U.S. EPA
OFFICE OF AIR QUALITY PLANNING AND STANDARDS
AIR QUALITY ASSESSMENT DIVISION

$PM_{2.5}$ Speciation Network Newsletter

Issue 5 April 2006

Special points of interest:

- **Modification of STN carbon FAQs**
- **Semi-continuous speciation results**
- **Handling of field, trip, and lab blanks**

Inside this issue:

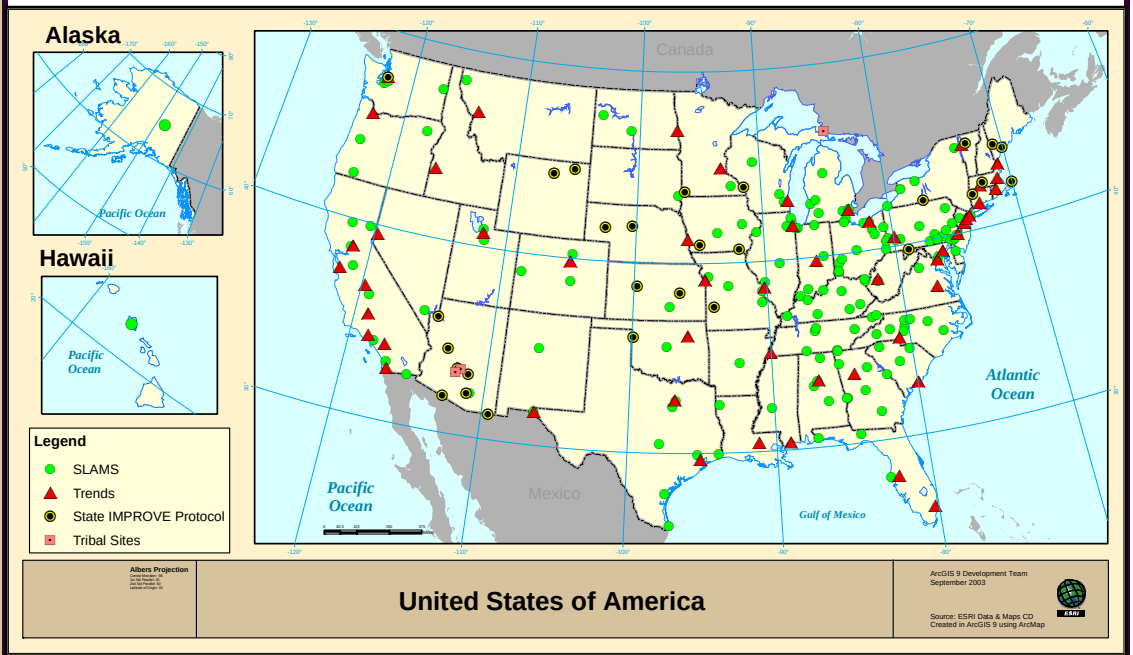
Speciation Network Map

The latest speciation network map is shown below. It reflects the 54 Speciation Trends Network (STN) sites; 159 supplemental State and Local Air Monitoring Stations (SLAMS); 3 Tribal sites; and 28 SLAMS that have IMPROVE monitors (State IMPROVE Protocol sites). There is also one STN site in Guaynabo, Puerto Rico that is not shown. The map was compiled from information provided by the Delivery Order Project Officers (DOPOs) in January 2006. The speciation SLAMS are very dynamic and continue to change to meet state and local air monitoring needs and to match available monitoring resources. The Trends sites are largely stable to support the program objectives listed on the right.

Program Objectives

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.



Speciation Shipping Boxes—Changes in Box Material

RTI is the EPA speciation contract lab and handles the preparation, shipment and analysis of samples for all 54 STN sites and most of the supplemental SLAMS sites. RTI ships about 20,000 samples per year in support of the speciation network. In order to reduce the program's shipping cost, RTI is using new cold shipping boxes. The new shipping box reduces the shipping weight and subsequent cost by about 50%. Samples will continue to be shipped overnight. The new cardboard box started being shipped to some sites in December 2005. Early reports show a significant decrease in shipping cost for the new boxes. In order to increase the life of the new shipping boxes, RTI will be moving from corrugated cardboard to corrugated plastic boxes. The new boxes were fully implemented in March 2006. A picture of the new corrugated plastic box is shown in the picture to the right.

Picture of the corrugated plastic box with modules and ice packs.

Modification of Carbon Procedures in the Speciation Network and FAQs

The $PM_{2.5}$ carbon data appear to have the greatest disparity between the urban Speciation Trends Network (STN) and rural Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring programs. Data users have expressed the need for consistency across the organic carbon (OC) and elemental carbon (EC) measurements provided by these programs. Two carbon methods are currently used by the STN and IMPROVE networks. The STN uses a Thermal Optical Transmittance (TOT) method and the IMPROVE uses Thermal Optical Reflectance (TOR).

Given that data consistency is desirable, OAQPS requested that the Clean Air Scientific Advisory Committee (CASAC) provide expert advice and recommendations regarding the strengths and weaknesses related to the harmonization of the rural- and urban-based $PM_{2.5}$ chemical speciation networks. CASAC has recommended to the EPA Administrator that strong general support be given to making changes to the STN for comparability with IMPROVE. See CASAC's recommendations in the report "EPA's Final Draft National Ambient Air Monitoring Strategy", EPA-SAB-CASAC-05-006, May 2005; posted at http://www.epa.gov/sab/pdf/casac-05-006.pdf

OAQPS is committed to establishing data comparability between the STN and IMPROVE networks while maintaining the overall program objectives of the STN to support control strategy development for the $PM_{2.5}$ NAAQS. EPA plans to convert all of the Trends and supplemental sites (about 200 sites total) to IMPROVE carbon sampling and analysis protocols over a 2-3 year period. This will add consistency in the networks for carbon and allow for retention of the longer-term record for the other STN species (mass, ions and elements).

OAQPS has started dialog with Regional office representatives and State and Local agencies. Here are some of the **frequently asked questions (FAQs)** and responses so far.

1) When will the carbon conversion occur?
We don't have exact dates at this point, but we anticipate that the installation of sampling devices at the 54 Trends sites should start in the summer of 2006. Installations would be done in batches and could be done by geographical Regions. We will continue to talk with States and data users on the logistics of specific sites and when.

2) Will the site operators be trained on any software or filter installation issues? There may be some issues with siting at some sites.
Yes, the plan is for the contractor to procure the samplers, and with cooperation from site operators, install them at the sites. The contractor will provide on-site training when the installation occurs. It will be up to the site operator to make sure the necessary infrastructure is in place prior to the site visit. The contractor will provide more detail on the infrastructure needed prior to installation.

Modification of Carbon Procedures in the Speciation Network and FAQs (cont'd)

3) Should our site-specific Quality Assurance Project Plan (QAPP) be updated to reflect this change?
Yes, the national speciation field QAPP is currently under revision and can serve a "template" to assist you in QAPP revision.

4) How is the data to be handled? Is the old carbon channel data to be "ended" in AQS and new channel data started?
Yes, the plan is for the old channel is to be ended and the new one started. We will likely use method codes and comment fields to communicate when the change occurred in AQS.

5) What are the power requirements for the IMPROVE carbon sampler?
The minimum requirement is a single 15 amp circuit. The preferred is 20 amps, but for a single module it may be overkill. Where a second circuit is available the controller is plugged in to it to avoid possible electrical interference, but that's a precaution and not a requirement.

6) Are there any costs for training that the states should be focused on?
EPA will provide the cost for samplers, installation and training.

7) Are there additional costs that will be incurred?
After the first year of operation, there will be a recurring lab analysis cost for the increase to move to IMPROVE TOR analysis. This cost will be about $7 per sample which translates into $1,050 per site per year for 1 in 3 day sampling and $525 per site for 1 in 6 day sampling. As with the current lab costs, the increase will be deducted from available grant funds before distribution to the individual agencies.

8) Who will provide carbon sample analysis?
RTI will coordinate the analysis of samples by Desert Research Institute (DRI)

9) Will the IMPROVE carbon samples be shipped separately from the routine Speciation samples?
No, RTI will add the necessary sampling cassettes and cartridges to the routine speciation shipping container. The samples will continue to be shipped under ice.

10) Is there a picture of the IMPROVE sampling module for carbon?
A picture of the IMPROVE controller and sampling module is shown below. The dimensions of the controller are: 17" x 12" x 6.75" and the weight is 22 lbs. The sampling module dimensions are: 17" x 12" x 6.75" and the weight is 39 lbs.

For more information or questions, contact Joann Rice at rice.joann@epa.gov or 919-541-3372.

Picture of the IMPROVE controller (left) and Module C sampler (right).
Courtesy of URG Corp in Chapel Hill, NC

The IMPROVE sampler controller dimensions are 17" x 12" x 6.75" and the weight is 22 pounds. The Module C sampler dimensions are 17" x 12" x 6.75" and the weight is 39 pounds.

Semi-Continuous Speciation Study Results

In 2002, OAQPS worked with five state agencies to kick off the semi-continuous speciation study. The objectives of the study were to determine if commercially-available semi-continuous carbon, nitrate, and sulfate monitors were sufficiently robust to allow routine application in the speciation monitoring network; assess operational issues, such as downtime and maintenance costs; and to assess comparability and predictability using filter-based samplers in the STN as the benchmark. Instrument vendors were engaged to assist in making monitor improvements and adjustments over the course of study. Data collected at five sites (see map below) during a three year period from 2002-2005 were analyzed. For more detail and information, please refer to "Comparison of Integrated Filter and Semi-continuous Measurements of $PM_{2.5}$ Nitrate, Sulfate, and Carbon Aerosols in the Speciation Trends Network (STN)", EPA 454/R-05-004, Dec. 2005 posted at http://www.epa.gov/ttn/amtic/semicontin.html

Monitors used in the study were the Rupprecht and Patashnick (R&P) 8400N nitrate , R&P 8400S sulfate, R&P5400 carbon and the Sunset carbon monitor. The primary operational issues identified for the 8400N were flash strip failures and the need for molybdenum converter replacement. For the 8400S, flash strip failures were identified to be more frequent than the 8400N. The 5400 had flow, leak, and afterburner issues; and collector replacements were needed every 6-12 months. The Sunset analyzer had PC failures and issues with software versions.

The instrument vendors were very responsive in helping to solve issues.

Neither the 8400N nor the 8400S consistently met the defined comparability criteria. Only one 8400N monitor in Phoenix met comparability criteria after converter replacement. Additional improvements and enhancements are required to improve comparability of these monitors with filter-based measurements. The 8400N and 8400S did a better job at meeting the predictability (correlation) criterion. The comparability and predictability of the 5400 carbon monitor was poor. The Sunset carbon monitor was better at meeting, or close to meeting, the comparability criteria. The Sunset monitor met the correlation criterion at all sites tested. Semi-continuous monitors with reasonably good performance for predictability appear most useful for obtaining diurnal pattern information at sites that also have collocated speciation measurements.

The data analysis and final report conclude the 'study' phase. Monitors will continue to operate at five pilot sites at discretion of the Regions and state and local (S/Ls) agencies. The S/Ls are encouraged to continue exploring new and existing semi-continuous technologies and improvements with filter-based monitors for information on diurnal patterns.

For more information, contact Solomon Ricks at ricks.solomon@epa.gov or 919-541-5242.

EPA Would Like to Acknowledge:

Arizona Dept. of Environmental Quality

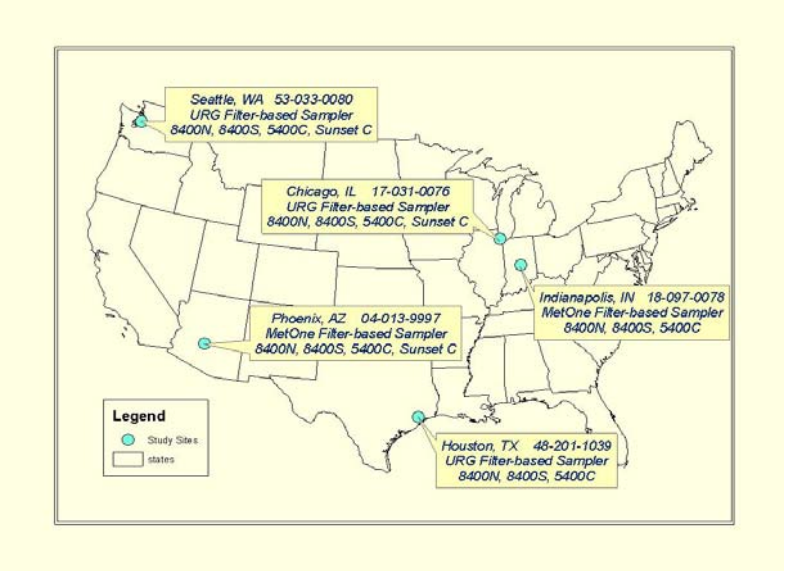
Cook County Dept. of Environmental Control

Illinois EPA

Indiana Dept. of Environmental Management

Texas Commission of Environmental Quality

Washington Dept. of Ecology



Field, Trip, and Laboratory Blanks in the Speciation Program

Have you ever wondered about the blanks in the speciation program? The speciation program collects two types of blanks for the field program. There are also laboratory or quality control (QC) blanks that are generated in at the analytical laboratory at RTI.

The field program blanks are field blanks and trip blanks. Field blanks are collected once every 10 days and trip blanks are collected once every 30 days. The field blank samples are assembled, packaged and shipped exactly like normal, routine field samples. However, the field blank samples are momentarily opened (for a few minutes at most) and exposed to the ambient air. No ambient air is actually drawn through these samples. The field blanks are then repackaged and shipped back to RTI in the same manner as routine samples. The trip blanks are also assembled, packaged and shipped exactly like normal, routine field samples; however, they are never opened and exposed to ambient air. Trip blanks only provide an estimate of contamination during transport to and from the field. Both the field and trip blank samples are analyzed in the same manner at routine samples and the data also reported to AQS. Field and trip blank data are not currently used to adjust or correct routine sample values prior to loading the data into AQS. The raw routine sample data and the trip and field blank data are reported to AQS.

RTI also analyzes a series of QC blanks in the laboratory for routine sample analysis. The laboratory QC blanks are as follows:

X-Ray Fluorescence (XRF)— The XRF lab runs routine QC filter blanks to monitor background levels in particular filter lots, as well as changes in baseline due to recalibration or instrument maintenance. A background correction is applied for a limited number of elements whenever the average blank concentration exceeds 3 times the average uncertainty. This correction is based on results from a set of about 10 lot stability blanks obtained from the gravimetry lab.

Ion Chromatography (IC) — The IC lab runs routine QC reagent and filter blanks at a rate of 5%. Filter blanks are also analyzed to monitor nylon filter washing batches, ensuring adequate removal of sodium and other ions from filters by the special washing process that RTI developed for the speciation program.

Organic and Elemental Carbon (OC/EC)— The OC/EC laboratory runs instrument blanks daily, or every 30 filters, and filter lot oven cleaning blanks. The latter are used to ensure that the filter cleaning process is adequate before a lot of filters is released for sample collection.

Gravimetry— The Gravimetry lab runs preweighed laboratory blank filters along with routine filters that are heading to the field. The laboratory blanks are re-weighed when filters from the original batch are returned after being sampled. This process is intended for detection of systematic contamination or other changes affecting a particular batch. A second type of blank in the Gravimetry laboratory is the lot stability blank. These are filters that are weighed multiple times over a period of days to ensure that a new filter lot's weight is stable. The lot stability blanks are also analyzed by the XRF laboratory as described above.

For more information or questions, contact Joann Rice at rice.joann@epa.gov or 919-541-3372.

New DOPOs for the Speciation Program

There are some recent changes to the Delivery Order Project Officers (DOPOs) that are assisting Regional coordinators and states with RTI lab analysis orders to support the speciation program. With the retirement of Ken Wang, Michael Copeland in Region 8 has taken over support to Regions 8, 9 and 10. Greg Noah and Richard Guillot in Region 4 will be taking over the support to Regions 1, 2, 3 and 4 from Reshma Punswasie in the next few months. Regina Krystyn continues to support Regions 5, 6, and 7. The DOPO contact information is given on the last page.

As always, thanks to all the DOPOs for the work they do to support the Regions, states, and the speciation program.

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AIR QUALITY ASSESSMENT DIVISION

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

New Reports on the Technology Transfer Network (TTN)

The Ambient Air Monitoring Group (AAMG) is continually adding new information to the Technology Transfer Network (TTN) Ambient Monitoring Technology Information Center (AMTIC) web site. The web site contains information related to EPA ambient monitoring programs. Here is a list of reports with $PM_{2.5}$ Speciation content that have recently been posted since the last newsletter on EPA's TTN AMTIC web site: www.epa.gov/ttn/amtic/speciepg.html

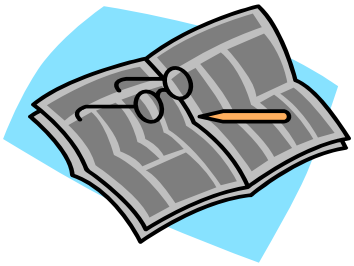
01/13/06: The ***EPA Audit of the RTI Chemical Speciation Lab*** report is posted in the Speciation Lab Audit Reports and Assessments file area.

01/13/06: The ***Comparison of Integrated Filter and Semi-continuous Measurements of $PM_{2.5}$ Nitrate, Sulfate, and Carbon Aerosols in the Speciation Trends Network (STN), EPA-454/R-05-004*** report is posted in the Semi-continuous Speciation file area.

01/23/06: The ***Revised Quality Assurance Project Plan for the Chemical Speciation of $PM_{2.5}$ Filters*** is posted in the Speciation Field Guidance Documents file area.

01/24/06: The latest issue of **"The QA Eye"** which includes an article on Speciation QA by Dennis Crumpler (OAQSP) and Jeff Lantz (ORIA), is posted at: http://www.epa.gov/ttn/amtic/qanews.html

03/15/06: The ***Experimental Intercomparison of Speciation Labs*** report s posted in the Speciation Lab Audit Reports and Assessments file area.



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Regions 5, 6, 7 — Regina Krystyn; 312-886-6205; *krystyn.regina@epa.gov*
Regions 8, 9, 10 — Michael Copeland; 303-312-6010; *copeland.michael@epa.gov*

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