



MANE-VU

Mid-Atlantic/Northeast
Visibility Union



MANE-VU Technical Overview

National Technical RPO Meeting
June 9, 2005
Gary Kleiman, NESCAUM

Technical SIP Needs

- **Reasonable Progress Goals**
- **Baseline and Natural Visibility Conditions**
- **Long Term Strategy**
 - (including inventory, modeling, pollution apportionment, control measures, smoke management plan, and BART)
- **Monitoring strategy**



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} Uniform Progress Goals

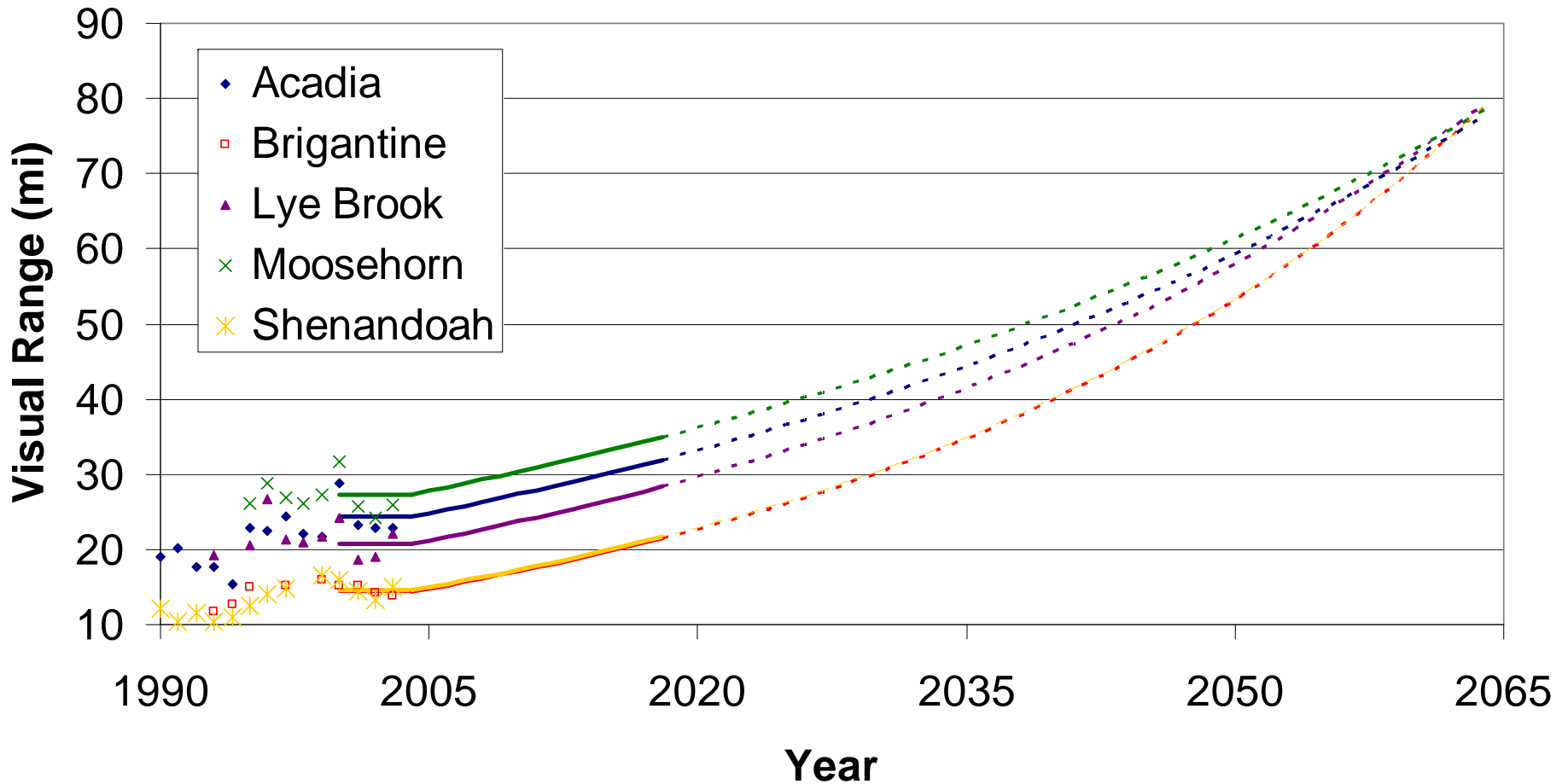


Monitoring Data: Baseline Conditions/Uniform Progress

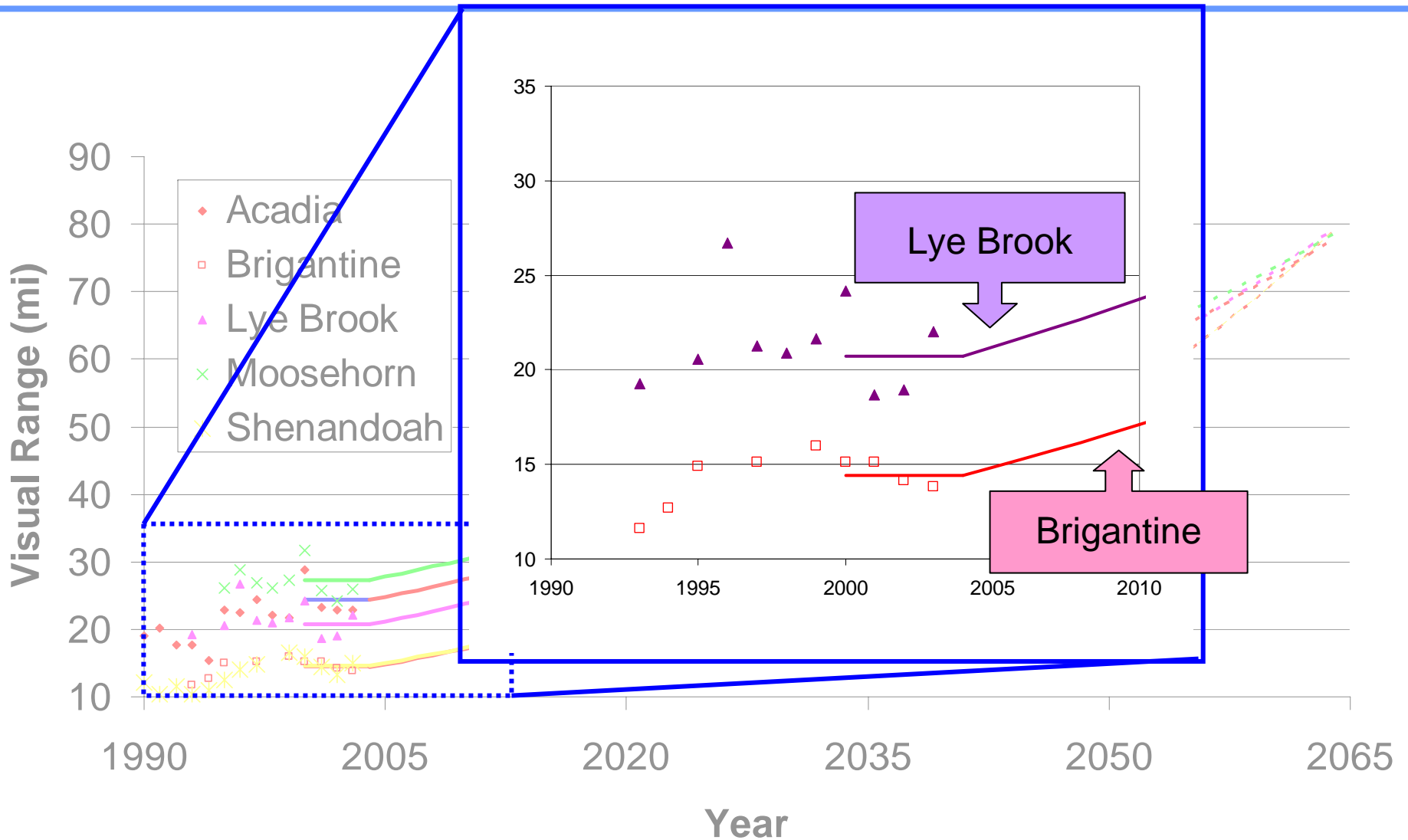
Natural Background and Baseline calculations for Select Class I areas				
Site^[1]	Natural Background (DV)	Baseline 2000-03 (DV)	Uniform Rate (DV/year)	Interim Progress Goal 2018 (DV)
Acadia	11.45	23.06	0.19	20.35
Brigantine	11.28	28.30	0.28	24.33
Lye Brook	11.25	24.67	0.22	21.54
Moosehorn	11.36	21.91	0.18	19.45
Shenandoah	11.27	28.19	0.28	24.24

^[1] The MANE-VU Class I monitoring site, Great Gulf, is not tabulated since only 2001-2003 data are available.

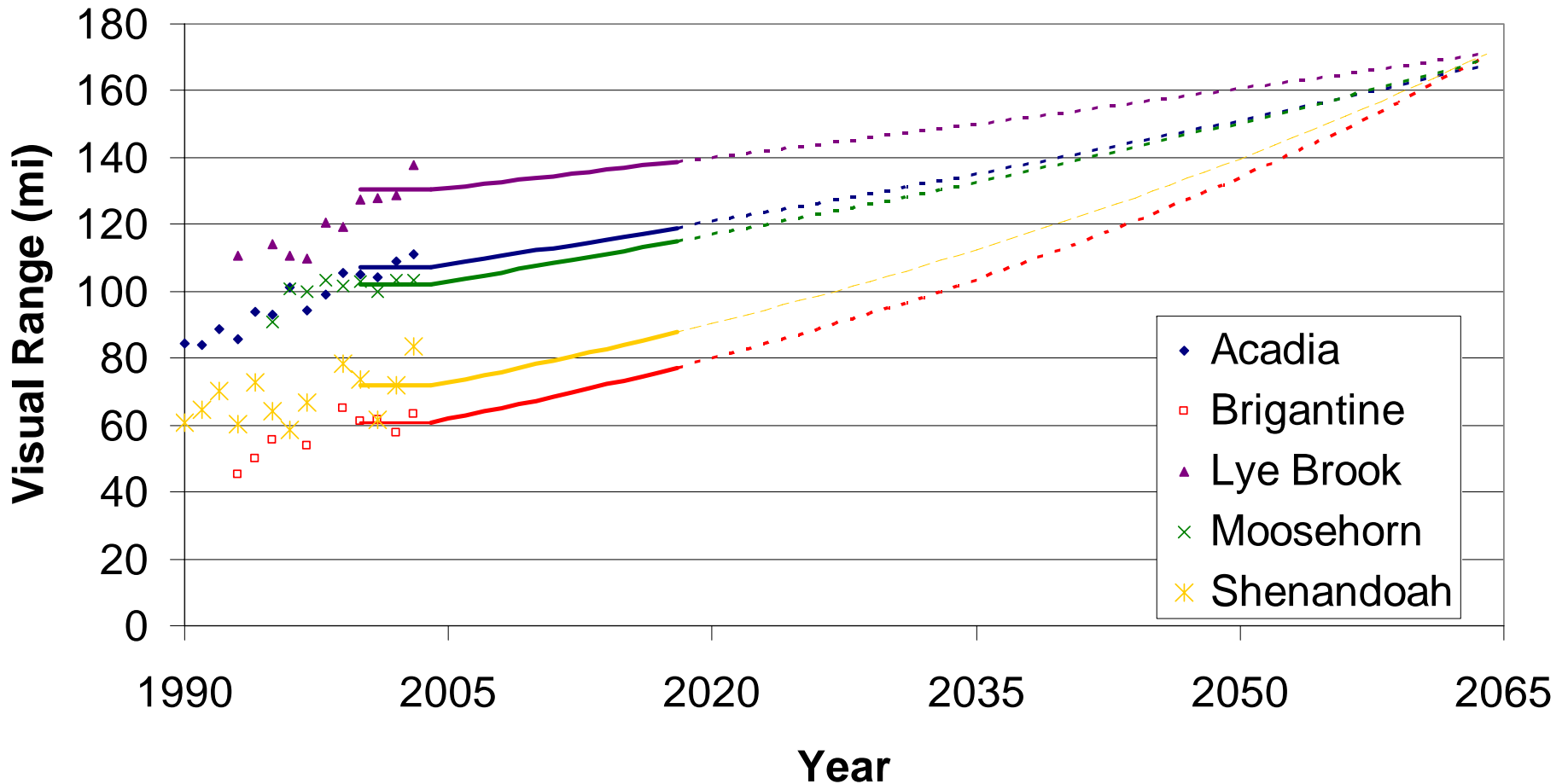
Preliminary Uniform Progress Goals (20% Worst Visibility Days)



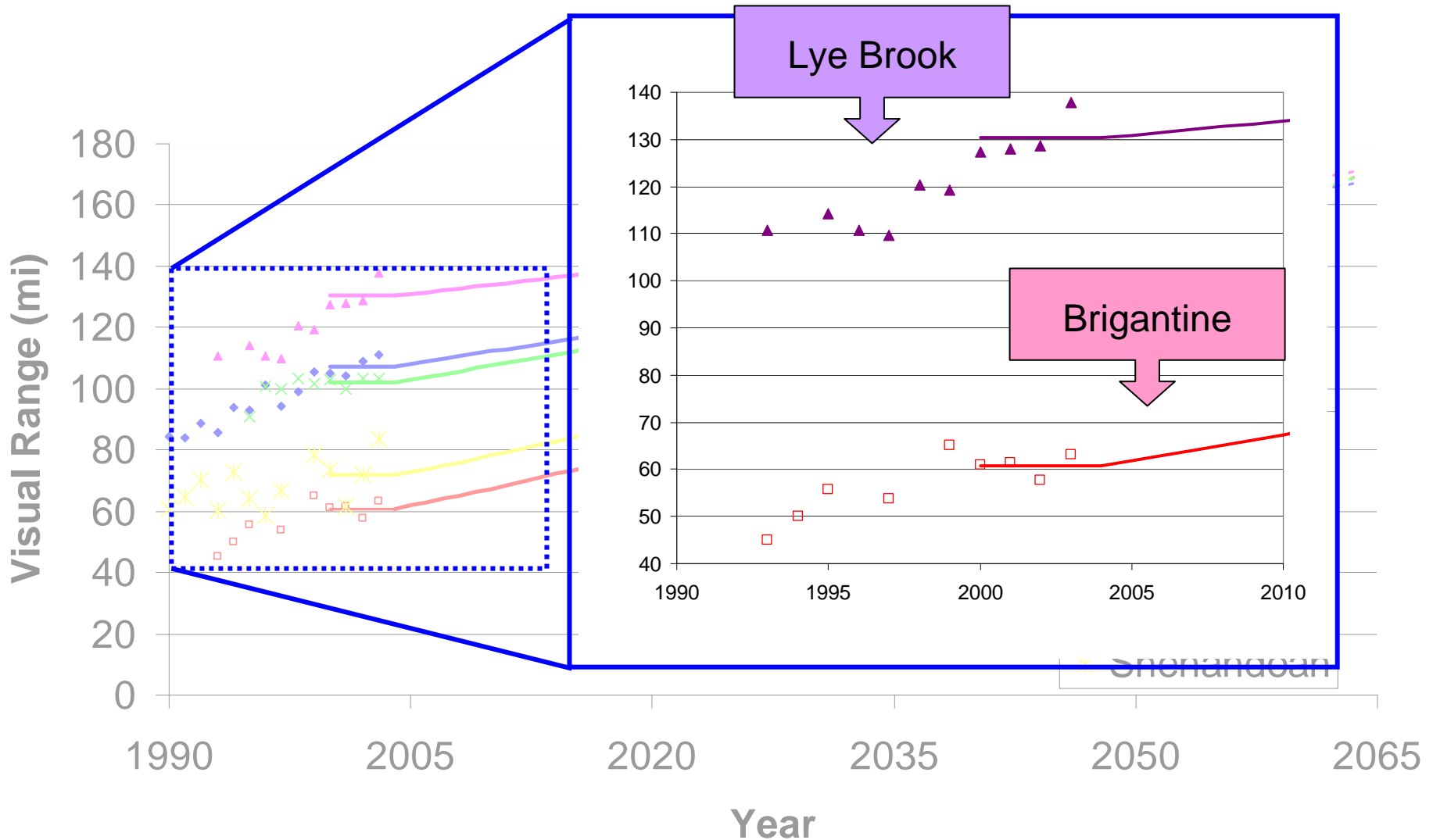
Preliminary Uniform Progress Goals (20% Worst Visibility Days)



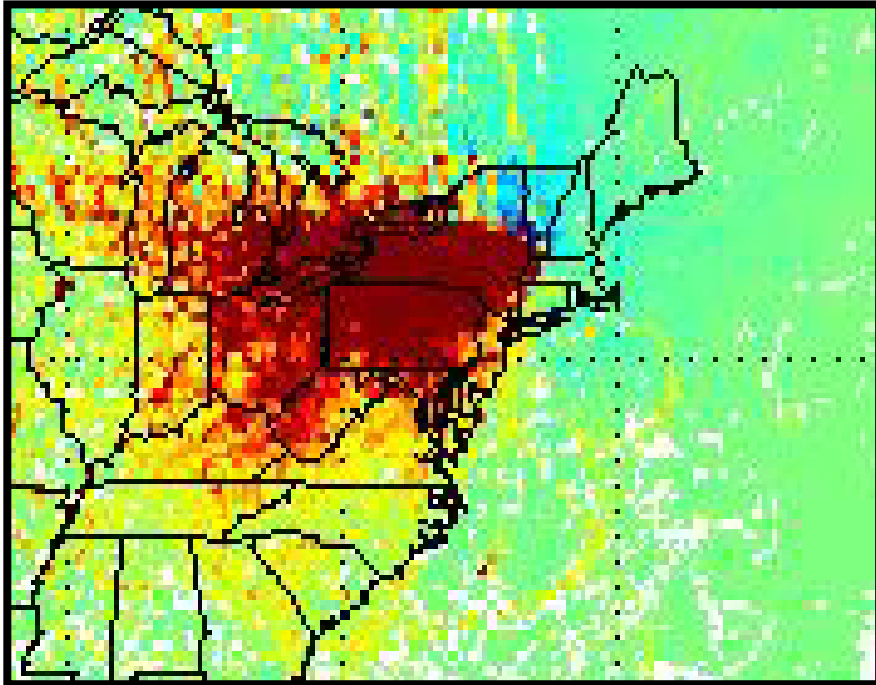
Preliminary Uniform Progress Goals (20% Best Visibility Days)



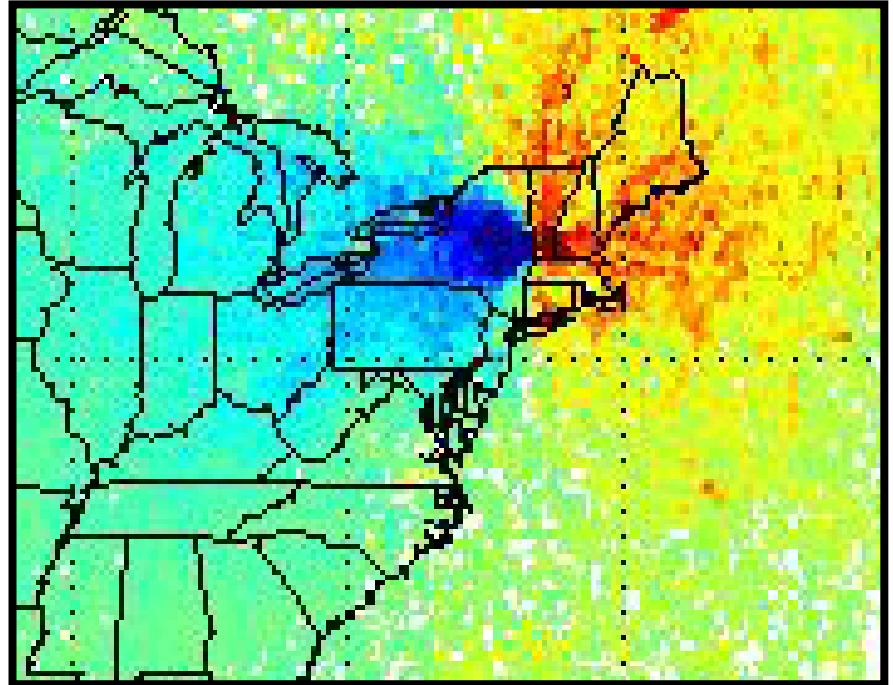
Preliminary Uniform Progress Goals (20% Best Visibility Days)



Lye Brook Source Regions



Transport region on 10% highest sulfate days. **Red** indicates increased probability of contributing to **high** days.



Transport region on 10% lowest sulfate days. **Red** indicates increased probability of contributing to **low** days.

What is **reasonable** to control??

(Example: Brigantine, NJ)

Sulfates and Nitrate Based Control Program

1.26 $\mu\text{g}/\text{m}^3$

Mass Reduction



- Organic Carbon
- Elemental Carbon
- Nitrate
- Sulfate

Baseline Conditions

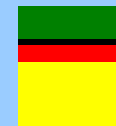
Median Day ($8.4 \mu\text{g}/\text{m}^3$)



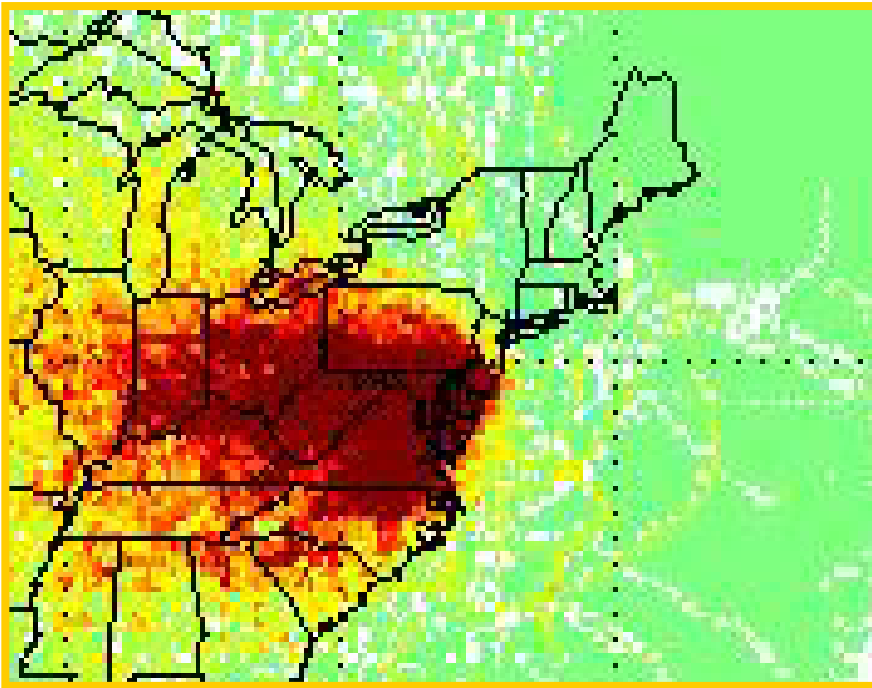
Control All Components In Proportion

1.46 $\mu\text{g}/\text{m}^3$

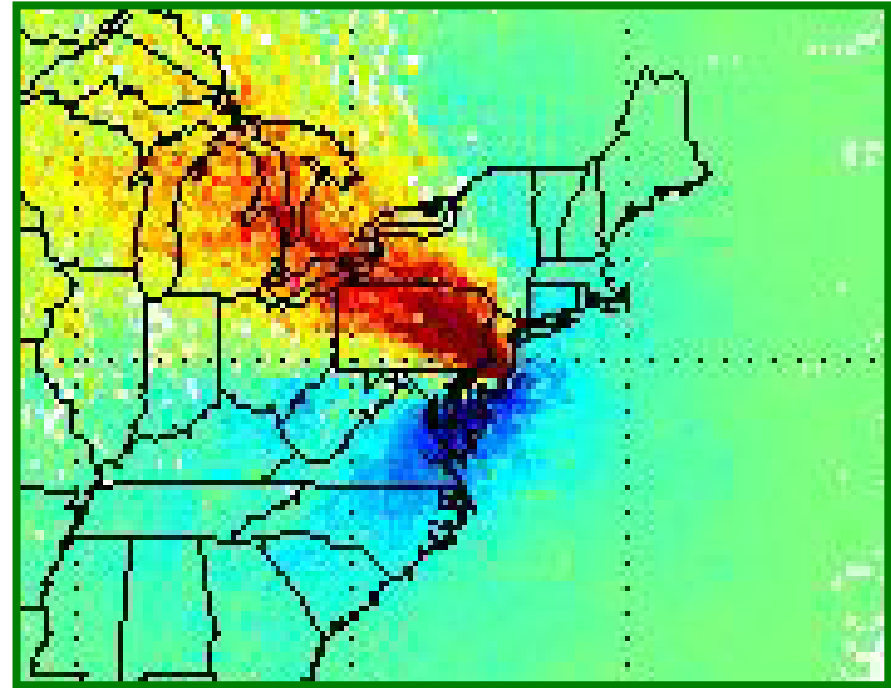
Mass Reduction



Same transport region??



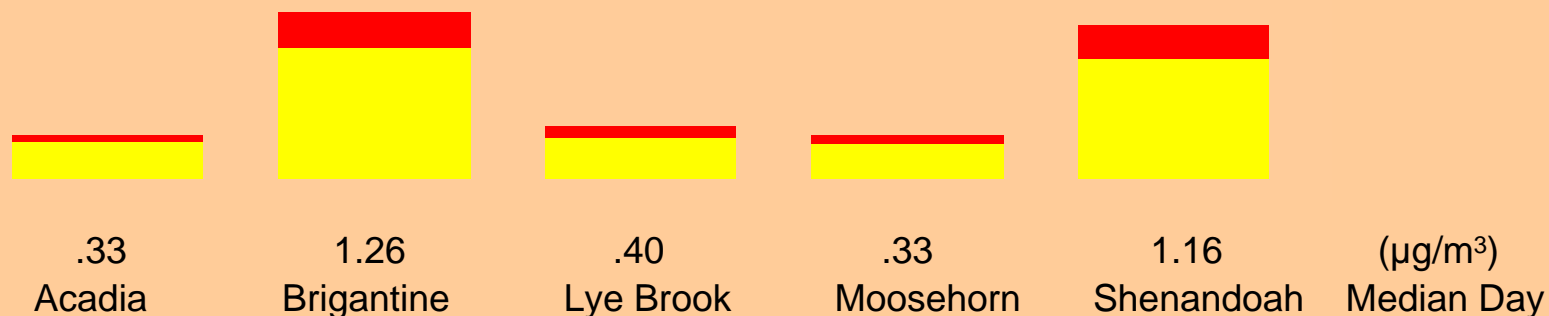
Transport region on 10% worst **sulfate** days at Brigantine, NJ



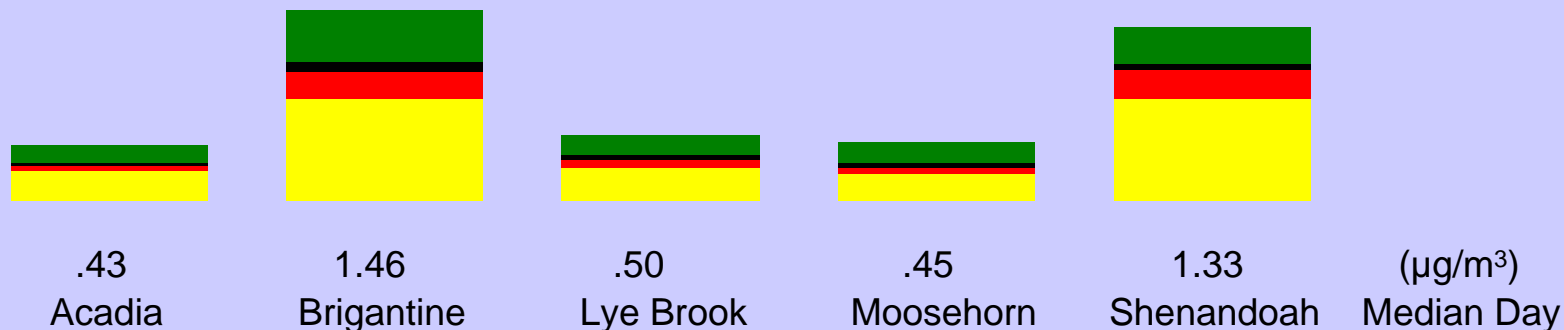
Transport region on 10% worst **organic carbon** days at Brigantine, NJ

Alternative strategies for achieving uniform progress by 2018

Proportional reductions in sulfate and nitrate only, or ...



Proportional reductions in sulfate, nitrate, organic carbon and elemental carbon



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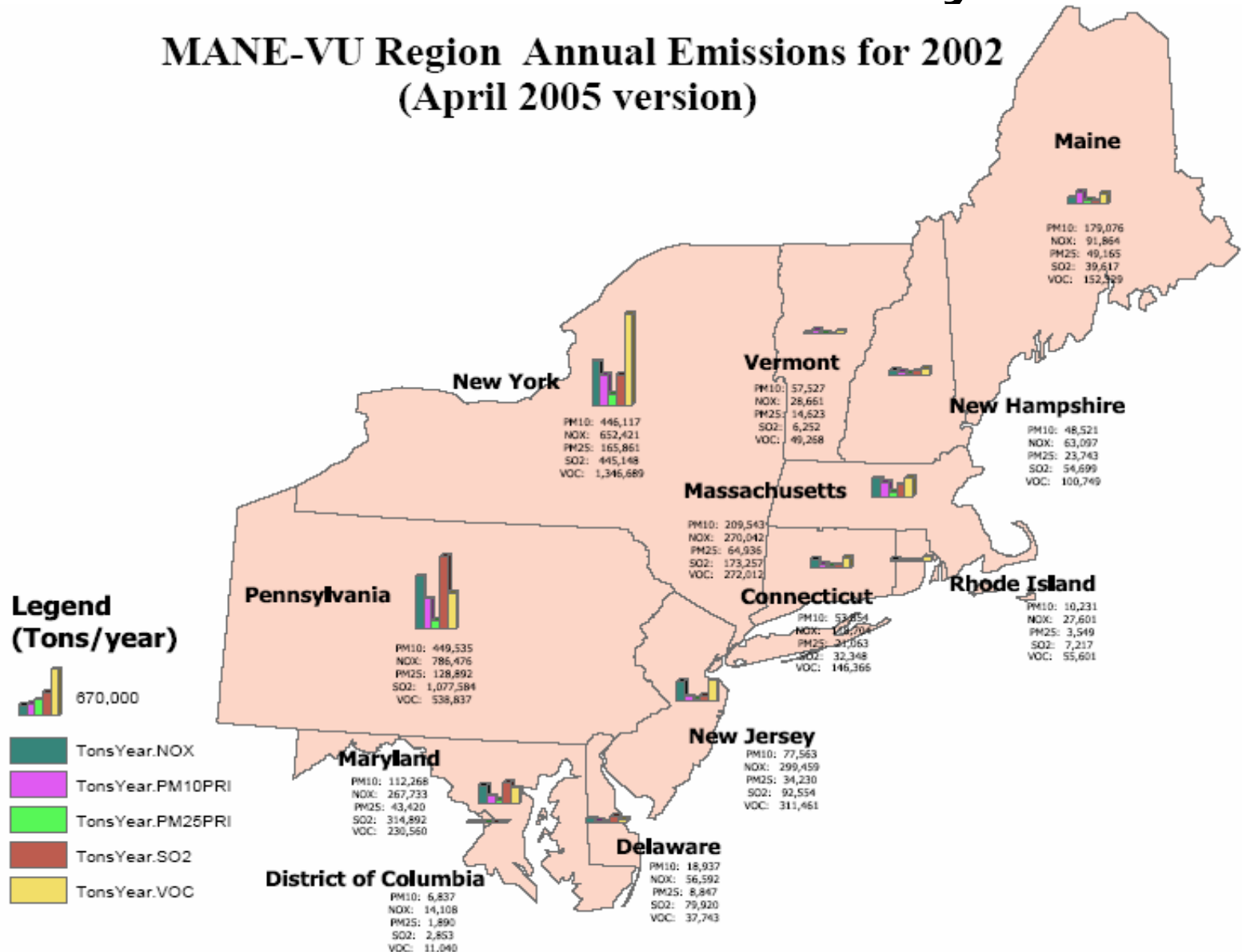


2002 MANE-VU Inventory

- Version 1.0 Completed in January
- Several small state updates have been made – Version 1.1 completed in April 2005 – available soon on MARAMA FTP site
- Relying on National wildfire project for point source fire emissions – due July 2005
- Developing state specific and seasonal profiles based on CEM data – Summer 2005
- Another MANE-VU inventory version may be released in August

Emission Inventory

MANE-VU Region Annual Emissions for 2002
(April 2005 version)



MANE-VU Emissions Projection Work

EGU inventory projection for 2009, 2012, and 2018

- Running IPM in conjunction with MRPO, VISTAS and CENRAP
- Each RPO recommended specific global assumptions
- Base case and CAIR/CAMR policy case results for 2009 and 2018 due in June/ July
- Further sensitivity analysis and control scenario IPM runs – Summer/ Fall 2005
- Area/mobile projection: EGAS 5.0, Nonroad, Mobile 6 supplemented with State or CAIR projection data

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Control Strategy Modeling

- Integrated SIP Modeling Platform established at four regional modeling centers

- NESCAUM
- NY DEC
- University of Maryland (MDE)
- Rutgers Ozone Research Center (NJ DEP)



Brigantine
New Jersey

- Annual Runs with CMAQ: (MM5 from UMD; SMOKE based on RPO Inventory and IPM Projections)

- 2002 Base case
- 2009 Reference and Control
- 2012 Reference and Control
- 2018 Reference and Control

Control Strategy Modeling

- Integrated across pollutants - Same runs and control strategies being developed for:
 - 8-hr Ozone
 - PM_{2.5}
 - Regional Haze

- Different groups coordinating post-modeling analysis:
 - OTC Modeling Committee for 8-hr Ozone
 - NESCAUM for Regional Haze
 - States for PM_{2.5}

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Weight of Evidence Approach

Analytical technique	Approach
Emissions/distance	Empirical
Incremental Probability	“Receptor”-based trajectory technique
Cluster-weighted Probability	“Receptor”-based trajectory technique
Emissions x upwind probability	Empirical/trajectory hybrid
Source Apportionment Approaches	Receptor model/trajectory hybrid
REMSAD tagged species	“Source”-based grid model
CALPUFF with MM5-based meteorology	“Source”-based dispersion model
CALPUFF with observation based meteorology	“Source”-based dispersion model



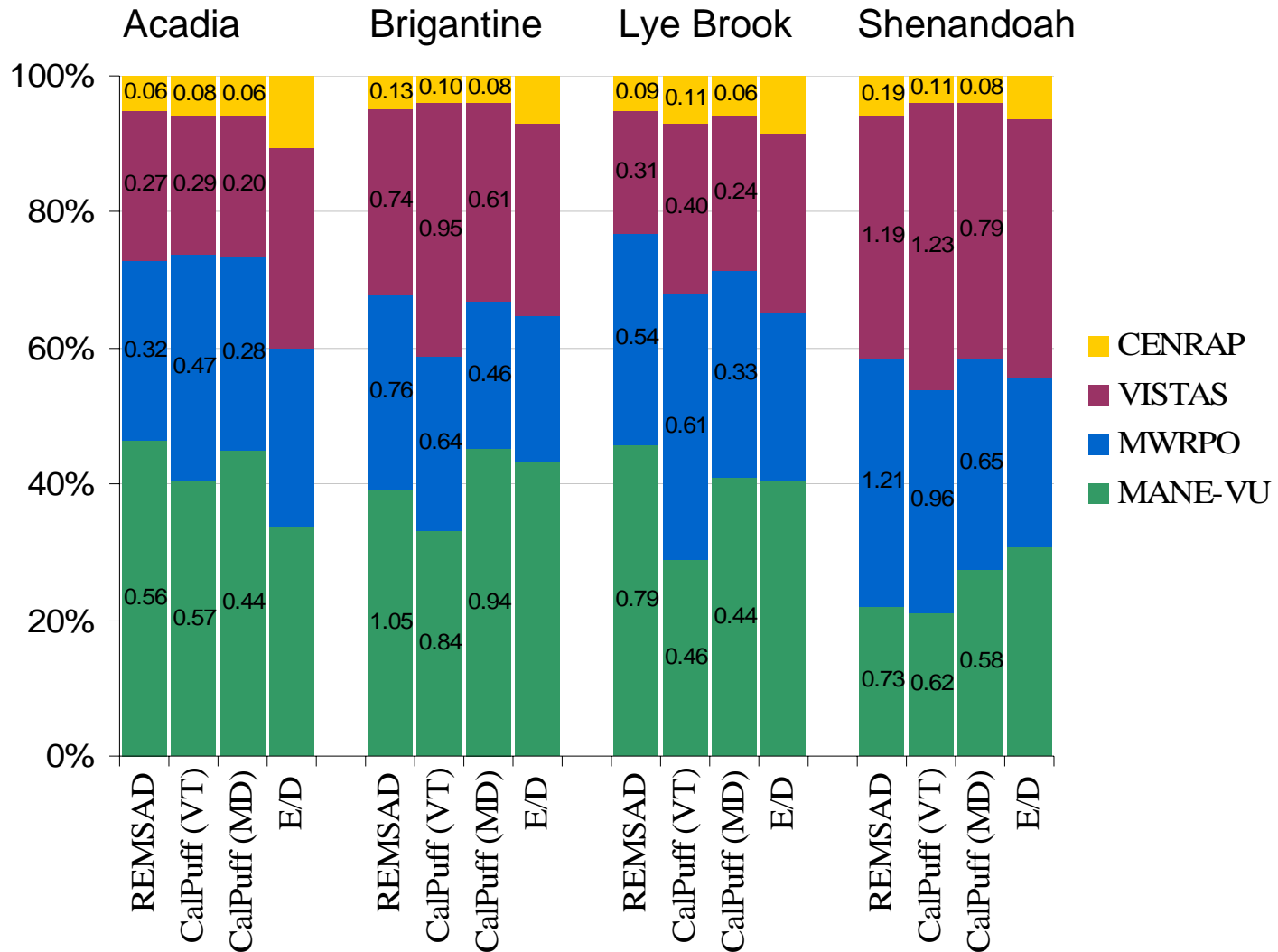
Geese
Brigantine
New Jersey

Ranked Contributors to Sulfate

	AVG	REMSAD	CALF_VT	CALF_MD	E/D	TR_IP	TR_CWP
ACADIA:	PA	PA	OH	PA	PA	PA	NY
Ranked	OH	OH	PA	OH	OH	NY	PA
contributions to	NY	NY	MA	NY	IN	OH	MI
annual average	MI	MA	IN	MA	NY	MI	OH
sulfate by	MA	MI	MI	IN	WV	VA	VA
multiple	IN	WV	WV	MI	NC	WI	WI
techniques	WV	IN	NY	WV	IL	TN	IL
	VA	MD	IL	IL	MA	IN	IN
	IL	VA	ME	NH	MI	KY	MA
	KY	NC	MD	VA	GA	TX	NH
	NC	NH	KY	KY	ME	AL	KY
	MD	ME	VA	NC	KY	MO	WV
	NH	IL	NC	MD	MD	IA	VT
	WI	KY	NH	NJ	TX	NC	MN
	TN	NJ	TN	VT	VA	WV	NC
	GA	WI	MO	TN	AL	VT	MO
	MO	TN	WI	WI	TN	GA	IA
	NJ	GA	NJ	MO	NH	NH	NJ
	AL	CT	IA	GA	MO	MD	MD
	IA	DE	DE	SC	SC	MS	TN
	TX	AL	GA	LA	WI	MA	CT

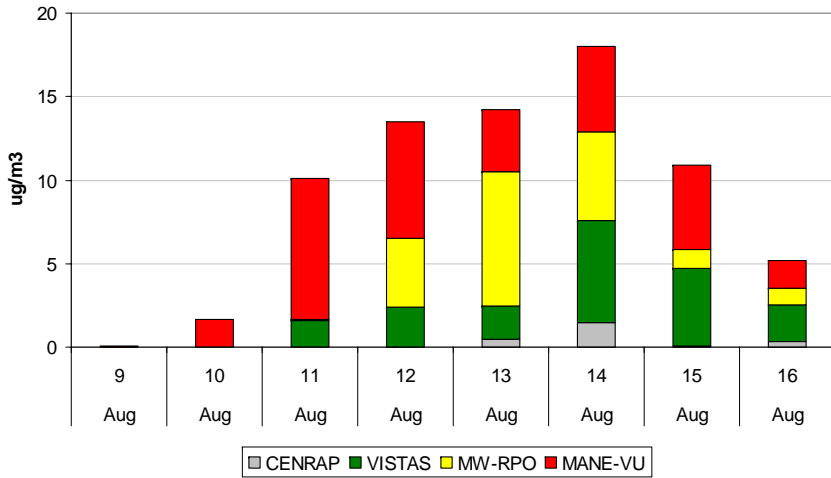
Relative contribution of RPOs?

(to sulfate only; not including Canada yet)

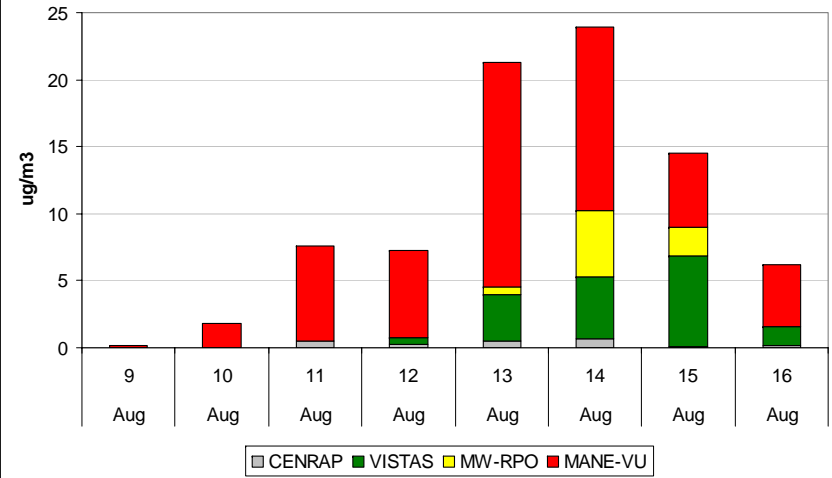


Episode Analysis

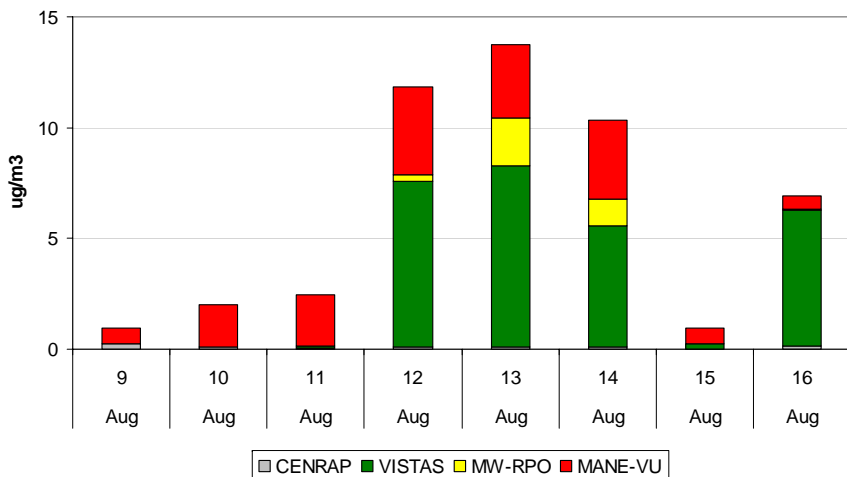
Lye Brook, VT



Acadia, ME



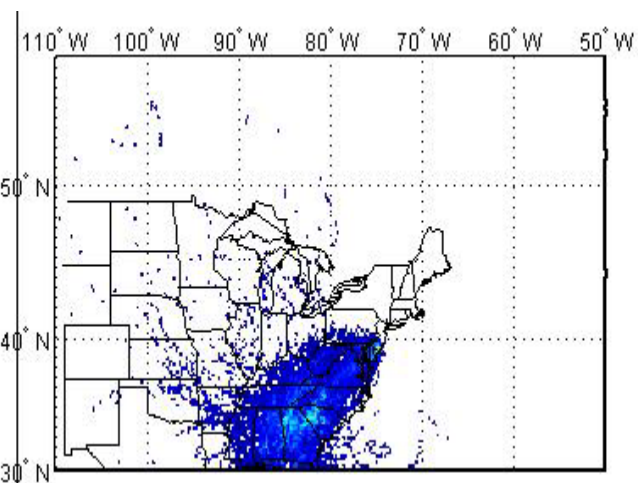
Brigantine, NJ



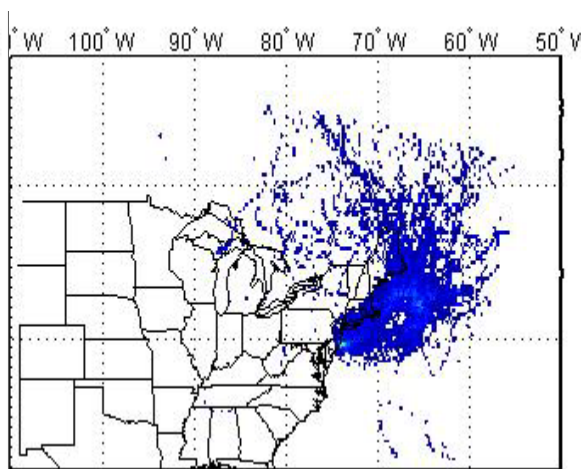
Episode Analysis (Continued)

- See Animation...

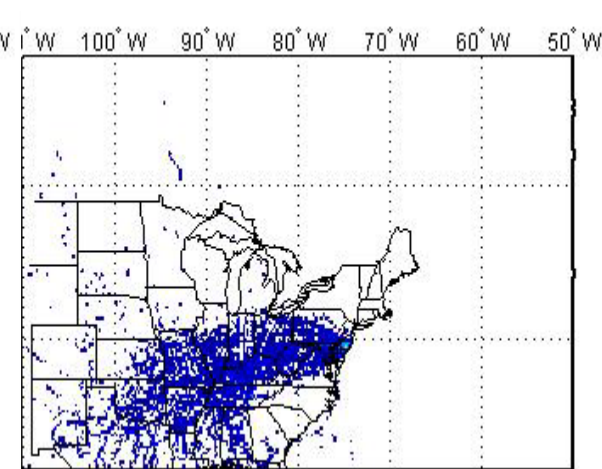
Cluster Analysis



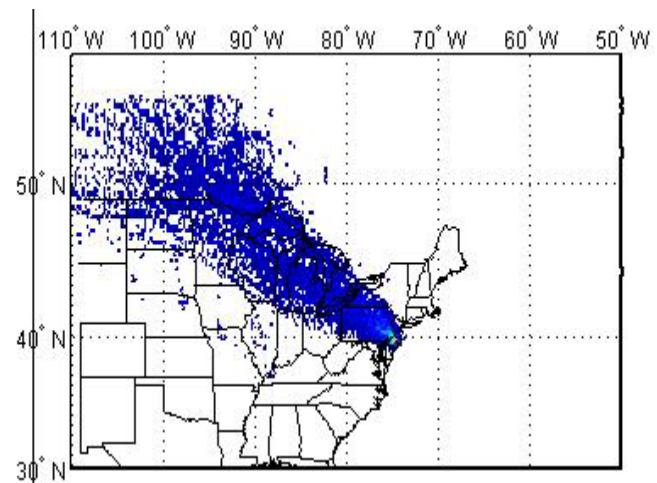
Cluster 14; SO4=4.26
PM2.5=12.61
RecExt=82.92 OC=2.48



Cluster 19; SO4=1.52
PM2.5=5.61
RecExt=37.01 OC=2.22



Cluster 20; SO4=7.05
PM2.5=17.41
RecExt=131.18 OC=3.52



Cluster 15; SO4=3.27
PM2.5=9.61
RecExt=71.54 OC=2.21

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SMP and BART

NESCAUM has formed a BART workgroup to encourage consistent application of BART within MANE-VU and Single source modeling is being conducted via REMSAD and CALPUFF

Smoke Management Plan is being developed by MARAMA

Monitoring Strategy

- IMPROVE serves as foundation
- Work with Inter-RPO workgroups and IMPROVE steering committee to ensure improvements to that network over time
- Supplement with continuous speciated monitoring via MANE-VU's Rural Aerosol Intensive Network (RAIN)



Mulholland Point Lighthouse
Roosevelt Campobello
Maine

Monitoring Data: RAIN

