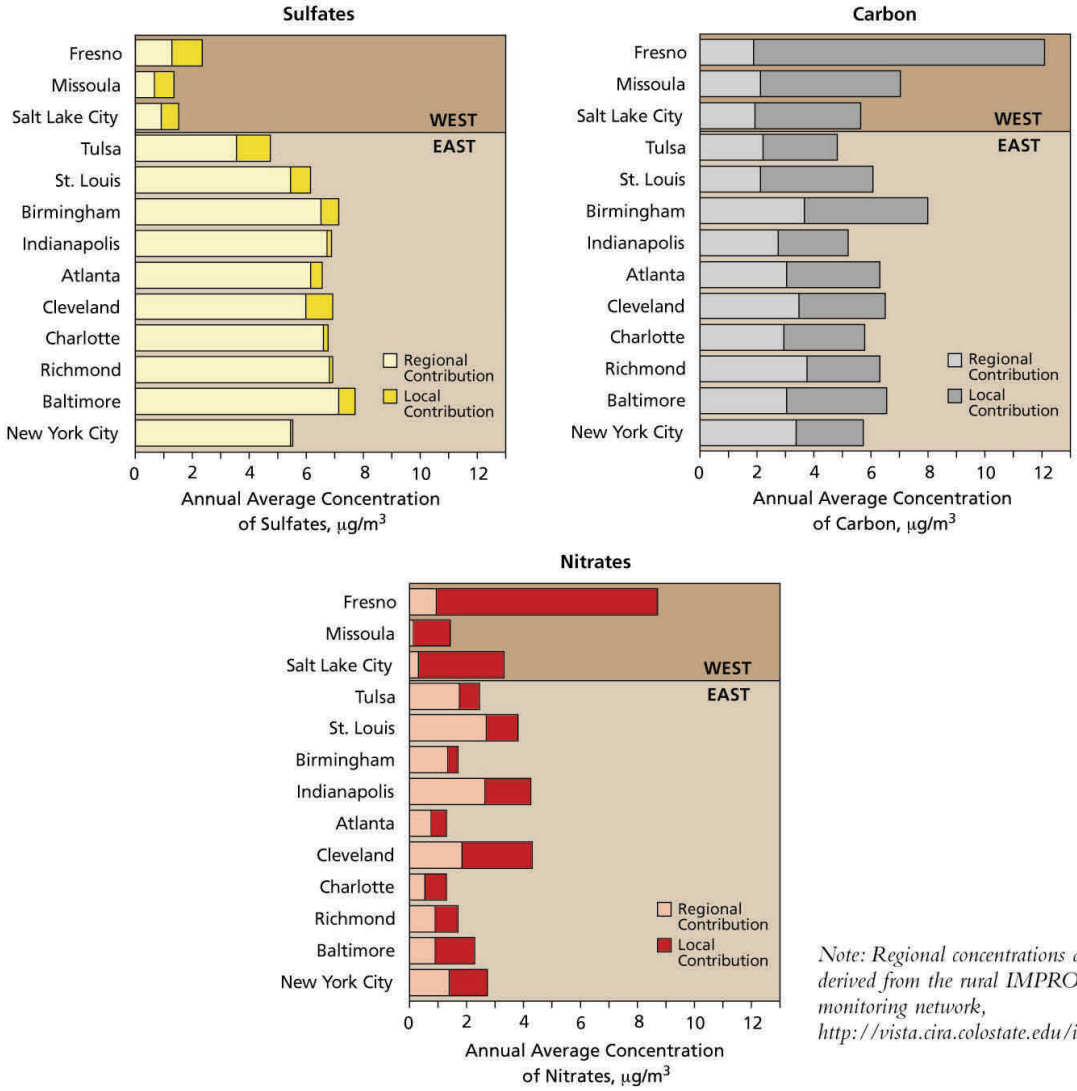
Note: Urban and nearby rural $PM_{2.5}$ concentrations suggest substantial regional contributions to fine particles in the East. The measured $PM_{2.5}$ concentration is not necessarily the maximum for each urban area. Regional concentrations are derived from the rural IMPROVE monitoring network, http://vista.cira.colostate.edu/improve.

Special Feature—Speciation Data Analysis (continued)



For more information on particle pollution, see the **Particle Pollution Report.** If you have questions regarding these results or the report, contact Tesh Rao at 919-541-1173 or by e-mail at rao.venkatesh@epa.gov or James Hemby at 919-541-5459 or by e-mail at hemby.james@epa.gov.

Figure 2. Local and regional contribution of major $PM_{2.5}$ chemical components.



Note: Regional concentrations are derived from the rural IMPROVE monitoring network, http://vista.cira.colostate.edu/improve.

First Performance Evaluation of Sunset Carbon Monitors

PE samples have been very useful in identifying issues with the semi-continuous analysis equipment

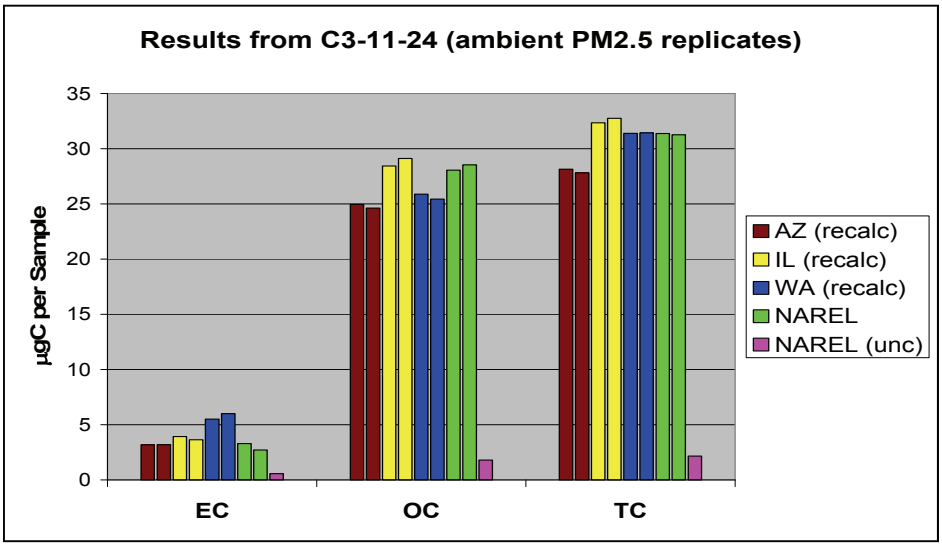
EPA's Office of Radiation and Indoor Air Radiation (ORIA), National Air and Radiation Environmental Laboratory (NAREL) provides QA assistance to OAQPS to evaluate data quality for the $PM_{2.5}$ Speciation Network. NAREL supports the semi-continuous speciation study by providing performance evaluation (PE) samples. NAREL has recently developed PE samples to audit the Sunset semi-continuous monitors. These PE samples are actual field sample punches that are incorporated into the monitor's sample analysis chamber. PE samples have been very useful in identifying issues with the analysis equipment. The PE results showed reasonable agreement among the 3 monitors audited, yet upon closer inspection of the raw data, it was noted that all sites were not using the same version of software. Tests were run to determine the consequence of different software versions. Recalculated results with the latest version of software improved the results for those sites with old software versions. Sunset Laboratories is working with the state operators and EPA to update the software at the 3 semi-continuous sites in the study.

Questions regarding the NAREL QA activities for the Continuous Speciation Study should be directed to Solomon Ricks at 919-541-5242 or by e-mail at *ricks.solomon@epa.gov*

Sunset Field Instrument; courtesy of Sunset Labs at www.sunlab.com

Use of trade names or identification of vendor equipment does not constitute endorsement by the U.S. Environmental Protection Agency

MetOne Speciation (SASS) Sampler used in the Speciation Trends Network (STN)



Speciation Sampler Maintenance—QA

Speciation Technical System Audits (TSA) are uncovering some issues with speciation sampling equipment. Issues have been identified regarding flow rates and monthly flow checks. It is important for our field operators to keep the samplers in good repair. The STN Quality Assurance Project Plan (QAPP) requires that the operators perform monthly flow rate, temperature, and pressure checks. The results from these checks should be reported quarterly to AQS. Initial guidance was not clear on the process for reporting this data to AQS. Therefore, we are revising the guidance and providing a mechanism through RTI for routine reporting. We are now in the process of assessing the sampling network and are asking that operators report information from their most recent maintenance and service records to our QA lead, Dennis Crumpler. If you have questions regarding this process or you are an operator of a speciation sampler, please contact Dennis at 919-541-0871 or by e-mail at *crumpler.dennis@epa.gov*.

"Rain, sleet, snow!!"—Speciation Audit Update

There isn't much that can stop the EPA QA team from doing an on-site technical systems audit (TSA). The speciation QA team (Jewell Smiley, Steve Taylor, Dennis Crumpler) and Program Lead (Joann Rice) recently visited the UC Davis and Desert Research Institute (DRI) laboratories for a TSA. Both labs provide analytical services for the IMPROVE and speciation SLAMS networks. On its first stop, the team visited beautiful Sacramento, CA and the UC Davis Crocker Nuclear Lab (CNL). The CNL staff provided great hospitality and Sacramento provided bright, sunny, warm weather. Next stop, DRI in Reno, NV. The only things standing in the QA team's way were 130 miles, the Sierra Nevada, a snow storm, and the infamous Donner Pass. Donner Pass is located at 7,239 feet in the Sierra. Above 7,000 feet, the annual snowfall totals range from 400 to 450 inches. In 1846, the Donner party was trapped for months by successive snow storms. With limited food supplies they were reduced to cannibalism. The forecast for our mountain trek was 4 feet of snow and growing! Tire chains were mandatory, but that did not deter the team. The TSA must be done, so tire chains were purchased for the rental car and the team got on the road. First it was rain, then sleet, and finally snow. A drive that normally takes 2 hours, took more than 5. The team arrived safely and we went on to visit DRI. The TSA report will be coming soon. Sierra and Donner Pass facts taken from *Weather History of Donner* Pass at: www.thestormking.com/donner.pdf

The only things standing in the way were 130 miles, the Sierra Nevada, a snow storm, and the infamous Donner Pass

Jewell Smiley and Dennis Crumpler install tire chains while Steve Taylor is at the wheel.

Snow falling in the Sierra

RTI Semi-Annual Data Summary Reports

RTI supports the $PM_{2.5}$ Speciation program by shipping ready to use filter modules to the STN and SLAMS field sites, and conducting gravimetric and chemical analysis of the teflon, nylon and quartz filters collected for the program. RTI compiles semi-annual data reports that provide a summary of the quality control (QC) procedures and results for the gravimetric, ion, carbon, x-ray fluorescence, denuder refurbishment, data processing, sample handling and archive labs. Information relevant to data validity and data completeness is also provided, as well as any significant corrective actions. The latest data summary report covering the period July 1 through December 31, 2004 and previous reports can be found at: www.epa.gov/ttn/amtic/specdat.html

If you are interested in the details of the laboratory activities, RTI's Standard Operating Procedures (SOPs) are posted at: www.epa.gov/ttn/amtic/specsop.html

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EMMISIONS, MONITORING & ANALYSIS DIVISION

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Mail Drop D243-02
Research Triangle Park,
North Carolina 27711

Our website address is www.epa.gov/ttn/amtic

Speciation Network Design—Update

OAQPS is recommending reductions in the current number of SLAMS speciation sites. In order to make preliminary recommendations to the EPA Regions regarding cuts, the current speciation network design was evaluated. Two tools were used to evaluate the network: 1) a "decision matrix", and 2) a GIS mapping tool. The "decision matrix" was developed by OAPQS and used to rank existing monitoring sties based on a set of network design criteria. See the Speciation Newsletter Issue 2 for details on the decision criteria. We have received some very good feedback on the decision criteria and have modified it to include concentrations of sulfate, nitrate and carbon. Preliminary recommendations have been forwarded to the Regions for communication and discussion with state and local agencies. The Regions work with the states to make decisions on the network design and communicate that Information back to OAQPS for planning purposes. For more information, contact Kevin Cavender at 919-541-2364 or *cavender.kevin@epa.gov*

The Monitoring and Quality Assurance Group (MQAG) has been renamed the Ambient Air Monitoring Group (AAMG). The AAMG is responsible for identifying ambient monitoring needs based on OAQPS's data requirements, and for developing the national monitoring program and quality assurance infrastructure to support these requirements with high quality ambient air data.

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