NESCAUM Project Summary
Coordinated Analysis of Regionally Archived Particulate Samples for Elements (CARAPACE).

NESCAUM coordinated an effort with its Monitoring and Assessment Committee members to analyze 232 FRM samples for mass and elements. This cooperative project was entitled Coordinated Analysis of Regionally Archived Particulate Samples for Elements (CARAPACE). The task included analysis of filters from 49 sites across all eight NESCAUM states. To maximize the utility of the project, two episodes were chosen for analysis: July 14-21, 1999 and February 21-27, 2000. These were intended to represent typical summer transport and winter stagnation aerosol episodes respectively. Fifty-eight of the samples were also analyzed for water-soluble ions. An additional 16 FRM filter samples ions, which were taken concurrently with speciation samples from Boston and New York mini-trends sites, have been analyzed for mass, elements and ions.

The project had five objectives:

1. Evaluate and improve filter archive procedures
2. Provide a preliminary assessment of PM2.5 species in the NESCAUM region
3. Improve knowledge of local and regional source influences on high PM mass days
4. Guide implementation of the speciation network
5. Provide quality control information

Research Triangle Institute (RTI) completed the analyses in early 2001. These results, in addition to relevant hourly data, were included in a database. This database is available from NESCAUM by request and includes the components listed in the attached Tables 1 and 2.

The project had its origins in EPA's FRM filter archiving requirement of refrigeration/archival of filters at 4 °C or less for the period of one year. The state of Connecticut performed experiments that revealed possible mass loss issues. Since filter storage required resources, they wanted to assure the integrity of samples over time-otherwise, why retain the filters? To better justify the effort required for re-weighing filters, the Monitoring and Assessment Committee thoughtfully chose two aerosol episodes and included supplemental analyses of the filters.

Some states re-weighed their filters before sending them back to RTI for analysis. This mass determination was intended to provide baseline data on possible effects of shipping filters long distances. Additionally, states had different storage protocols (see Table 3), which may affect mass change during storage. Al Leston of the Connecticut Department of Environmental Protection analyzed the mass loss data. The results were inconclusive, with average mass loss recorded of 4.4%. However, by segregating the samples by season, he showed there is some apparent seasonal dependency. Figure 1 shows that at lower filter mass, the percent mass loss is similar for both seasons. However, at higher masses, the percentage mass loss is much greater during the winter episode than during the summer. He also investigated the mass loss dependence of filter storage temperature. The results show opposite trends in winter and summer. In summertime, greater percent loss is observed for those samples stored at higher temperatures (Figure 2). In the winter, the opposite is true, with the greatest percent mass loss seen for the samples stored at the lowest temperatures (Figure 3).

Data analysis has not proceeded beyond this first look. The intent of the project was to make the information available to interested parties. Currently, MANE-VU plans to analyze the elemental and ionic results to address objectives 2 and 3, assessment of dominant species in the region and determination of source signatures to the extent possible. Results of that analysis will be used to direct any future retrospective FRM filter analyses in the region.

24-Hour PM-2.5 Data

Dates	Sample Type	Gravimetric	Elements	Ions	Carbon
Jul 14-20, 1999	FRM Teflon filter	39 sites (2 daily), 118 samples (8 colos)	39 sites (2 daily), 118 samples (8 colos)*	22 sites, 33 samples (5 colos)*	
Jul 14-21, 1999	IMPROVE	5 sites, 15 samples	5 sites, 15 samples	5 sites, 15 samples	5 sites, 15 samples
Jul 14-20, 1999	IMPROVE Protocol	4 sites, 10 samples	4 sites, 10 samples	3 sites, 9 samples	3 sites, 9 samples
Feb 21-27, 2000	FRM Teflon filter	39 sites (3 daily), 114 samples, (8 colos)	39 sites (3 daily), 113 samples, (8 colos)	24 sites, 25 samples (2 colos)	
Feb 21-27, 2000	EPA speciation trends	1 site, 1 sample	1 site, 1 samples	1 site, 2 samples	1 site, 2 samples
Feb 24, 2000	IMPROVE Protocol	1 site, 1 sample		1 site, 1 sample	
Feb 20-27, 2000	HSPH Teflon filter	1 site, 8 samples (9am)			
Feb 21-27, 2000	TEOM uncorrected	1 site, 7 samples			
Mar 4 - Apr 24, 2000	FRM Teflon filter**	2 sites, 16 samples	2 sites, 16 samples	2 sites, 16 samples	
Mar 4 - Apr 24, 2000	EPA speciation trends**	2 sites, 18 samples	2 sites, 18 samples	2 sites, 18 samples	1 site, 13 samples
N/A	MA Lab Blanks		4 samples	4 samples	

Table 1. The sites analyzed in the July 1999 episode were not all the same as the sites analyzed in the February 2000 episode. Hence, the total number of sites included in these two episodes is 49.

* Only mass of elements and ions on filter will be available until sample volume data are collected from states.

** FRM collocated with EPA speciation trends site.

1-Hour Data

Dates	Site	Method
July 14-21, 1999	Harvard	TEOM uncorrected
July 14-20, 1999	New Haven - State	TEOM uncorrected
July 14-20, 1999	New Haven - Stiles	TEOM-10 corrected
July 14-21, 1999	Roxbury	Aethalometer BC
July 14-20, 1999	Newark	TEOM uncorrected
July 14-20, 1999	Elizabeth	TEOM uncorrected
July 14-20, 1999	Ft. Lee	TEOM uncorrected
Feb 21 - 27, 2000	Harvard	TEOM uncorrected
Feb 21 - 27, 2000	Harvard	CAMM
Feb 21 - 27, 2000	Harvard	Aethalometer BC
Feb 21 - 27, 2000	Roxbury	Aethalometer BC
Feb 21 - 27, 2000	New Haven - State	TEOM uncorrected
Feb 21 - 27, 2000	New Haven - Stiles	TEOM-10 corrected
Feb 21 - 27, 2000	Portland	TEOM uncorrected
Feb 21 - 27, 2000	Elizabeth	TEOM uncorrected
Feb 21 - 27, 2000	Ft. Lee	TEOM uncorrected
Mar 4 - Apr 24, 2000	Harvard	

Table 2. Summary of 1-Hour data included in the CARAPACE database.

Org.	Archive Temp. ($^oC.$)	Storage Container	Sealing Method	Lighting Conditions
CTDEP	-23^o	P. dish w cover / Petri box	Friction / friction	Dark
MADEP*	25^o	P. dish w cover / plas sleeve	Friction / tape	Dark
MEDEP	-16^o	P. dish w cover	Friction	Dark
NJDEP*	-4^o to -10^o	P. dishes in bags	Friction	Dark
NYDEC	3^o to 7^o	P. dish w cover / Petri tray / bag	Fric / Fric / ZipLoc	Dark
RIDEM	3^o to 7^o	P. dish w cover / Petri tray / bag	Fric / Fric / ZipLoc	Dark
VTDEC	4^o	Petri dish / Petri box	Friction/friction	Dark

Table 3. $PM_{2.5}$ Filter Archiving Conditions

* MADEP Sleeves in taped boxes
* NJDEP One year max archival period

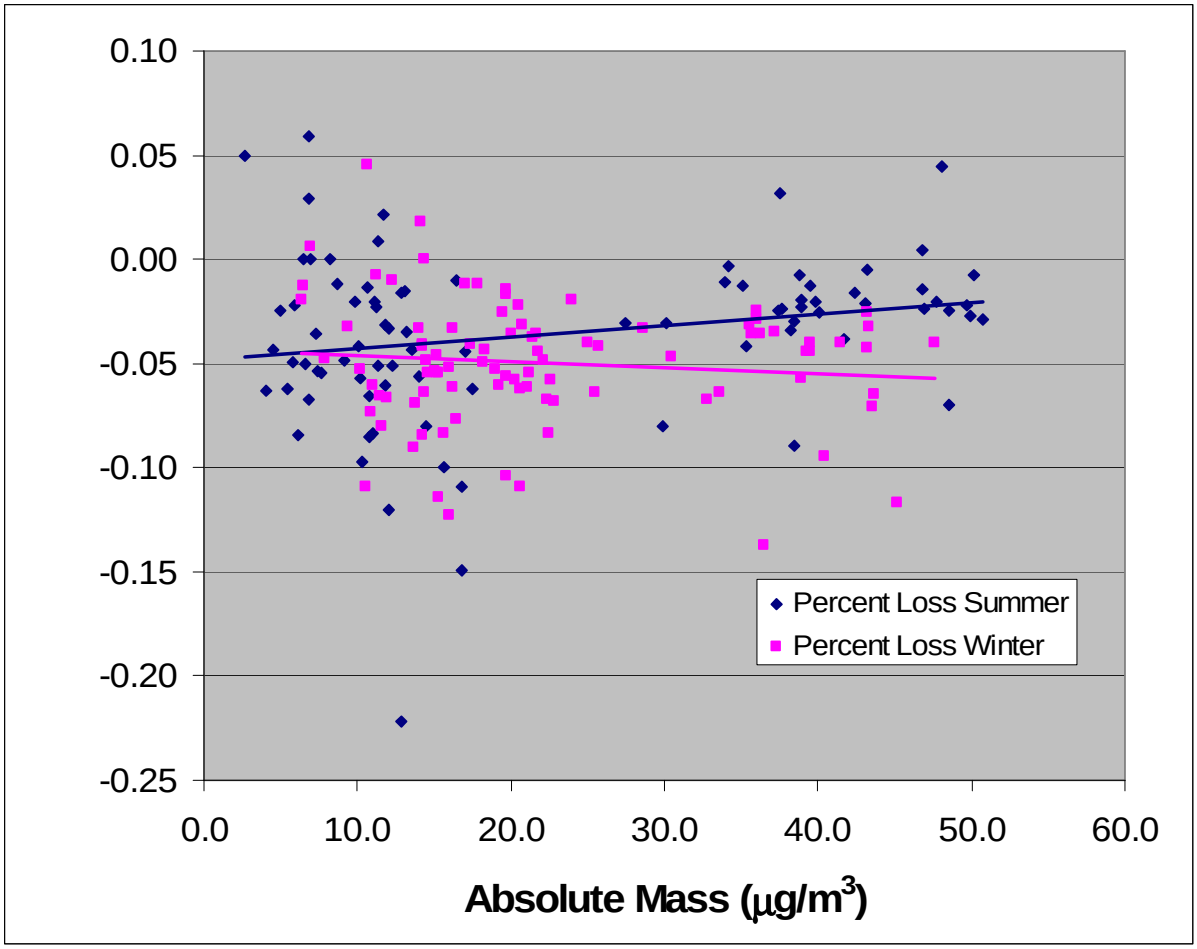

Figure 1. Percent Mass Loss by Season

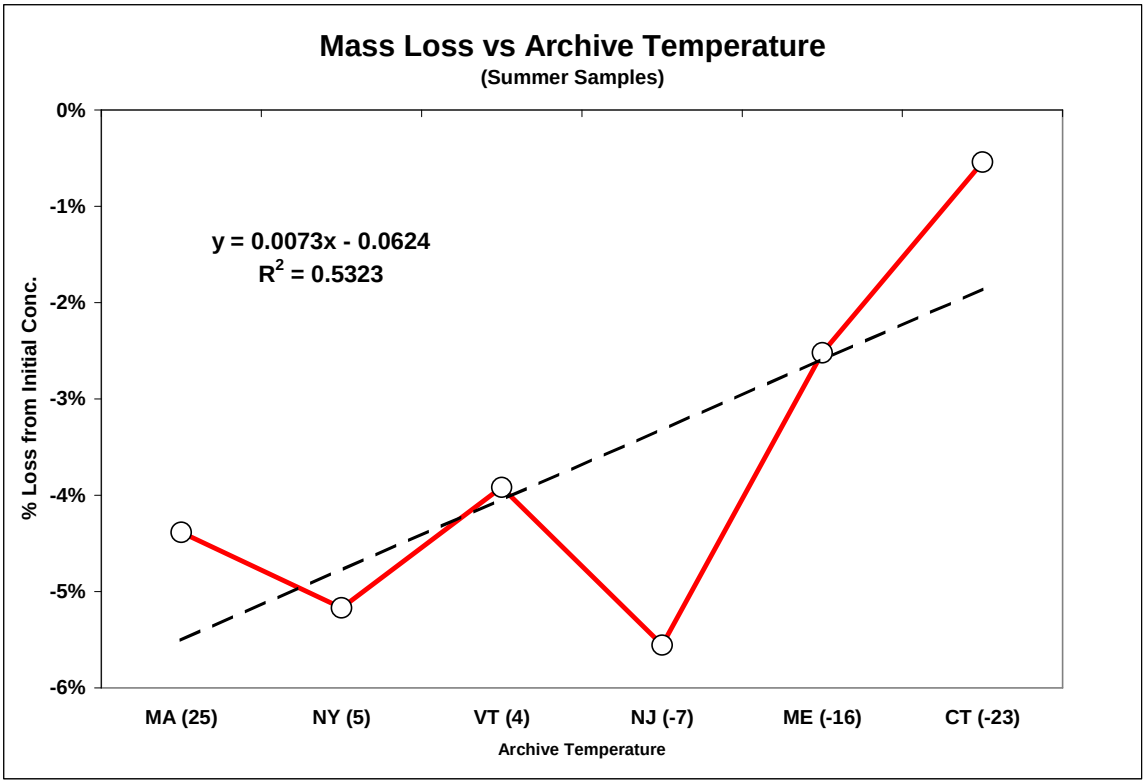

Figure 2. Average Summertime Percent Mass loss by filter storage temperature

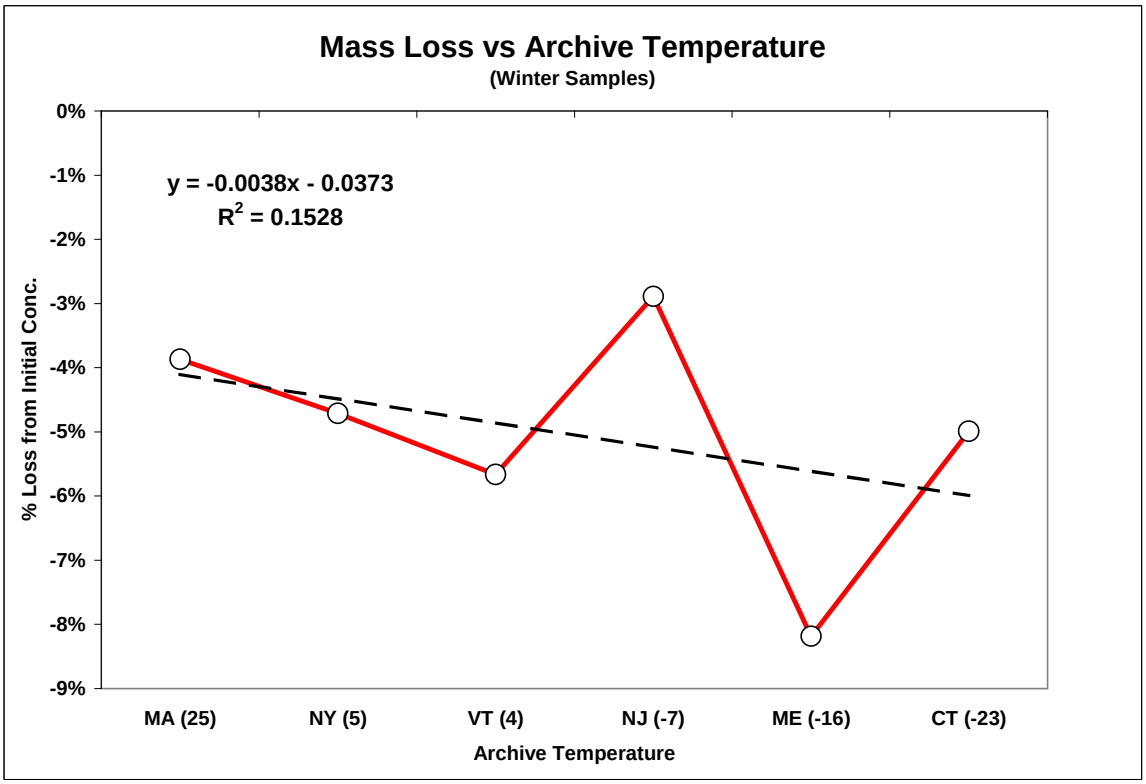

Figure 3. Average Wintertime Percent Mass loss by filter storage temperature