

PM_{2.5} Speciation Network Newsletter



Special points of interest:

- Field Audit Training to be held in RTP, NC in November 2004
- 41 STN sites have better than 95% completeness
- Additional IMPROVE monitors to be located at 9 urban sites in 2004
- The continuous STN study will expand to 7 additional sites in 2004/2005
- Field and trip blank data will be posted to AQS in Nov. 2004

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Newsletter Purpose

This is the first quarterly issue of the PM_{2.5} Speciation Network newsletter. The objective of this newsletter is to inform the EPA Regions, States, Local and Tribal air monitoring agencies of recent developments and activities, and to facilitate communication of information to site operators, data analysts and policy makers regarding the performance of the speciation monitoring network and resulting data quality.

The main features in the edition are:

- Speciation Program Objectives
- Program Background
- Sampling and Analysis Descriptions
- Quality Assurance Activities
- Data Completeness & Data Management
- Special Studies
- Speciation News

Speciation Program Objectives

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

- Assessing the effectiveness of emission reductions strategies through the characterization of air quality trends.
- Supporting the development of predictive modeling tools and application of source apportionment modeling for control strategy development (e.g., SIPs).
- Supporting programs aimed at improving environmental welfare, such as the Regional Haze program.
- Supporting health effects and exposure research studies.

Program Background

The PM_{2.5} Speciation program was established by regulation in 1997 as a complement to the PM_{2.5} Federal Reference Method (FRM) mass network. It began as a small pilot network of 13 Sites operating from February through July of 2000. After the pilot phase, the Speciation program continued with deployment of the Speciation Trends Network (STN) in the fall of 2000. The Speciation program now consists of 54 Trends sites and about 185 supplemental sites. Of the 54 Trends sites, about 20 are currently collocated at Photochemical Assessment Monitoring Stations (PAMS). The supplemental sites are State and Local Air Monitoring Sites (SLAMS) deployed by State, Local and Tribal agencies to allow flexibility in meeting local air monitoring needs. The Speciation sites are located in urban areas and is a companion network to

the rural IMPROVE (Interagency Monitoring of Protected Visual Environments) network. For more information on the Speciation and IMPROVE programs visit www.epa.gov/ttn/amtic/amticpm.html.





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

STN Monitor Types and Lab Analysis Description

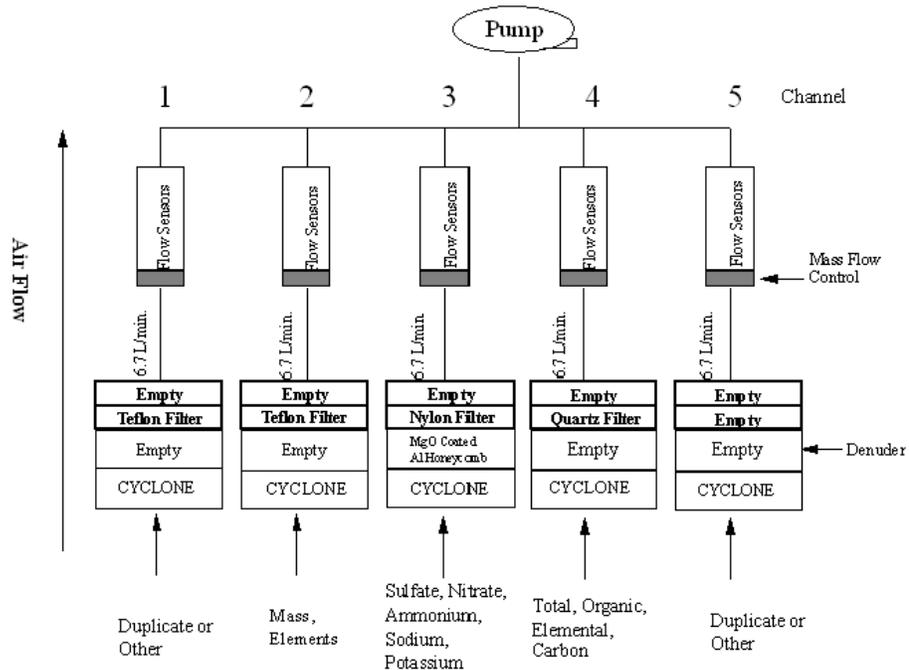
There are 3 sampler types used strictly for the Speciation Trends Network. They are the Thermo Andersen RAAS, MetOne SASS and URG MASS. Specific sampler selections were left up to the State, Local and Tribal agencies. MetOne samplers are currently the predominant sampler in the Trends network. All samplers incorporate a PM_{2.5} size-selective inlet and collect particles on 3 separate channels that contain a Teflon, nylon and quartz filter. A single magnesium oxide (MgO) denuder is used ahead of the nylon filter to capture potentially interfering acid gases. No other denuders are used. A schematic diagram of the MetOne SASS is shown below. The STN samplers collect a 24-hour sample from midnight-to-midnight every 3rd day. Supplemental (SLAMS) sites may use a variety of sampler types, different analysis laboratories and collect samples at a frequency of one every 3rd or one every 6th day.

All Trends network filters are analyzed under EPA contract with the Research Triangle Institute (RTI) International Laboratory in Research Triangle Park, NC. The Teflon filter is analyzed for PM_{2.5} mass and elements, the nylon filter for ions and cations and quartz filter for carbon. RTI performs gravimetric mass measurements in accordance with the requirements of FRM mass network. Teflon filters are also analyzed for elements by EDXRF (Energy Dispersive X-Ray Fluorescence). The nylon filters are analyzed for ions using a filter extraction and ion chromatography (IC) method and the quartz filters are analyzed for organic and elemental carbon using a thermal optical transmittance method (TOT). RTI's Standard Operating Procedures (SOPs) for sample handling, filter analyses and data management can be found on our website at www.epa.gov/ttn/amtic/specsop.html.

The STN samplers collect 24-hour samples from midnight-to-midnight every third day



Thermo Anderson RAAS Speciation Sampler with door detached



Schematic diagram of the SASS™ sampling system

Schematic of the MetOne SASS

Three of five available channels are used for routine sample collection. The two additional channels are available for duplicate sample collection if needed. For updates and additional information on the MetOne SASS see www.metone.com.

Quality Assurance (QA) Activities

EPA's Office of Indoor Air and Radiation (ORIA) provides QA assistance to OAQPS to evaluate data quality for the PM_{2.5} Speciation network. The ORIA laboratory in Montgomery, AL provides laboratory auditing activities and performs a variety of special studies to support the resolution of data quality issues. The ORIA laboratory in Las Vegas, NV provides field audits and training activities. A number of laboratory audits have been completed over the course of the Speciation program. Laboratory audits in the form of performance evaluation (PE) samples and TSAs (Technical Systems Audits) are performed on the RTI and SLAMS laboratories. There are currently 2 SLAMS laboratories (Oregon Dept. of Environmental Quality and the California Air Resources Board) in operation. The latest report on findings from ORIA's audit of RTI was issued March 2004. The next RTI audit is scheduled for December 2004. The March 2004 and other audit reports are available at www.epa.gov/ttn/amtic/pmspec.html.



Filter being weighed at the ORIA Montgomery, AL laboratory to determine particulate matter.

ORIA's laboratory in Las Vegas, NV provides a number of field training activities, field audits and field support to special studies. The Las Vegas staff provides field auditor training for EPA Regional and State and Local personnel. The training covers the STN and IMPROVE sampling systems and the next training session will be held November 2004 in Research Triangle Park, NC. Field audit SOPs and TSA questionnaires can be found at www.epa.gov/ttn/amtic/pmspec.html. For more information or to register for the audit training, contact Dennis Crumpler at 919-541-0871 or by e-mail to crumpler.dennis@epa.gov

STN and IMPROVE Comparison Study

In order to resolve issues associated with the difference between the data generated by the STN and IMPROVE programs (specifically carbon data), we began a comparison study at 6 locations across the U.S. in 2002. The first 6 sites (3 urban, 3-rural) were located in the Seattle, Washington DC, and Phoenix areas. Data from these sites are currently being analyzed to support long-term decisions and the resolution of differences between programs. Preliminary results show very good correlation between most of the major species, including the carbon data collected by IMPROVE and STN monitors after blank subtraction of the STN data. To evaluate the differences in areas with more challenging aerosols (e.g., higher nitrate and carbon concentrations) we plan to collocate IMPROVE monitors at 9 additional urban Trends sites in 2004. These include:

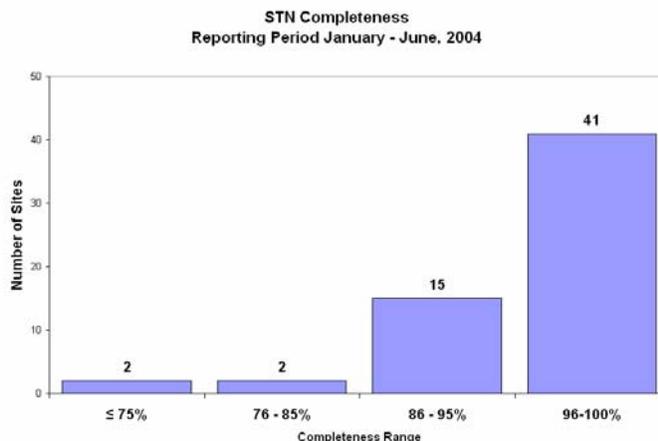
New York, NY	Chicago, IL	Pittsburgh, PA
Atlanta, GA	Deer Park, TX	Detroit, MI
Birmingham, AL	Rubidoux, CA	Fresno, CA

For more information, contact Dennis Crumpler at 919-541-0871 or crumpler.dennis@epa.gov

**An additional
9 IMPROVE
monitors will
be collocated
at urban
Speciation
Trends sites in
2004**

STN Data Completeness

The percent completeness is determined and reported in the Semi-Annual Data Summary Reports prepared by the RTI Speciation Laboratory. The latest report covers the reporting period from January 1, 2004 through June 30, 2004. The number of routine samples collected and analyzed are compared to the number of samples scheduled for each site. For this period, 41 of the 60 STN sites (including 6 collocated sites) have a percent completeness in the 96-100% range. Two sites have <75% complete data. Percentages <75 are usually the result of sampler service issues, site repair issues and problems with shipping. For more detail on completeness by site, refer to the latest Data Summary Report posted at www.epa.gov/ttn/amtic/pmspec.html.



Up to 12 STN sites will be equipped with continuous sulfate, nitrate and carbon monitors

Continuous Speciation Study

EPA is coordinating a study of continuous Speciation monitors at a small number of STN sites. The goals of this study are to assess the operational characteristics and performance of continuous carbon, nitrate, and sulfate monitors for routine application at STN sites; evaluate the use of an automated data collection and processing system for real time display and reporting; and begin the installation and operation of up to 12 STN sites equipped with continuous sulfate, nitrate, and carbon monitors. The first five study sites are Chicago, IL; Indianapolis, IN; Deer Park, TX; Phoenix, AZ; and Seattle, WA. An additional 7 sites will begin participation in 2004/2005. These are:

Atlanta, GA	New York, NY
Raleigh, NC	Los Angeles, CA
Fresno, CA	Salt Lake City, UT
Fargo, ND	

So far, only Rupprecht & Patashnick (R&P) 5400, 8400S, and 8400N monitors have been evaluated. Newly available Thermo sulfate and Sunset Lab carbon analyzers will be installed at 2 to 3 of the existing sites. Once acceptable performance has been demonstrated through comparison with the STN network filter-based measurements, real-time sulfate, nitrate, and carbon data will be provided through AIRNOW. Look for more information in upcoming newsletters. For more information, contact Solomon Ricks at 919-541-5242 or by e-mail at ricks.solomon@epa.gov



The continuous monitoring station at Deer Park, Texas.

Field and trip blank data will be posted to AQS beginning in November 2004

Speciation Data Management

Filter Blank and Uncertainty Data

The EPA AQS (Air Quality System) database has recently been modified to accept filter blank data. In preparation for posting blank data in AQS, RTI is now calculating and reporting an effective concentration for all target species for trip and field blanks. The nominal sampling volume (based on sampler design flow over a 24-hour period) for the appropriate sampler channel will be used to calculate the concentration. Trip and field blanks now appear in the concentration summary spreadsheets provided to each site as a result of this change. RTI plans to start posting blank data to AQS in November 2004. Blank data collected under the current contract will be loaded (starting with July 2003 data) into AQS after the initial posting.

EPA (with RTI) is also developing a protocol for reporting uncertainty values for all parameters in AQS. Once the protocol is approved, RTI will load uncertainty data for records generated for the entire program. The uncertainty data is being generated to primarily support receptor modeling applications. For more information, contact Solomon Ricks at 919-541-5242 or by e-mail at ricks.solomon@epa.gov



Supersites Meeting

Just a reminder that the Particulate Matter Supersites Program and Related Studies, AAAR International Specialty Conference will be held February 7-11, 2005 at the Sheraton Hotel in Atlanta, GA. More information on this meeting can be found at www.aaar.org

Speciation News

This section highlights information of special interest, key activities and plans for the Speciation network. It serves to communicate important items and upcoming events to the Speciation network and data use community.

Key activities and plans for the Speciation Network are contained in the Speciation News



EPA is planning to convert the TOT method used by STN to the TOR method used by IMPROVE

Role of Continuous Speciation Monitors

An update on the continuous speciation study is provided on page 4. Over the last five years, considerable testing of available instrumentation has been conducted through the continuous study, the Super-sites program and a collection of other state and local agency-sponsored efforts. Currently, continuous carbon, sulfate and nitrate monitors are being evaluated in the

continuous speciation study. The continuous samplers provide more detailed temporal data to support model evaluation, source-receptor applications, association of acute and adverse health impacts, and forecasting air pollution events. Although improvements have been made, continuous monitors must continue to be collocated with traditional filter-based samplers. The filter-based samplers provide the additional chemical species (not currently provided by continuous monitors) needed for closure of total aerosol mass.

Conversion of the STN Carbon TOT Method to TOR

Two thermal-optical methods are currently used by the Speciation and IMPROVE networks for the analysis of carbon. The Speciation network uses a Thermal Optical Transmittance (TOT) method and IMPROVE uses Thermal Optical Reflectance (TOR). The Speciation method is provided by RTI. The IMPROVE method is provided by Desert Research Institute (DRI) and has historically been used for assessing visibility in Federal Class I areas. Since the carbon data are thought to have the greatest disparity between the STN and IMPROVE programs, EPA is planning to convert the TOT method used for STN to the TOR method used by IMPROVE.

This decision is based on "practical" concerns to better serve data analysts and the model evaluation community. These groups have expressed the need for agreement between the organic and elemental carbon measurements provided by the IMPROVE and STN networks. This decision does not reflect a judgment of the best "science" in regard to delineating organic from elemental carbon; rather, a realization that a scientific consensus or solution is not likely to emerge in the near future. Given that the STN network is relatively new and the IMPROVE protocols are relatively stable, this change will yield a pragmatic and consistent network across the nation. Although the IMPROVE network explicitly supports visibility assessments, it offers substantial value to a broader range of objectives underlying PM_{2.5} implementation.

In particular, the regional nature of air quality that demands comprehensive characterization across large geographic areas. As the Nation promulgates major rules such as the Clean Air Interstate Rule (CAIR), greater focus will be directed toward the "urban increment", which may be dominated by carbonaceous components. It will become important for our Speciation networks to provide a consistent framework to assess the relative importance of urban versus regional contributions with a focus on carbon.

The start of conversion to the TOR method will begin at STN sites with at least one year of comparison data with IMPROVE (See STN and IMPROVE Comparison Study on page 3). Implementation is delayed due to instrument changes at the DRI laboratory, where carbon analyses are performed for IMPROVE. Once the new DRI systems are in place, EPA will begin implementation of the TOR method for STN. In addition, EPA will explore the exchange of the current STN samplers with IMPROVE samplers. It is expected that this change to the STN will be implemented at the 54 Trends sites over the next 3 years. The STN to IMPROVE comparison studies will establish a relationship between programs and enable more effective interpretation of the data sets retrospectively.

While valuing consistency across the Speciation networks, this intended switch from TOT to TOR is based on the assumption that clear scientific consensus does not exist regarding the most appropriate carbon method. Should a clearly defined scientific consensus evolve that is reasonable and practical to deploy (e.g., not cost prohibitive), EPA will promote a change to the Speciation network.



Speciation News (continued)

Network Design Changes

EPA is recommending reductions in the current number of SLAMS Speciation sites. The rationale for such reductions is based on two items. First, the SLAMS were initially established to support SIP development and implementation, which covers an analysis period from 1999 through 2004. Starting in 2005 there will be a declining need for SLAMS to support further SIP development. Second, the resources required to maintain a large filter-based network prohibit expansion of new continuous Speciation and trace gas technologies to support the National Air Monitoring Strategy. A priority will be placed on retaining non-urban sites that fulfill important measurement gaps, as well urban sites in PM_{2.5} non-attainment areas. For more information contact Tim Hanley at 919-541-4417 or hanley.tim@epa.gov

NCore Level 2 Sites

The STN sites are expected to provide the basic infrastructure for locating urban sites in the NCore Level 2 network. The IMPROVE and CASTNET networks are expected to provide the non-urban infrastructure. The multiple-pollutant NCore Level 2 network will be phased in from now through 2007. Approximately 75 sites will make up the network, with about one-third of the sites in major cities in non-urban areas. More details on NCore Level 2 and the National Air Monitoring Strategy can be found at: www.epa.gov/ttn/amtic/monitor.html

The Monitoring and Quality Assurance Group (MQAG) 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.

PM_{2.5} Speciation Program Contacts

Recent staff changes have been made in the program. The current list of contacts are given below.

Program Lead: Joann Rice; 919-541-3372; rice.joann@epa.gov

Quality Assurance Coordinator: Dennis Crumpler; 919-541-0871; crumpler.dennis@epa.gov

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Data Analysis Contact: Tesh Rao; 919-541-1173; rao.venkatesh@epa.gov

IMPROVE Steering Committee Chair: Marc Pitchford; 702-862-5432; marcp@dri.edu

MQAG Group Leader: Rich Scheffe; 919-541-4650; sheffe.rich@epa.gov