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

$PM_{2.5}$ Speciation Network Newsletter

Issue 4 October 2005

Special points of interest:

- **Change in speciation shipping containers**
- **Special Report—$PM_{2.5}$ composition on high mass days**
- **A preliminary look at collocated STN data at 6 sites**
- **New FedEx® air bill hang tags**

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 speciation monitoring network and resulting data quality.

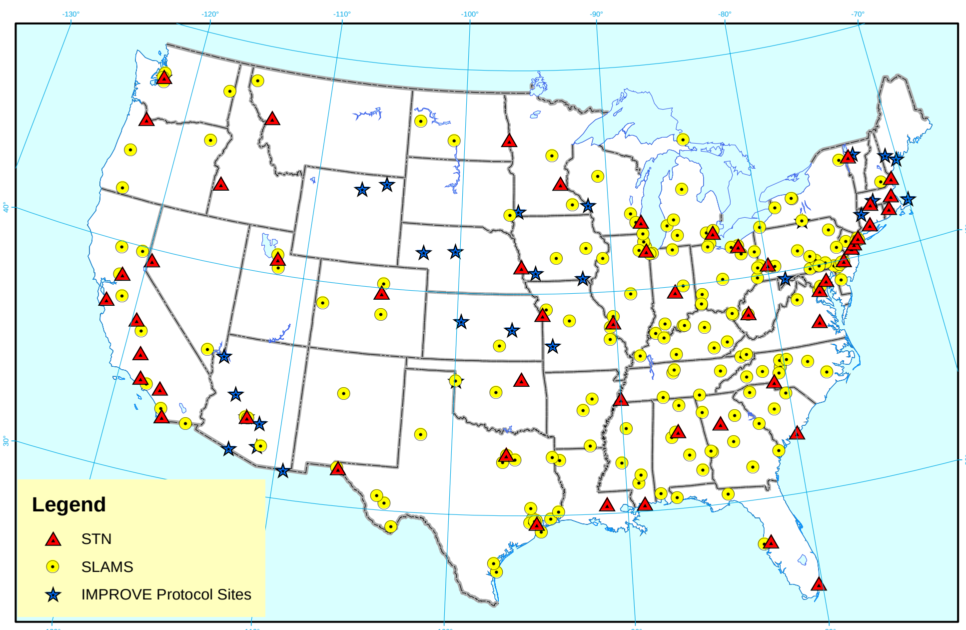
Speciation Network Map

The 2005 speciation network map is shown below. It reflects 54 Trends Network sites (STN); 181 State, Local and Tribal air monitoring stations (SLAMS); and 28 SLAMS that have IMPROVE monitors (IMPROVE Protocol Sites). There is also one STN site in Guaynabo, Puerto Rico that is not reflected on this contiguous U.S. map. If you notice any errors in your state, please contact Joann Rice by e-mail at rice.joann@epa.gov or call 919-541-3372.

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 reduction 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 Containers

RTI is the current EPA speciation contract lab and handles the preparation, shipment and analysis of samples for all 54 STN sites and most of the ~200 supplemental SLAMS sites. RTI ships about 22,000 samples per year in support of the speciation network. Following sample pickup, all samples are returned overnight using an express carrier. In order to reduce the program's shipping cost, OAQPS is currently exploring the use of new cold shipping containers. The new shipping container will reduce the shipping weight and subsequent cost by about 50%. Containers will continue to be shipped overnight. We expect to have the new containers in place by January 2006. Advance notice of the change will be provided to Regions, speciation contacts, and site operators.

Current speciation shipping cooler

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 made several contributions to the analysis and characterization of ambient particulate matter (PM) in the **Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information OAQPS Staff Paper; EPA-452/R-05-005**; June 2005. The following is an excerpt from that report which can be viewed at:
www.epa.gov/ttn/naaqs/standards/pm/s_pm_cr_sp.html

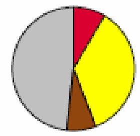
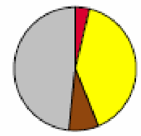
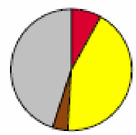
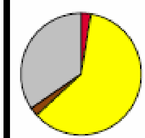
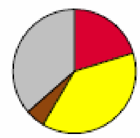
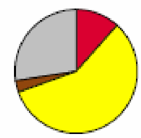
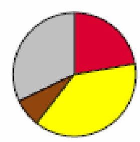
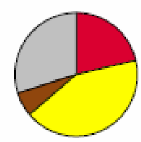
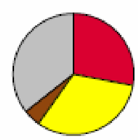
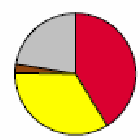
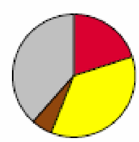
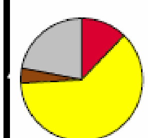
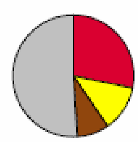
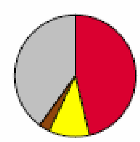
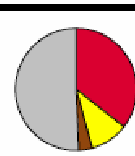
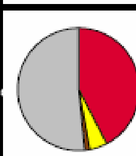
PM$_{2.5}$ composition on high mass days in select urban areas

The EPA evaluated speciated PM$_{2.5}$ data for 2003 from the urban EPA speciation network in order to compare the component profiles on high PM$_{2.5}$ mass days to annual average profiles. The table on the next page shows the analysis results for 8 different sites in large metropolitan areas (in the east: Birmingham, AL; Atlanta, GA; New York City, NY; Cleveland, OH; Chicago, IL; and St. Louis, MO; in the west: Salt Lake City, UT; and Fresno, CA). Mass is proportioned into four categories: sulfates, nitrates, crustal, and total carbonaceous mass (TCM, the sum of EC and OCM; OCM is OC multiplied by 1.4; and crustal is derived from the elemental composition of aluminum, silicon, calcium, iron and titanium). For each site, the table shows the 2003 annual average speciation pattern, the profile for the five highest PM$_{2.5}$ mass days in that year -- both individually and averaged together -- and corresponding FRM mass values (annual average, five highest days, and average of five highest). The table shows some notable differences in the percentage contribution of each of the species to total mass when looking at the high end of the distribution versus the annual average. In all of the eastern city sites, the percentage of sulfates is somewhat higher on the five high days as compared to the annual averages. In the two western cities, the percentage of nitrates is higher on the five high days as compared to the annual averages. TCM appears somewhat lower percentage on the five high days compared to the annual averages in most cities. It is of note that event-flagged data were excluded from this analyses; the carbonaceous fraction of mass would be significantly higher on sites where peak days are affected by smoke from wildfires.

In the East, the percentage contribution of sulfate to total mass is somewhat higher on high mass days than the annual average; in the west, the percentage of nitrate is higher

If you have questions regarding these results, 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.

PM$_{2.5}$ composition on high mass days in select urban areas, 2003

Urban Area	Statistic*	Composition Percents (%)				PM$_{2.5}$ mass** (µg/m3)	Annual average	Average of 5 highest days
		Amm. Nitrate	Amm. Sulfate	Crustal	TCM			
Birmingham, AL	• Annual average	8.5	35.6	7.6	48.3	17.9		
	• Average of 5 highest PM$_{2.5}$ mass days	3.8	40.0	7.8	48.3	40.7		
	• Highest PM$_{2.5}$ mass day	1.9	55.1	5.5	37.4	46.6		
	• 2nd highest PM$_{2.5}$ mass day	4.2	26.9	11.0	57.9	40.4		
	• 3rd highest PM$_{2.5}$ mass day	15.3	15.7	10.7	58.4	39.2		
	• 4th Highest PM$_{2.5}$ mass day	2.7	51.1	7.4	38.7	39.1		
	• 5th Highest PM$_{2.5}$ mass day	2.6	34.6	6.4	56.3	38.3		
Atlanta, GA	• Annual average	8.1	42.8	4.0	45.0	15.2		
	• Average of 5 highest PM$_{2.5}$ mass days	2.6	60.1	2.3	34.3	35.2		
	• Highest PM$_{2.5}$ mass day	2.0	70.5	1.9	25.6	37.8		
	• 2nd highest PM$_{2.5}$ mass day	2.0	47.8	2.5	47.8	37.1		
	• 3rd highest PM$_{2.5}$ mass day	2.4	67.6	2.1	27.9	36.8		
	• 4th Highest PM$_{2.5}$ mass day	3.2	50.8	2.9	43.1	35.0		
	• 5th Highest PM$_{2.5}$ mass day	3.6	67.5	1.9	27.0	29.3		
New York City, NY	• Annual average	20.2	38.3	5.1	36.4	13.1		
	• Average of 5 highest PM$_{2.5}$ mass days	11.6	57.9	3.0	27.4	40.5		
	• Highest PM$_{2.5}$ mass day	3.6	58.3	5.5	32.6	45.9		
	• 2nd highest PM$_{2.5}$ mass day	5.0	69.0	1.4	24.6	45.8		
	• 3rd highest PM$_{2.5}$ mass day	27.8	42.1	3.1	27.0	38.2		
	• 4th Highest PM$_{2.5}$ mass day	5.1	59.4	4.6	30.9	36.4		
	• 5th Highest PM$_{2.5}$ mass day	9.7	62.2	2.0	26.1	36.0		
Cleveland, OH	• Annual average	22.3	38.3	7.4	32.1	17.6		
	• Average of 5 highest PM$_{2.5}$ mass days	21.4	42.5	6.3	30.0	44.1		
	• Highest PM$_{2.5}$ mass day	32.7	43.2	2.3	21.7	57.9		
	• 2nd highest PM$_{2.5}$ mass day	25.1	41.5	4.0	29.3	46.4		
	• 3rd highest PM$_{2.5}$ mass day	4.8	64.4	8.7	22.1	45.5		
	• 4th Highest PM$_{2.5}$ mass day	8.8	37.5	14.7	39.0	35.7		
	• 5th Highest PM$_{2.5}$ mass day	31.4	20.5	4.0	44.0	35.0		
Chicago, IL	• Annual average	28.0	31.8	4.6	35.6	15.2		
	• Average of 5 highest PM$_{2.5}$ mass days	41.2	34.0	2.3	22.4	34.4		
	• Highest PM$_{2.5}$ mass day	46.0	30.7	1.2	22.1	38.3		
	• 2nd highest PM$_{2.5}$ mass day	49.2	36.4	0.8	13.6	35.3		
	• 3rd highest PM$_{2.5}$ mass day	51.8	27.7	1.2	19.3	35.1		
	• 4th Highest PM$_{2.5}$ mass day	5.6	61.7	3.8	28.9	32.5		
	• 5th Highest PM$_{2.5}$ mass day	47.8	16.1	5.3	30.8	30.7		
St. Louis, MO	• Annual average	20.0	36.0	5.6	38.4	14.5		
	• Average of 5 highest PM$_{2.5}$ mass days	12.2	61.9	3.9	22.0	35.9		
	• Highest PM$_{2.5}$ mass day	6.2	69.1	3.6	21.0	50.6		
	• 2nd highest PM$_{2.5}$ mass day	5.0	67.0	2.0	26.0	36.0		
	• 3rd highest PM$_{2.5}$ mass day	6.4	69.2	3.2	21.3	33.1		
	• 4th Highest PM$_{2.5}$ mass day	5.0	58.9	8.2	28.1	30.8		
	• 5th Highest PM$_{2.5}$ mass day	40.2	42.3	2.7	14.7	28.9		
Salt Lake City, UT	• Annual average	28.3	12.2	8.5	51.1	10.0		
	• Average of 5 highest PM$_{2.5}$ mass days	46.3	10.8	2.9	40.0	40.6		
	• Highest PM$_{2.5}$ mass day	50.6	6.3	2.5	40.5	59.5		
	• 2nd highest PM$_{2.5}$ mass day	43.5	11.9	2.6	42.0	52.1		
	• 3rd highest PM$_{2.5}$ mass day	42.4	13.5	3.7	40.4	34.2		
	• 4th Highest PM$_{2.5}$ mass day	48.2	5.9	4.7	41.3	28.7		
	• 5th Highest PM$_{2.5}$ mass day	45.4	20.2	1.5	32.8	28.4		
Fresno, CA	• Annual average	35.5	10.2	3.6	50.7	18.0		
	• Average of 5 highest PM$_{2.5}$ mass days	42.4	4.7	1.3	51.6	54.2		
	• Highest PM$_{2.5}$ mass day	55.2	4.6	2.1	38.2	59.0		
	• 2nd highest PM$_{2.5}$ mass day	58.4	8.5	0.9	32.2	56.3		
	• 3rd highest PM$_{2.5}$ mass day	17.5	1.5	1.3	79.7	54.4		
	• 4th Highest PM$_{2.5}$ mass day	35.1	5.3	1.0	58.6	52.6		
	• 5th Highest PM$_{2.5}$ mass day	44.6	3.7	1.3	50.3	50.0		

* The 5 highest days shown (and aggregated) for each site actually represent the 5 highest days (based on collocated FRM mass; see next bullet) that the speciation monitor sampled. FRM monitors at different locations in the metropolitan area and/or collocated FRM measurements on days that the speciation sampler did not record valid data may have had higher values than some or all of the 5 high values shown. Event-flagged data were omitted from this analyses.

** 'PM$_{2.5}$ mass' concentration represents the collocated (w/ speciation monitor) same-day FRM measurement unless not available, in which case the speciation monitor gravimetric mass was substituted.

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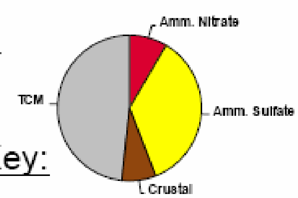
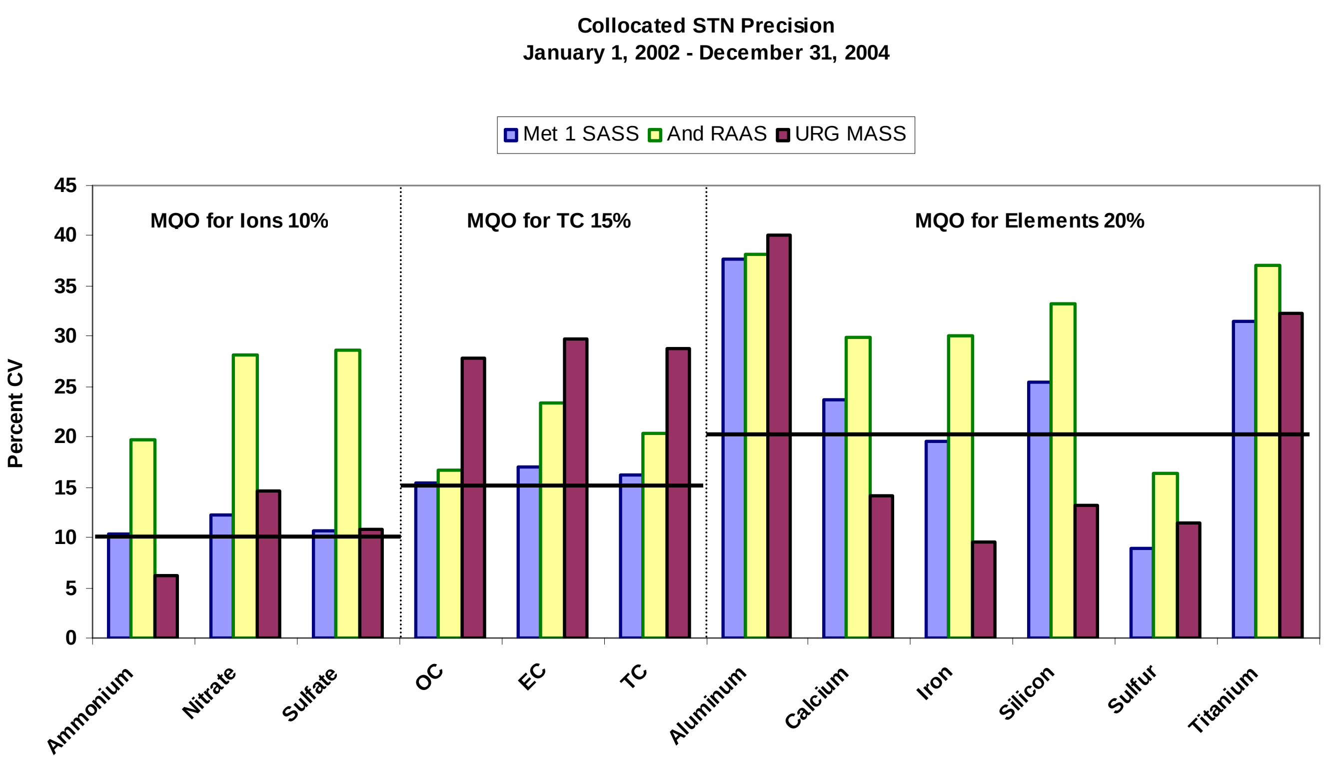


Collocated Speciation Precision Data for 2002-2004

Collated STN samplers at six sites provide data to assess network precision

The $PM_{2.5}$ Speciation Trends Network (STN) consists of 54 sites across the country. Six of the STN sites have collocated speciation monitors for the purpose of gathering data to assess sampling and analysis precision for the network. These side-by-side (duplicate) monitors have been operating since 2001. Four of the sites (Bakersfield, CA; Roubidoux, CA; New Brunswick, NJ; and G.T. Craig; OH) have MetOne SASS collocated samplers. One site (Deer Park, TX) has URG MASS samplers, and one site (Roxbury, MA) had Andersen RAAS samplers until August of 2004. Data for the major ions (sulfate , nitrate, and ammonium), carbon and the elements that comprise the "crustal" component were evaluated using a coefficient of variation (CV) aggregated by method. This is a preliminary look at precision data from the network and how it compares to the measurement quality objectives (MQOs) established for the program in 1999. Since the Met One SASS (predominant sampler in the network) is used at four of the collocated sites, there are the greatest number of observations (n) for that sampler type (~1000). The "n" for each of the other sampler types is ~200. While it is known that the difference in the number of observations by method affect the CV, the figure below is used here mainly for MQO benchmarks. For the ions, the SASS and MASS are close to the target MQO of 10%. For total carbon (TC), the SASS is closest to the MQO for TC, which includes organic (OC) and elemental carbon (EC). For the elements, all methods exceed the MQO for sulfur. The MASS exceeds the MQO and the SASS is close to the MQO for all of the remaining elements except aluminum and titanium. We know that aluminum and titanium can be present at very low concentrations in the atmosphere (contributing to the imprecision) and that these elements are difficult to measure analytically at those low concentrations. Since all methods CVs are similar for these two elements, the sampling method does not appear to be contributing as much to the imprecision as seen for the other elements. More assessments of these data will be done in the future. For more information or questions, contact Joann Rice at rice.joann@epa.gov or 919-541-3372.



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 the reports with $PM_{2.5}$ Speciation content that have recently been posted on EPA's TTN AMTIC web site at: www.epa.gov/ttn/amtic/speciepg.html

02/01/2005: ***Review of Sodium Ion Contamination Issue*** is posted in the Speciation Data Management and Reporting file area.

02/01/2005: ***Data Validation Process for the $PM_{2.5}$ Chemical Speciation Network*** is posted in the Data Management and Reporting file area.

09/20/2005: ***September 2005 Performance Evaluation of the DRI Laboratory*** is posted in the Speciation Lab Audit Reports and Assessments file area.

10/2005: The new Quality Assurance (QA) newsletter **"The QA Eye"** has been issued, which covers the overall QA aspects of ambient air quality monitoring programs and is posted at: www.epa.gov/ttn/amtic/pmqagen.html

New FedEx® Air Bill Hang Tags

FedEx® policy now requires that all speciation coolers use an air bill tie on tag that is attached to the handle of the cooler. In order to comply with this policy, RTI will no longer be sending out the plastic sleeve for the return air bills. Note that you will still receive the return air bill as usual. RTI recommends that site operators place the return air bill directly over the incoming air bill (reusing the original tie-on tag).

$PM_{2.5}$ Speciation Program Contacts

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