

Latest Regional Air Quality Analyses: Base M Modeling and Monitoring Data Trends

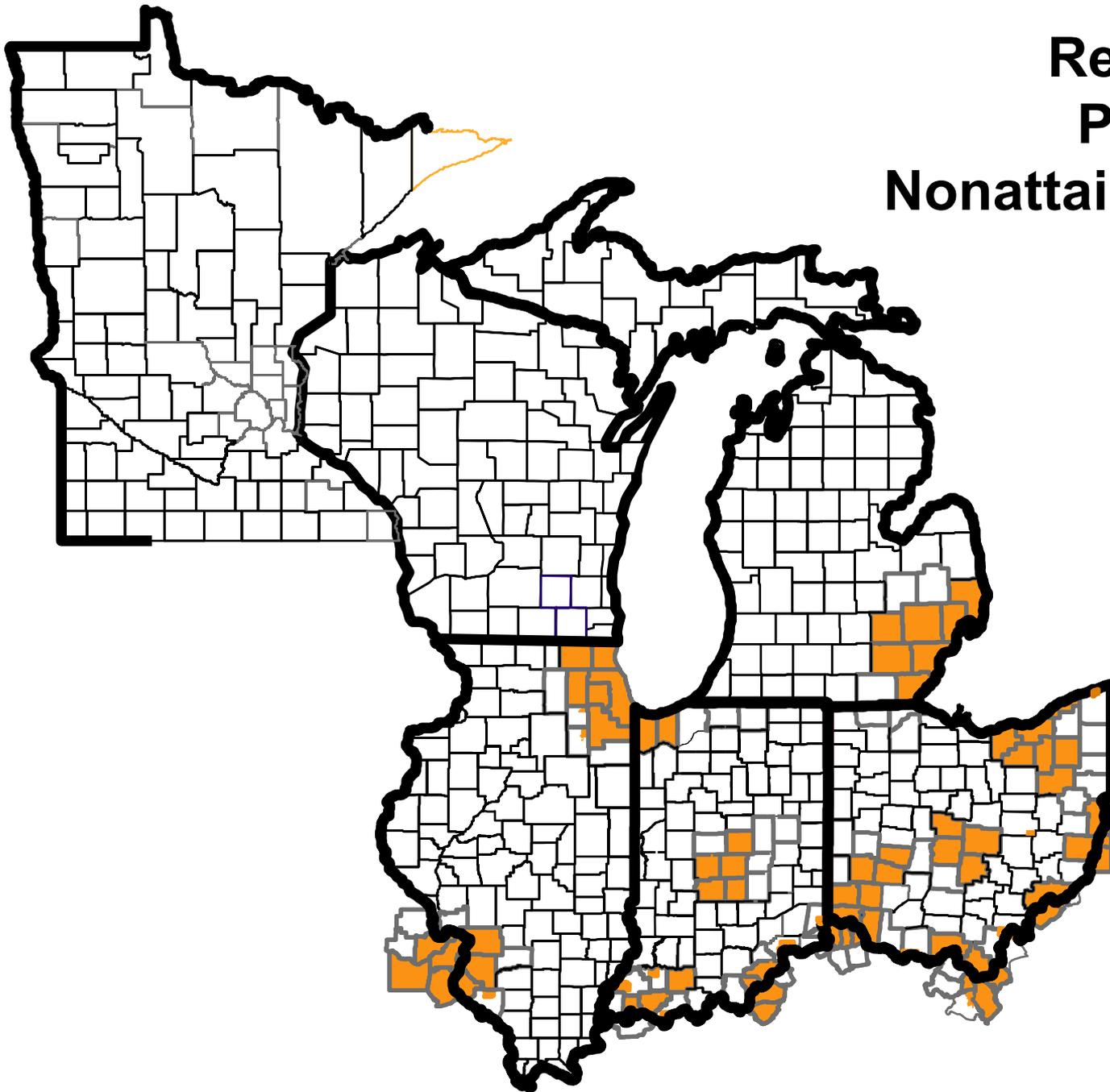
Michael Koerber
Lake Michigan Air Directors Consortium

October 4, 2007

Region 5

PM 2.5

Nonattainment Areas



Key Regulatory Dates

	Ozone	PM_{2.5}	Haze
Nonattainment Designations	April 15, 2004 <i>(June 15, 2004)</i>	Dec 17, 2004 <i>(April 5, 2005)</i>	-----
SIPs due	June 2007	April 2008	Dec 2007
Attainment dates	2007/2009/2010	2010	2018 (2064)

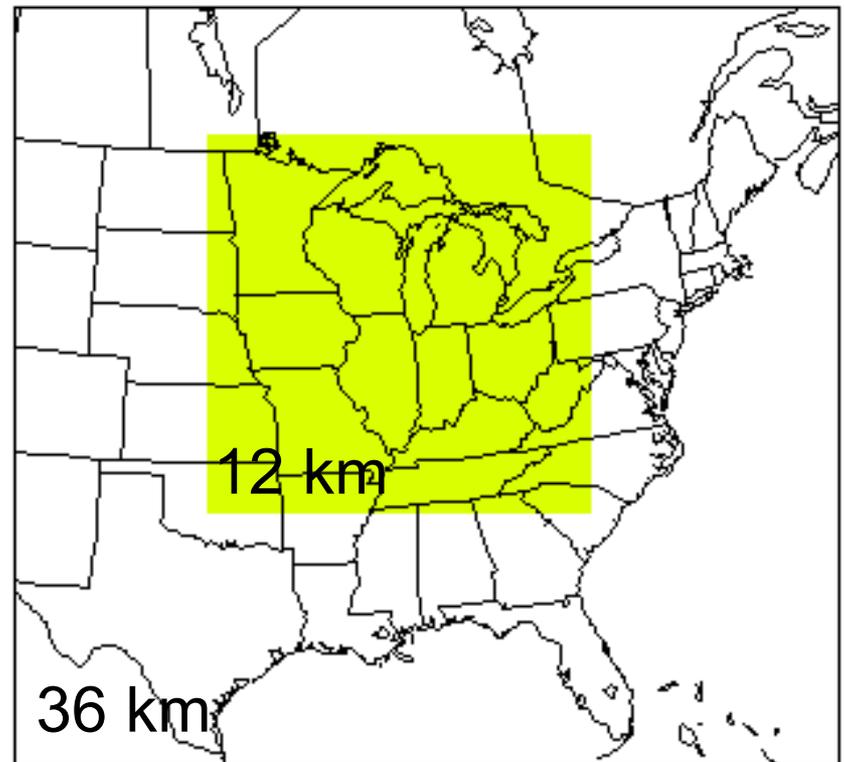
Air Quality Modeling

Model: CAMx

Domain/Grid: Eastern U.S.
(36 km), Midwest (12 km)

Year: 2002, **2005** (full year)
- PM/haze, 36 km

2002, **2005** (summer)
- O₃, 12 km



Caveats

- Model performance is generally okay, but there are a few concerns (e.g., underprediction for ozone and key PM_{2.5} species, like organic carbon)
 - Use relative, not absolute, model results
- Emissions projections are somewhat uncertain
 - EGU projections reflect 2010, not 2009
 - Growth factors are dynamic
- Results reflect REGIONAL-scale modeling. For PM_{2.5}, need to factor in LOCAL-scale analyses.

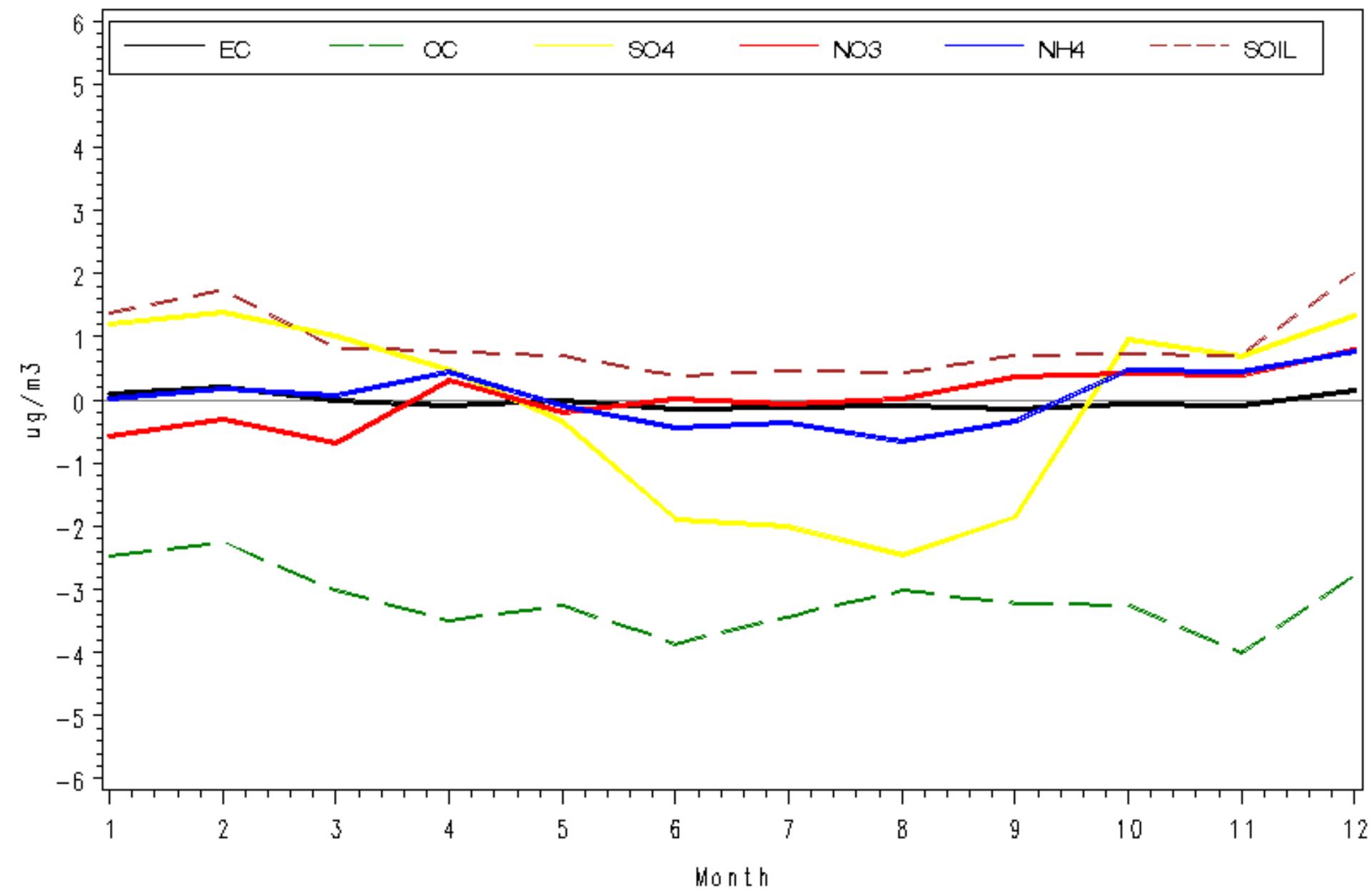
Key Findings

Ozone and PM_{2.5}

- By 2009, regional modeling shows attainment at all sites, except Holland (ozone), Detroit (PM_{2.5}), Cleveland (PM_{2.5}), Granite City (PM_{2.5}). Several other sites “close” to NAAQS, but below.
- By 2012, regional modeling shows attainment at all sites, except Detroit (PM_{2.5}) and Granite City (PM_{2.5})
- New modeling results look better than previous modeling, due to lower base year design values
- Attainment demonstration should reflect “weight of evidence”, with consideration of 2002 and 2005 base year modeling, and monitoring-based analyses
- Regional modeling also shows that the new PM_{2.5} (and ozone?) NAAQS will not be met, even by 2018

PM_{2.5}

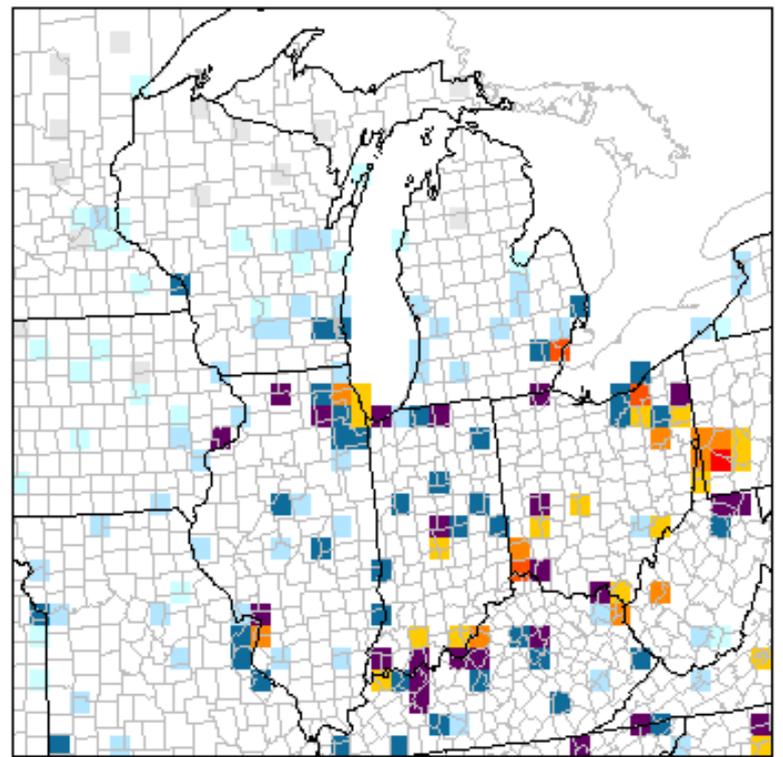
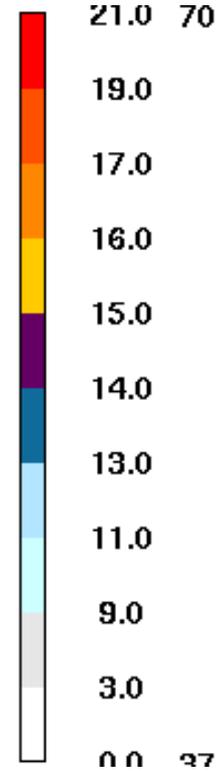
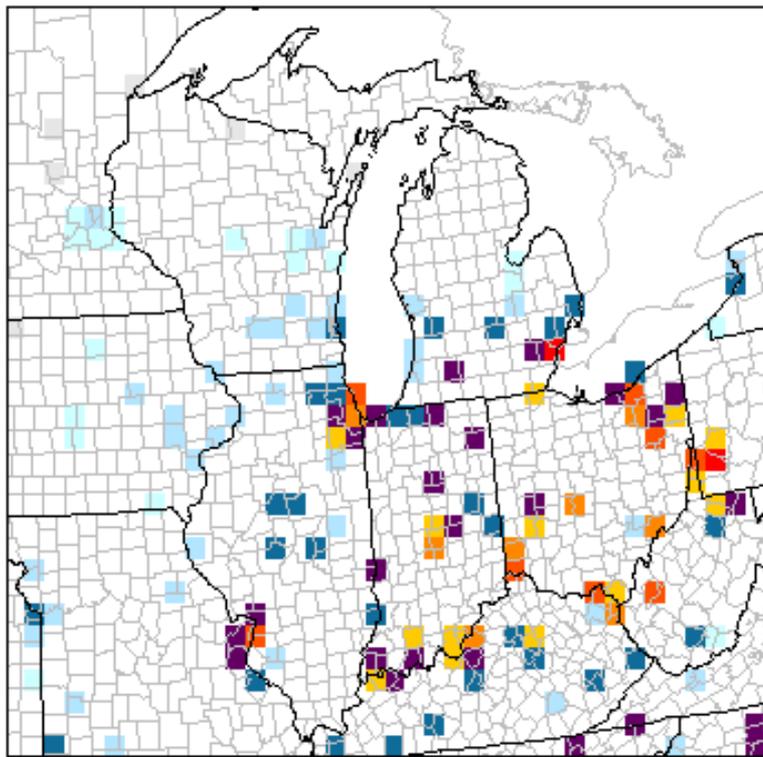
Monthly Average Mean Bias



Base Year Comparison: PM_{2.5}

2002

2005



Statistical Summary

# Sites > NAAQS	58
Peak Value	19.3 ug/m ³
Ave Exceedance Amount	1.2 ug/m ³

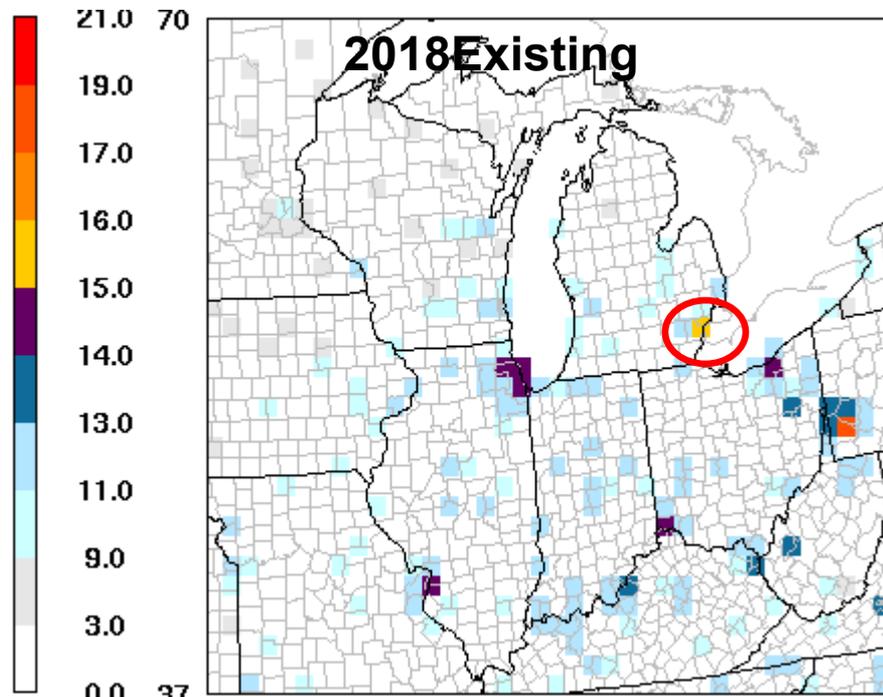
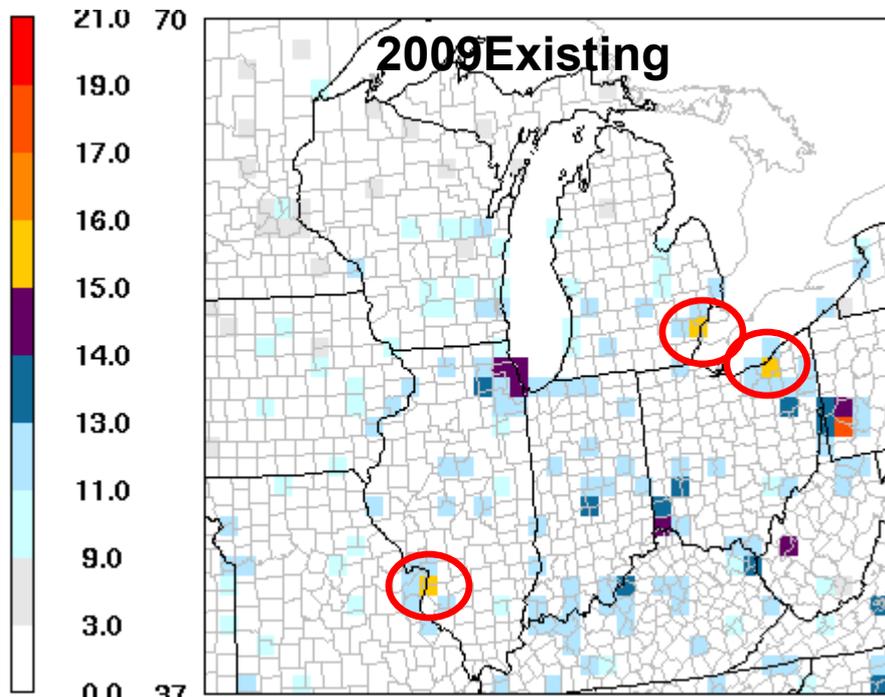
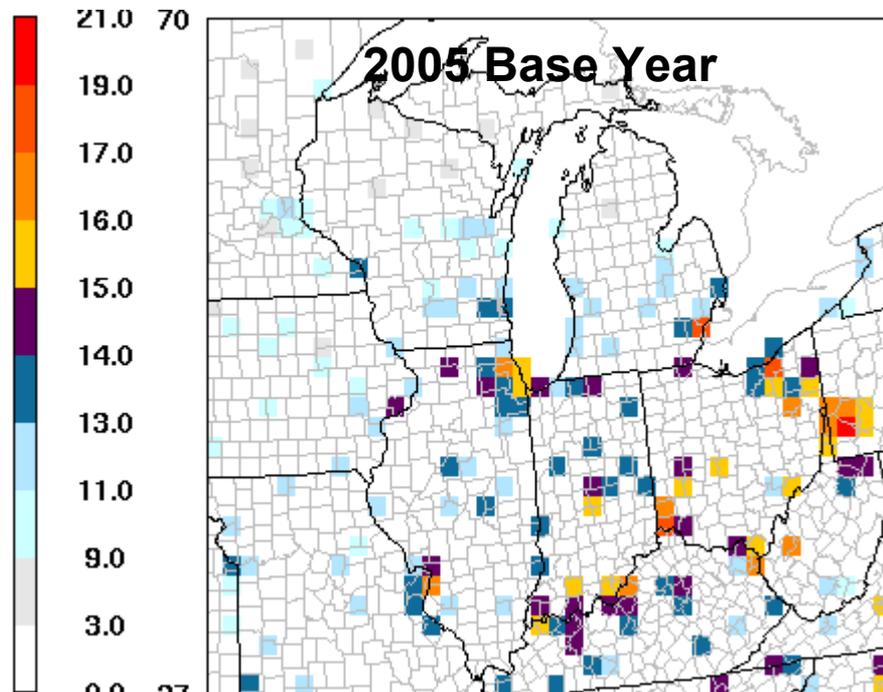
43
17.7 ug/m ³
0.9 ug/m ³

PM_{2.5}

Number of NA Monitors

	<i>Monitored</i>		<i>Modeled</i>					
	<u>2002</u>	<u>2005</u>	<u>2009</u>	<u>2012</u>	<u>2018</u>	<u>2002</u>	<u>2005</u>	
IL	11	9	3	1	3	1	2	0
IN	10	7	1	0	1	0	0	0
MI	6	2	3	1	2	1	1	1
OH	31	25	7	1	4	0	2	0
WI	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
total	58	43	14	3	10	2	5	1

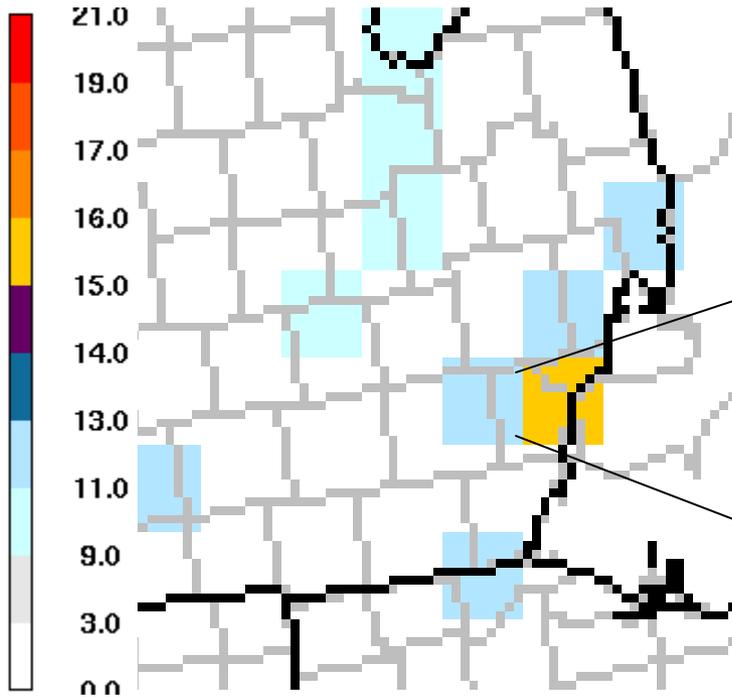
2002 BY 2005 BY



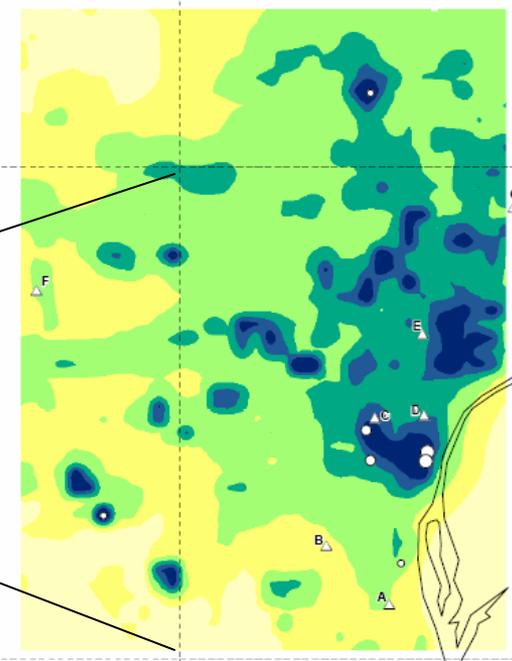
PM_{2.5} Modeling Results

Key Site	BY D.V.	2009	2012	2018
<i>Chicago Area</i>				
Chicago - Mayfair	15.8	14.2	14.2	13.8
Maywood	15.6	14.4	14.3	14.1
Schiller Park	16.4	14.9	14.8	14.3
<i>St. Louis Area</i>				
Granite City	17.0	15.2	15.1	14.5
E. St. Louis	15.6	14.0	13.8	13.2
<i>Detroit Area</i>				
Southwest High School	16.0	14.2	14.0	13.5
Dearborn	17.6	15.7	15.5	15.0
<i>Cleveland Area</i>				
Cleveland - St. Tikhon	17.5	15.1	14.8	14.2
Cleveland - E14 & Orange	17.3	14.8	14.6	14.0
<i>Cincinnati Area</i>				
St. Bernard	17.8	14.6	14.5	13.9
<i>Louisville Area</i>				
Jeffersonville	16.5	13.6	13.6	13.2

Addressing Local Source Impacts: Combining Regional Modeling with “Hot-Spot” Modeling



CAMx Regional Modeling
= 15.7 ug/m³ (Detroit)

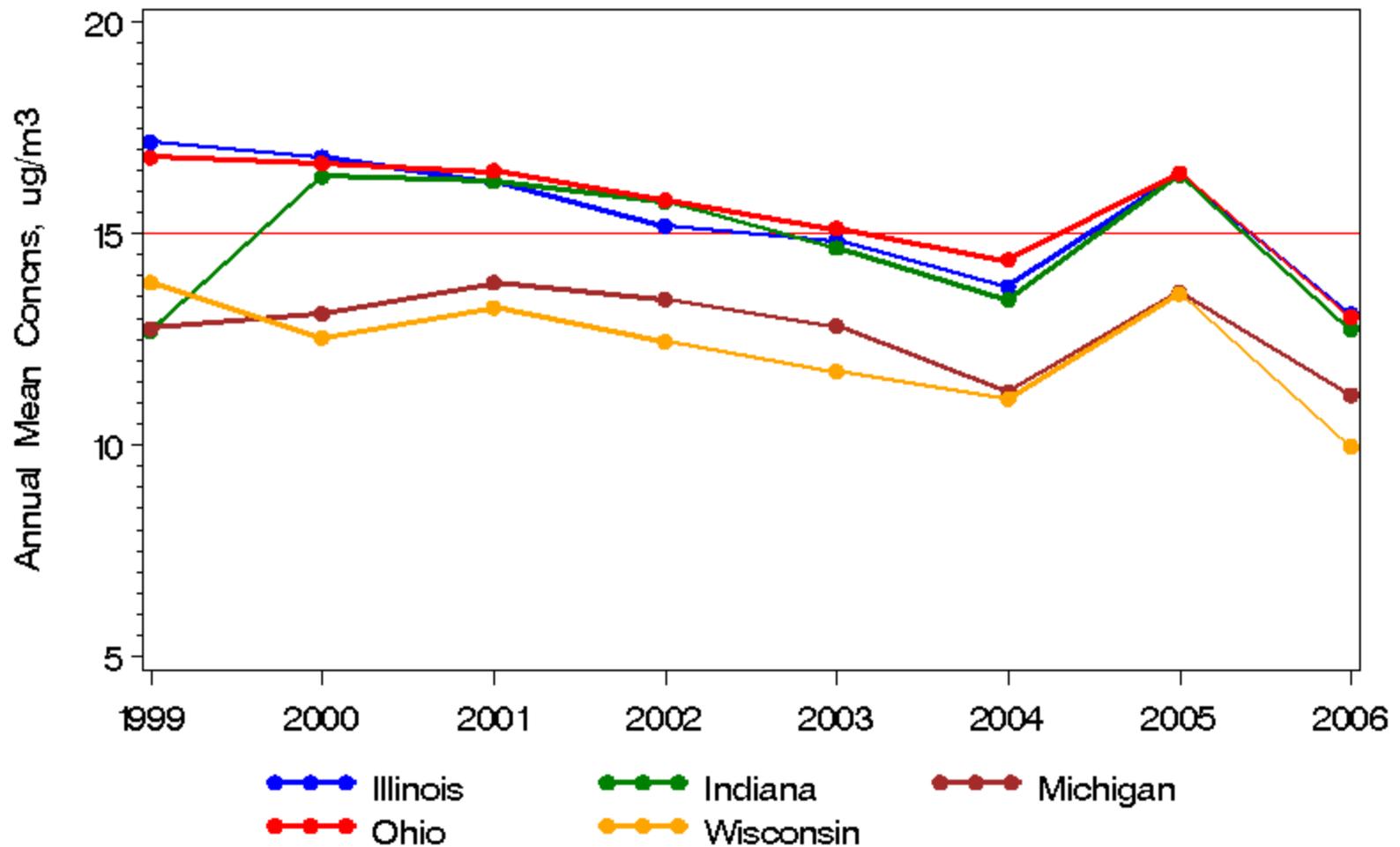


Cite: USEPA, 2006 NAAQS for Particle Pollution:
Regulatory Impact Analysis, Appendix B

AERMOD Local Modeling
= -??? ug/m³ (Detroit)

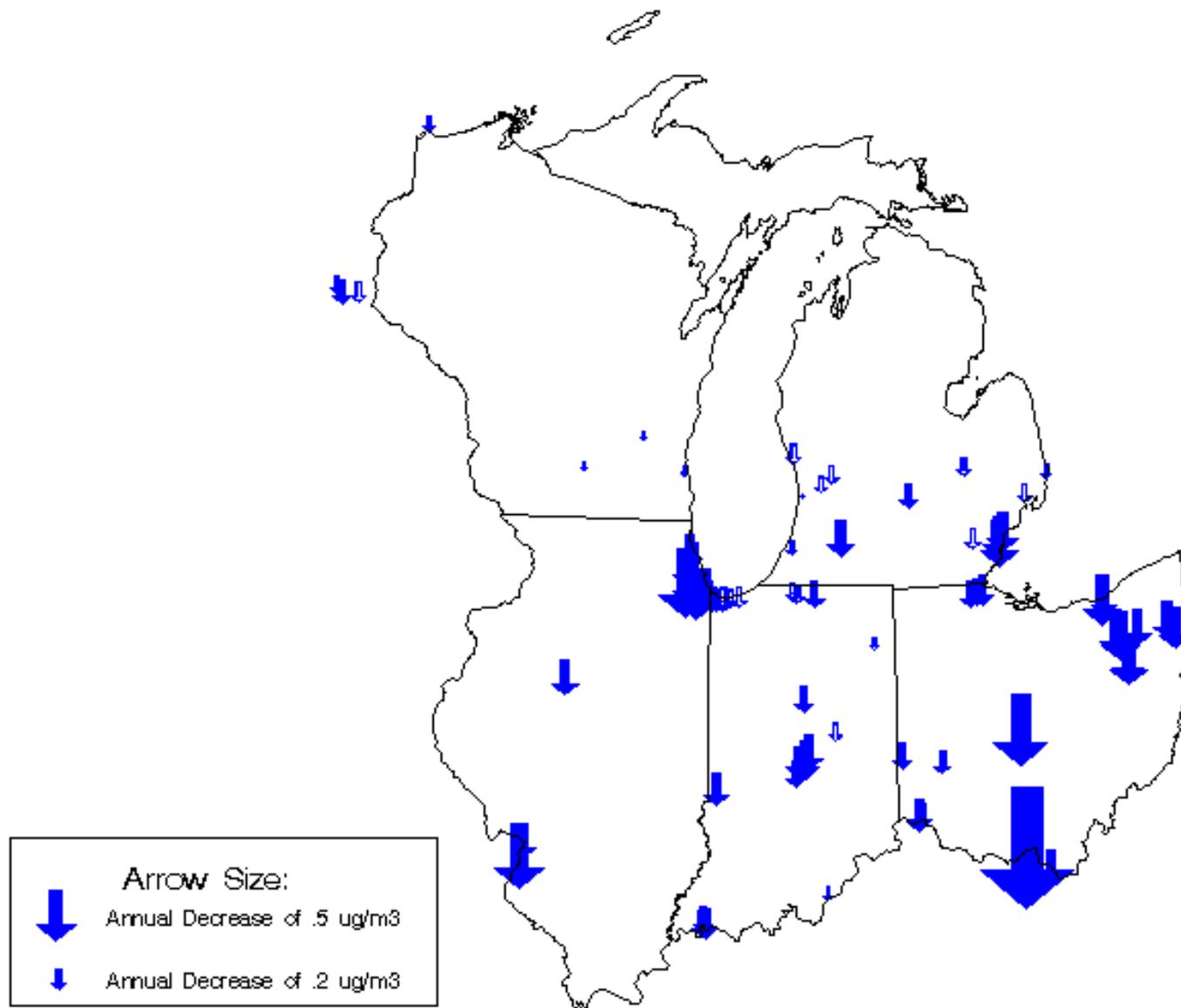
Net (adjusted) concentration = 15.7 - ??? ug/m³

PM2.5 Annual Mean Trends, LADCO States, 1999–2006



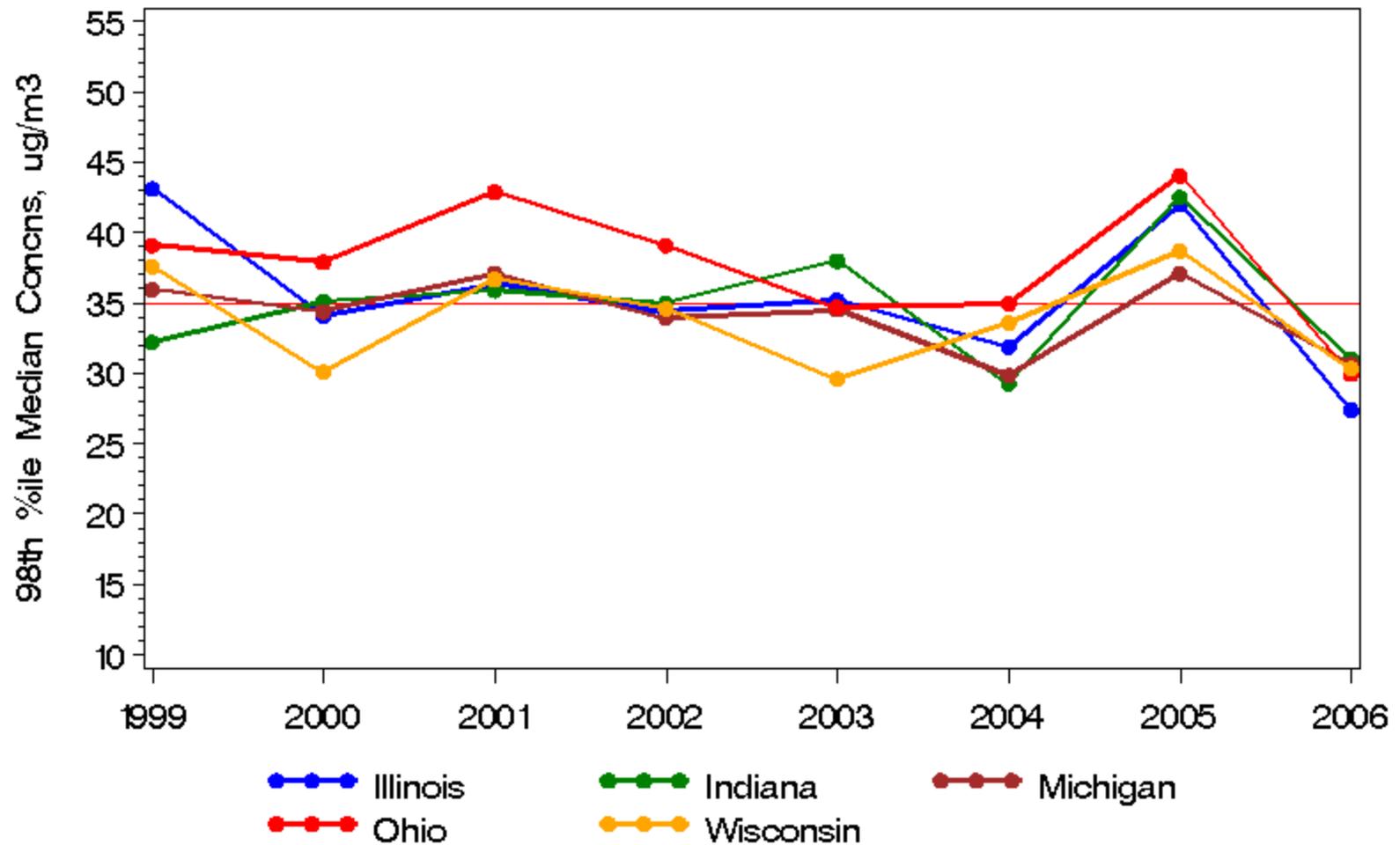
Preliminary data for 2006; trends for monitors with at least 7 years of data

Their Trends for FRM PM_{2.5}, 1999–2006



Solid arrows show statistically significant trends, empty arrows show trends that are not statistically significant.
Size of arrow is proportional to magnitude of trend

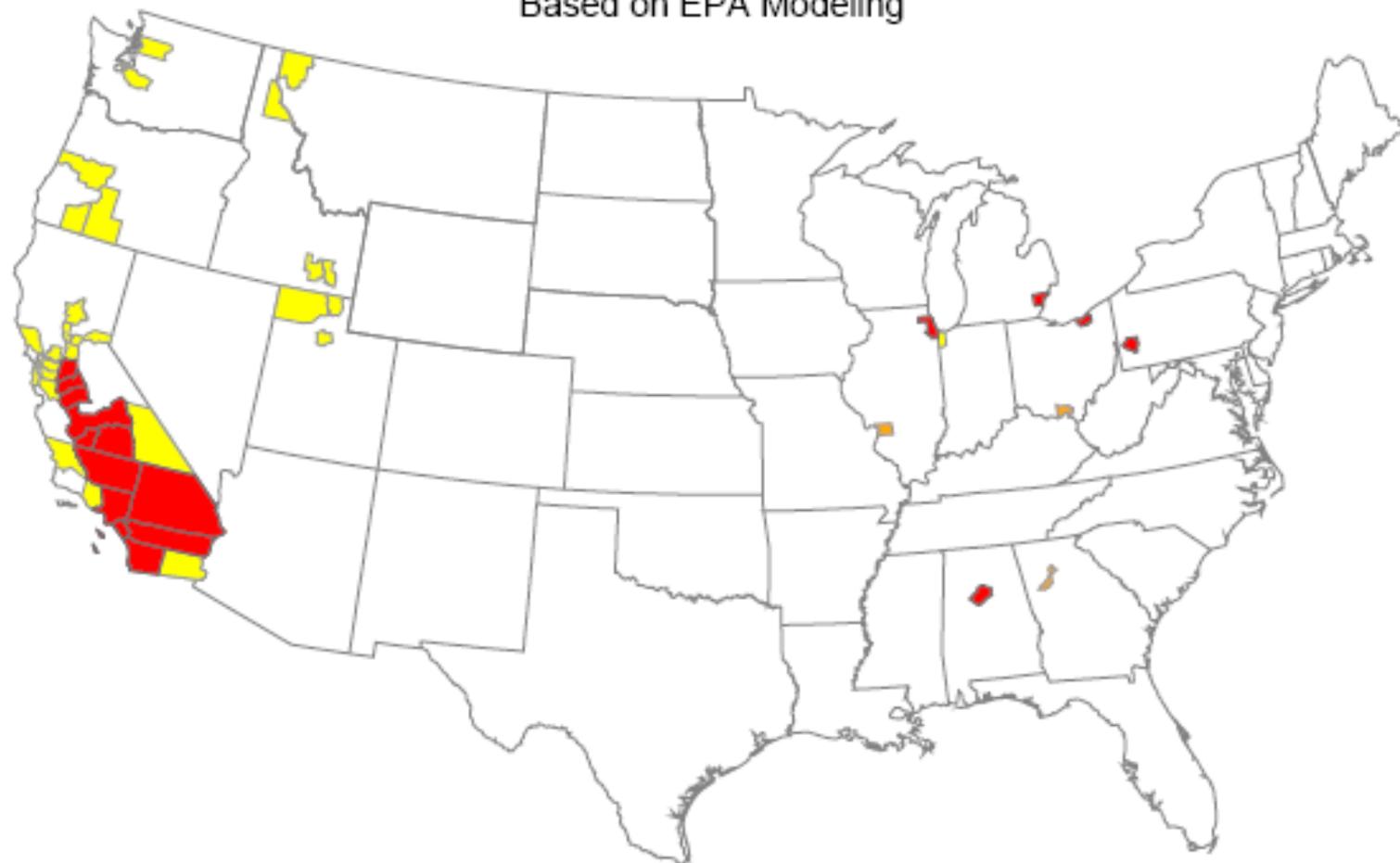
PM2.5 98%ile Trends, LADCO States, 1999–2006



Preliminary data for 2006; trends for monitors with at least 7 years of data

Counties Projected to Exceed the Revised PM_{2.5} Standards in 2020

Based on EPA Modeling*



Legend

County with monitor exceeding:

- both annual (15 $\mu\text{g}/\text{m}^3$) and 24-hour (35 $\mu\text{g}/\text{m}^3$) PM_{2.5} standards
- ONLY the 24-hour PM_{2.5} standard (35 $\mu\text{g}/\text{m}^3$)
- ONLY the annual PM_{2.5} standard (15 $\mu\text{g}/\text{m}^3$)

Number of Counties

	17
	28
	3
Total Counties Projected to Exceed	48

Air Quality Challenges Ahead for Midwest States

- Attain/maintain current (1997) ozone and PM_{2.5} standards
- Develop control plans to meet new (tighter) PM_{2.5} and, possibly, new (tighter) ozone standard
- Continue to make reasonable progress for regional haze
- Address mercury deposition, air toxics, greenhouse gases, and