

SAS and GIS Evaluation Methods for the EPA's Ozone Air Quality Standard Proposal

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AGENDA FOR TODAY'S TALK

- **ADP (Atmospheric Dispersion Project)**
- **Background Information**
- **Objectives**
- **Methods**
- **Results**
- **Conclusion**
- **Future Endeavors**
- **Acknowledgments**

MY PART OF THE PROJECT

ATMOSPHERIC DISPERSION OF $PM_{2.5}$ AND
OZONE ON THE MISSISSIPPI GULF COAST

BACKGROUND INFORMATION

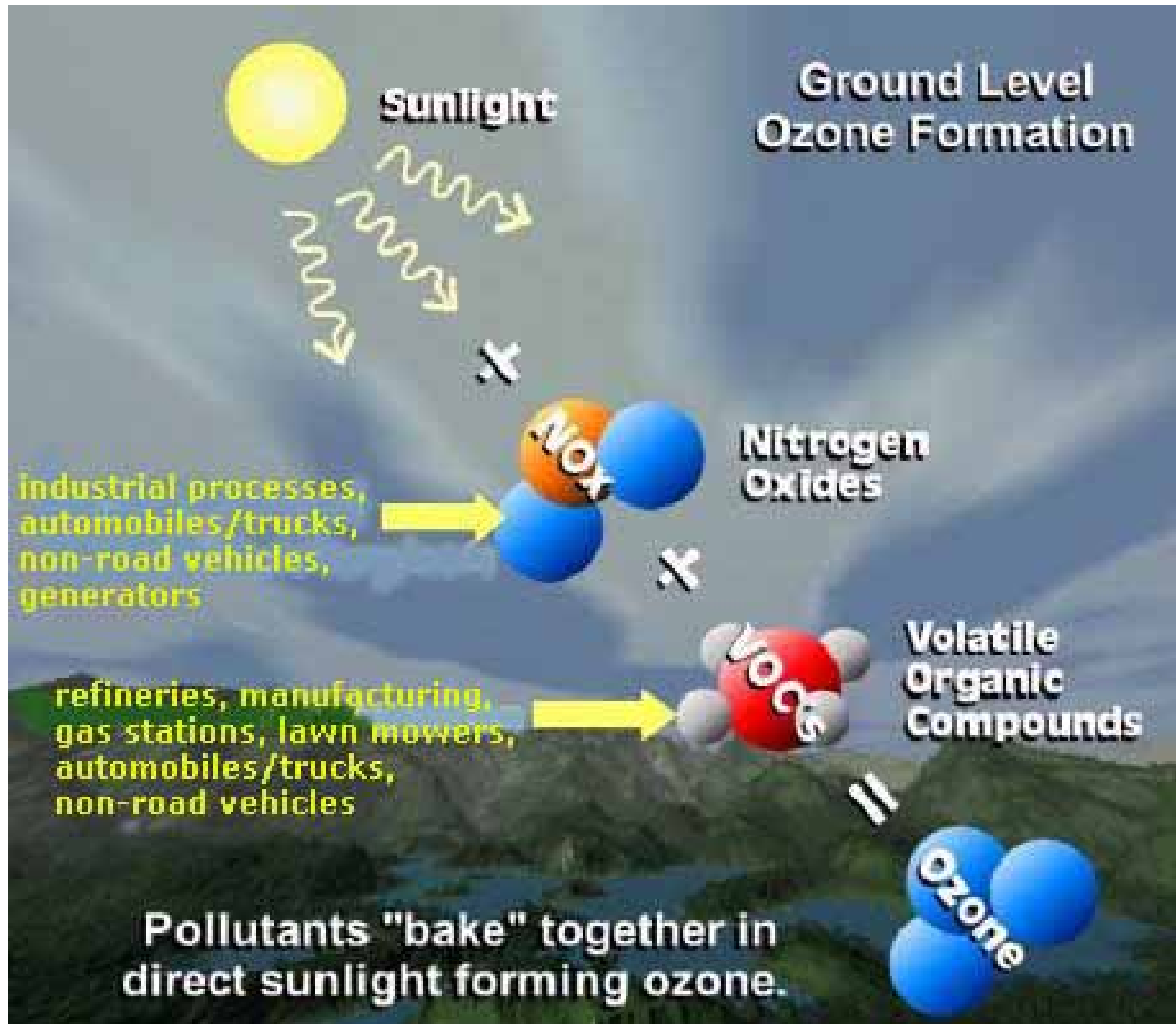
EPA's 2007 Proposal : Lowering Ozone Standard to a range of .070 to .075 ppm

EPA's 2008 Official Change : to a .075 ppm Standard (After NAAQS Review)

MISCONCEPTIONS

- **Ground Level Ozone (Troposphere)**
(Topic of this talk)

- **Upper Atmosphere Ozone (Stratosphere)**
(Holes in the layer}



<http://www.hcpbes.org/eph/ozone/home.htm>

OBJECTIVES

- **Determine if the a new standard has a major effect on MS**
- **Identify specific areas in danger of non-attainment**
- **Benchmark for further research**

METHODS

- **Data mining (Raw or Validated data)**
- **Ozone data is from Summer of 2007 & applied to the 8hr standard**
- **SAS – Statistical Analysis System**
- **AQI - Air Quality Index**
- **ESRI's Geostatistical Analyst**

FORMULA

AQI Conversion Formula

$$AQI = \frac{I_{HI} - I_{LO}}{BP_{HI} - BP_{LO}} \times (C_{O_3} - BP_{LO}) + I_{LO}$$

AQI = Air Quality Index

I_{LO} = Index Value at the Lower Limit of the AQI Category

I_{HI} = Index Value at the Upper Limit of the AQI Category

BP_{LO} = Break Point Conc. at the Lower Limit of the AQI Category

BP_{HI} = Break Point Conc. at the Upper Limit of the AQI Category

C_{O₃} = 8-Hour Ozone Concentration

www.epa.gov

COLOR CODE

www.epa.gov

Tables for converting 8-hour averaged ozone concentrations in parts per million (ppm) to the Air Quality Index (AQI)

Green		Green		Yellow		Orange		Red		Purple	
$I_{LO} = 0$		$I_{LO} = 0$		$I_{LO} = 51$		$I_{LO} = 101$		$I_{LO} = 151$		$I_{LO} = 201$	
$I_{HI} = 50$		$I_{HI} = 50$		$I_{HI} = 100$		$I_{HI} = 150$		$I_{HI} = 200$		$I_{HI} = 300$	
$BP_{LO} = 0.000$		$BP_{LO} = 0.000$		$BP_{LO} = 0.065$		$BP_{LO} = 0.085$		$BP_{LO} = 0.105$		$BP_{LO} = 0.125$	
$BP_{HI} = 0.064$		$BP_{HI} = 0.064$		$BP_{HI} = 0.084$		$BP_{HI} = 0.104$		$BP_{HI} = 0.124$		$BP_{HI} = 0.374$	
O3 Conc.	AQI	O3 Conc.	AQI	O3 Conc.	AQI	O3 Conc.	AQI	O3 Conc.	AQI	O3 Conc.	AQI
0.001	1	0.033	26	0.065	51	0.085	101	0.105	151	0.125	201
0.002	2	0.034	27	0.066	54	0.086	104	0.106	154	0.126	201
0.003	2	0.035	27	0.067	56	0.087	106	0.107	156	0.127	202
0.004	3	0.036	28	0.068	59	0.088	109	0.108	159	0.128	202
0.005	4	0.037	29	0.069	61	0.089	111	0.109	161	0.129	203
0.006	5	0.038	30	0.070	64	0.090	114	0.110	164	0.130	203
0.007	5	0.039	30	0.071	66	0.091	116	0.111	166	0.131	203
0.008	6	0.040	31	0.072	69	0.092	119	0.112	169	0.132	204
0.009	7	0.041	32	0.073	72	0.093	122	0.113	172	0.133	204
0.010	8	0.042	33	0.074	74	0.094	124	0.114	174	0.134	205
0.011	9	0.043	34	0.075	77	0.095	127	0.115	177	0.135	205
0.012	9	0.044	34	0.076	79	0.096	129	0.116	179	0.136	205
0.013	10	0.045	35	0.077	82	0.097	132	0.117	182	0.137	206
0.014	11	0.046	36	0.078	85	0.098	135	0.118	185	0.138	206
0.015	12	0.047	37	0.079	87	0.099	137	0.119	187	0.139	207
0.016	13	0.048	38	0.080	90	0.100	140	0.120	190	0.140	207
0.017	13	0.049	38	0.081	92	0.101	142	0.121	192	0.141	207
0.018	14	0.050	39	0.082	95	0.102	145	0.122	195	0.142	208
0.019	15	0.051	40	0.083	97	0.103	147	0.123	197	0.143	208

RESULTS

- **Test for Compliance Of both standards with graphs**

Ozone interpolation grids

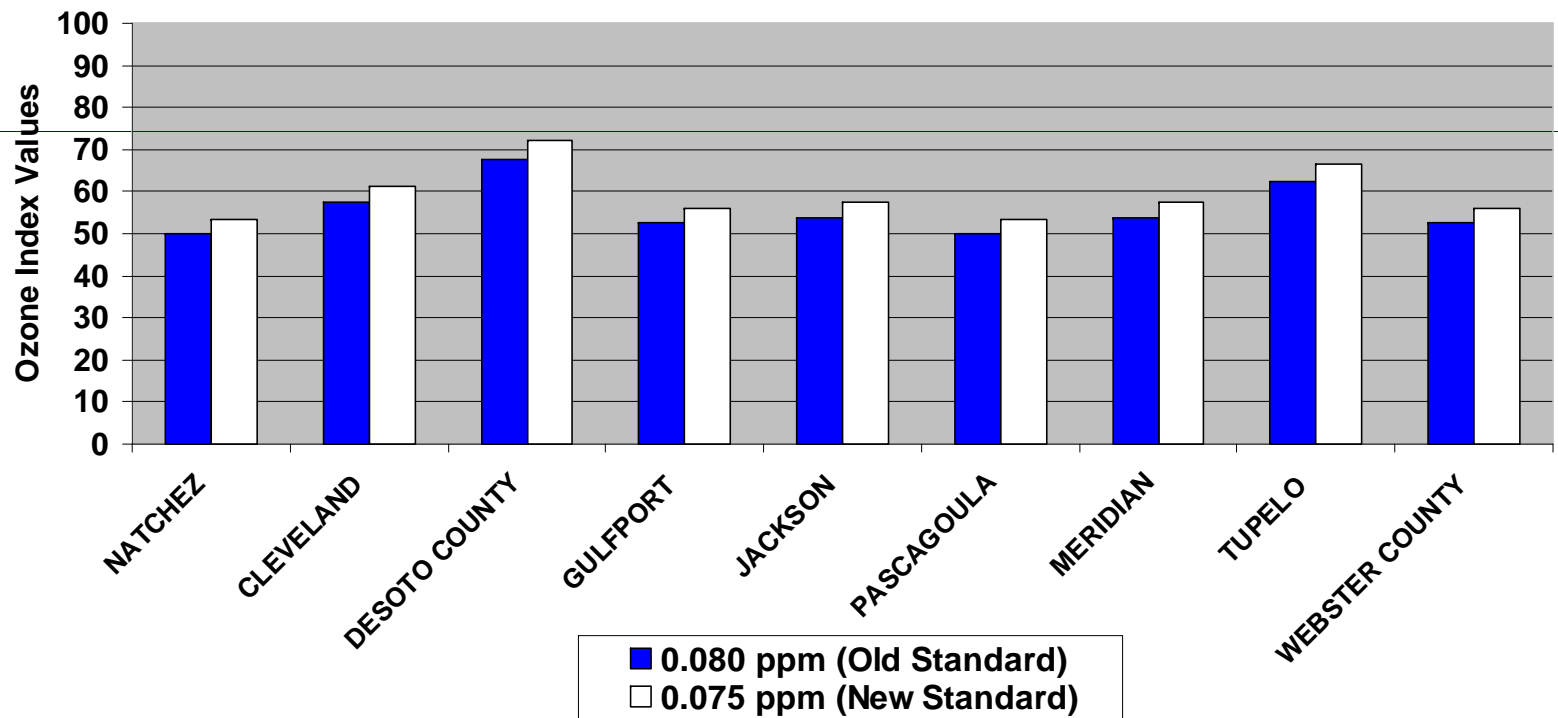
AQI TEST FORMULA

$$\text{AQI}_{\text{pollutant}} = \frac{\text{Pollutant data reading}}{\text{Standard}} \times 100$$

www.epa.gov

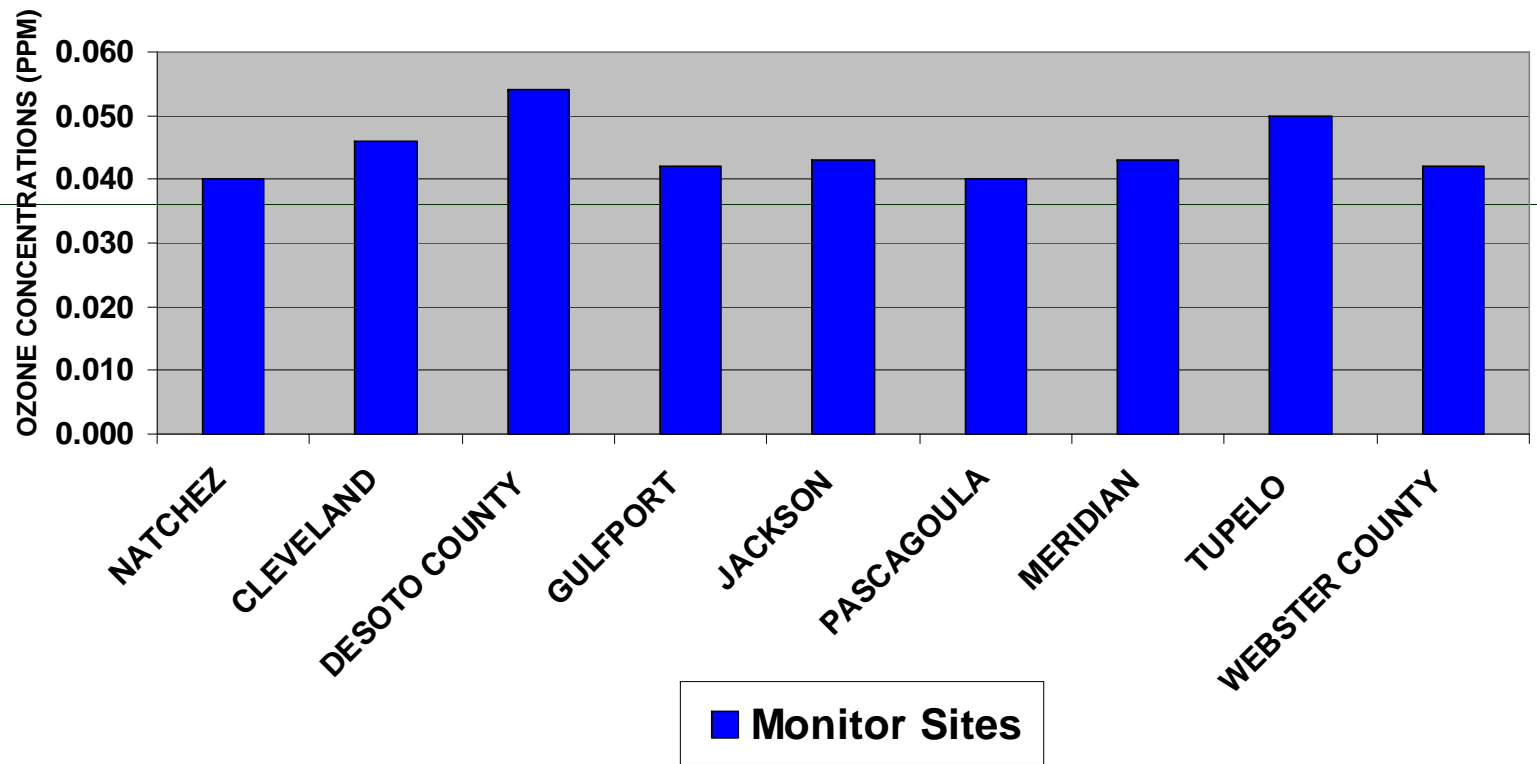
AIR QUALITY INDEX (AQI)

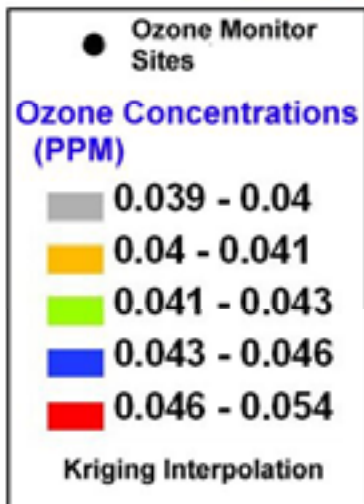
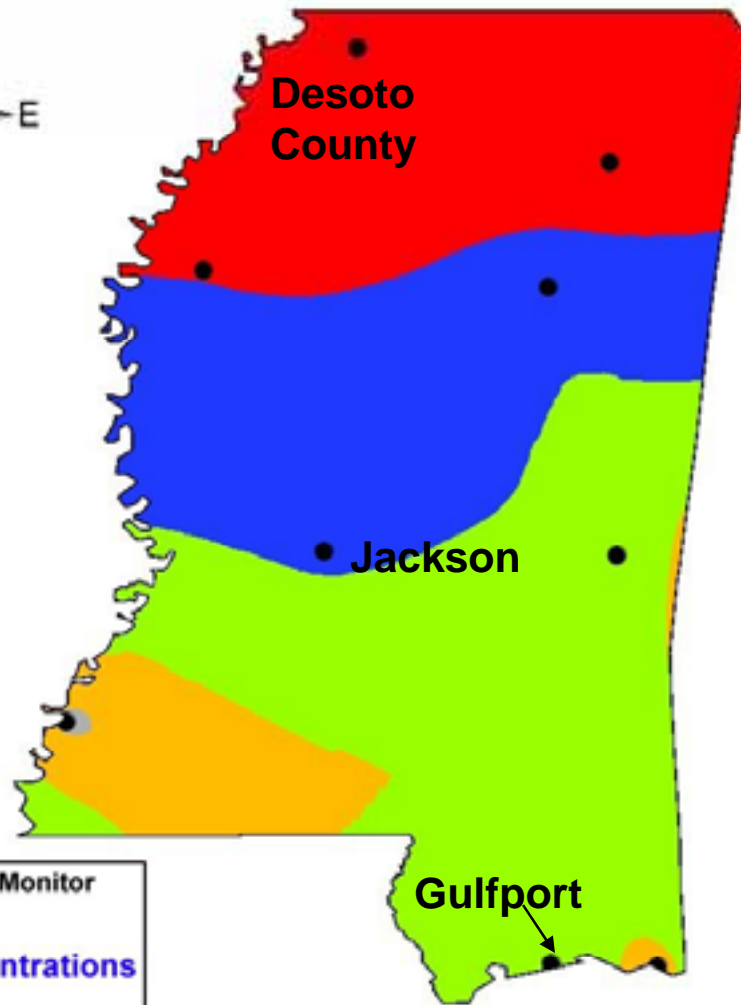
MISSISSIPPI OZONE AQI



MISSISSIPPI OZONE AVERAGES

JUNE, JULY, AND AUGUST 2007, (8am To 4pm)





Mississippi Ozone Interpolation Map (Prediction Map)



**Desoto
County**

Jackson

Gulfport

● Ozone Monitor Sites

**Ozone Threshold
Rankings**

■ 0

■ 1

Kriging Interpolation

**Threshold
Exceeding Map
(.043 ppm)
(Probability Map)**

EPA AQI MAP

Ozone: 8-Hour AQI Loop

Mississippi / Alabama
Thursday, June 28, 2007



Note: Animation reflects 8-hour average concentrations, calculated from observed 1-hour data. For today's animation only, the most recent hour shown reflects estimated 8-hour averages. www.epa.gov/ne/air

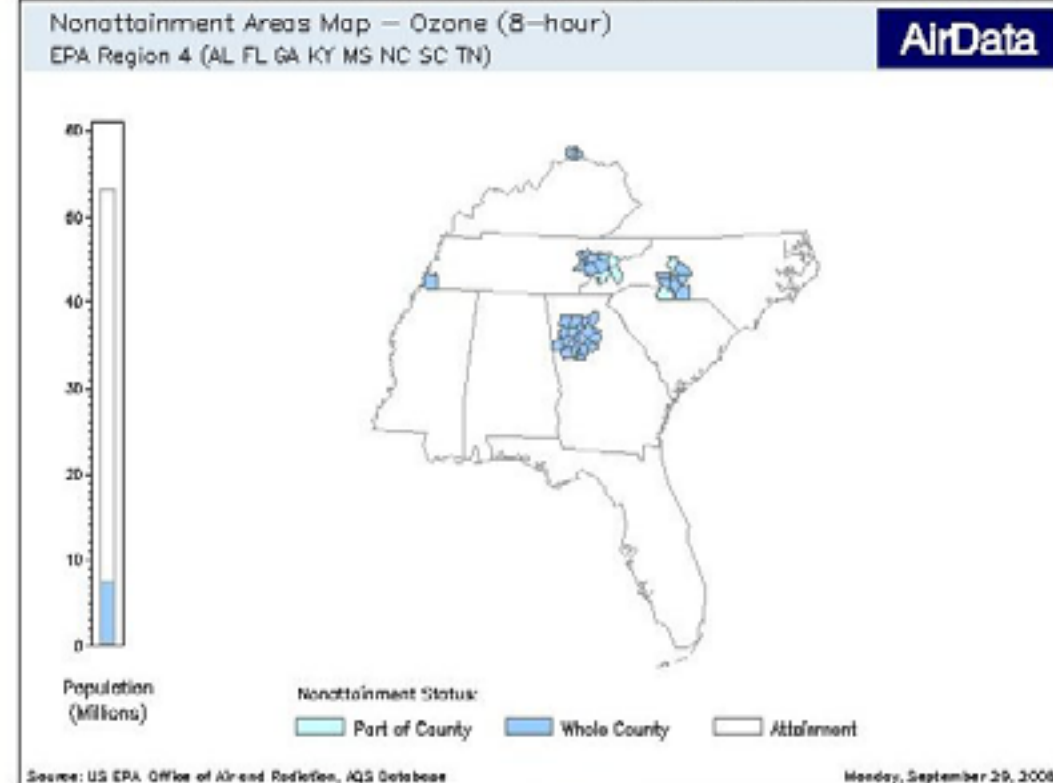
EPA NONATTAINMENT MAP

Pollutant: Ozone (8-hour)
Effective Date of Nonattainment Designations: August 2008

41 Nonattainment Counties

See [Disclaimer](#)

Position mouse pointer on map to view additional information. See zoom and pan instructions below this image.



CONCLUSION

- **Mississippi is not in danger of non attainment of ozone.**
- **This sub-project's data and techniques that will be used to validate data in the main project**

FUTURE ACTIVITIES (POLLUTION MODELS)

- **SMOKE** (SPARSE MATRIX OPERATOR
KERNAL EMISSIONS)
- **CMAQ** (COMMUNITY MULTISCALE AIR
QUALITY)

QUICK RECAP (SAS & GRAPHS)

- Choose raw or validated data
- Download data and datamine variables
- Prepare data for SAS
- Use SAS for statistics and special sorting
- Take SAS output and use in the AQI formula
- Graph results

QUICK RECAP (ARCGIS INTERPOLATION)

- **Create feature class or geodatabase from XY of monitor sites**
- **Import SAS data**
- **Activate Geostatistical Analyst**
- **Use analysis tools to explore data and check for normalization**
- **Choose interpolation method (Kriging for Ozone)**
- **Create prediction map (Main Interpolation)**
- **Create probability map (Threshold Exceeding)**

ACKNOWLEDGMENTS

Project is supported by the U.S. Department of Commerce through the National Oceanic and Atmospheric Administration (NOAA), Silver Spring, MD; Contract #NA06OAR4600192

- Dr. Anjayneyulu and Shelton Swanier**
- Trent Lott Geospatial and Visualization Research Center**
- Vera, Christopher, Joshua, and David Kelley**
- ESRI's Health GIS Staff**

REFERENCES

www.esri.com – Knowledge base & tutorials

www.sas.com - Statistics software

www.cmascenter.org - Pollution models

www.epa.gov- Validated air quality data

www.airnowtech.org – Raw or preliminary data

www.epa.gov/ne/aqi - Air quality index

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THANK YOU !!