

# Impact of Improved Temporal Profiles for Point Sources on Air Quality

Alper Unal<sup>1</sup>, Nilesh Lahoti<sup>2</sup>, Ray Papalski<sup>3</sup>,  
Panos Georgopoulos<sup>2</sup>

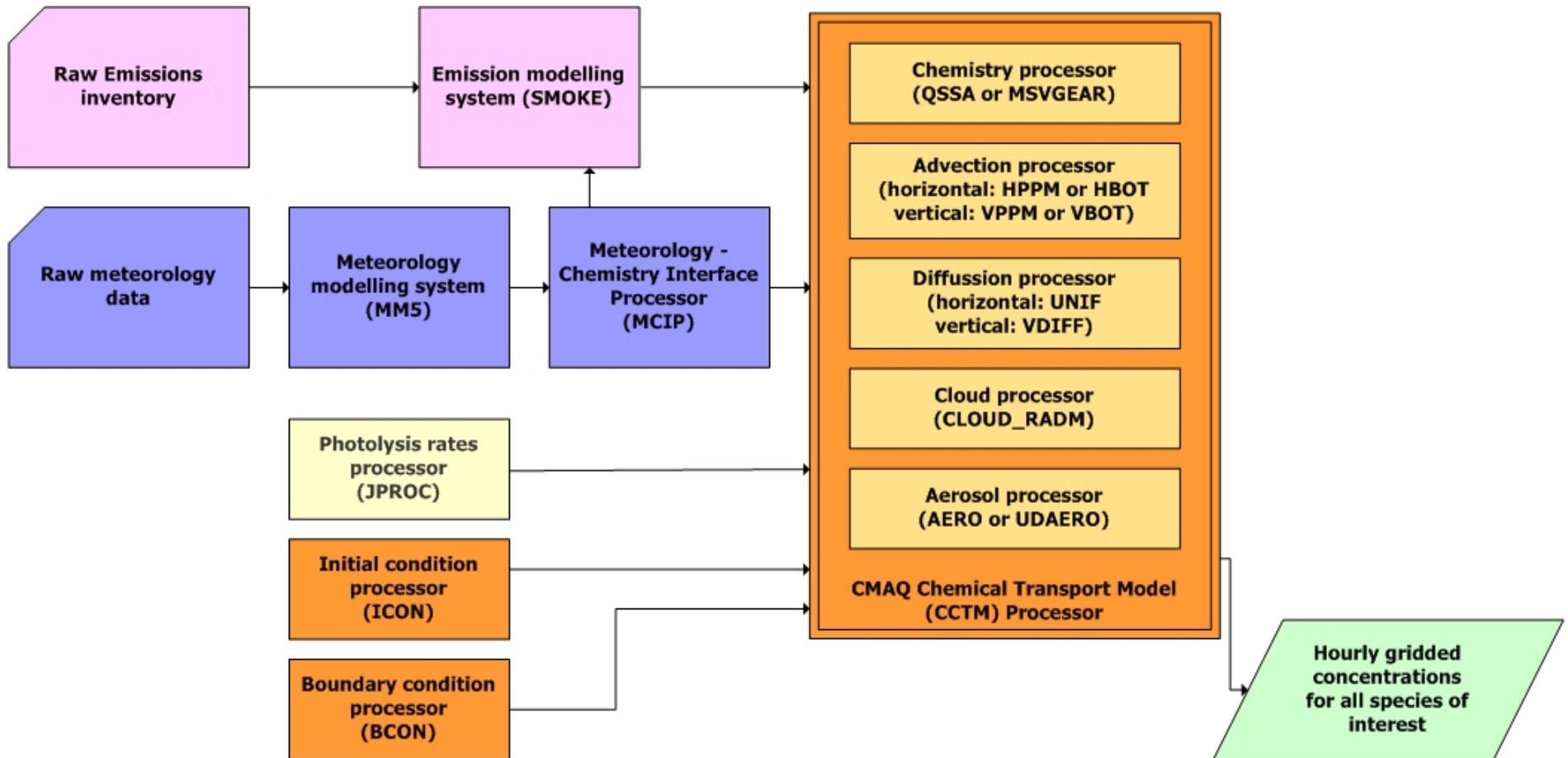


<sup>1</sup>MACTEC, Trenton, NJ

<sup>2</sup>Computational Chemodynamics Laboratory of the Environmental and Occupational Health Sciences Institute,  
a joint institute of Rutgers University & UMDNJ-RWJMS

<sup>3</sup>New Jersey Department of Environmental Protection

# Air Quality Modeling



# Objectives

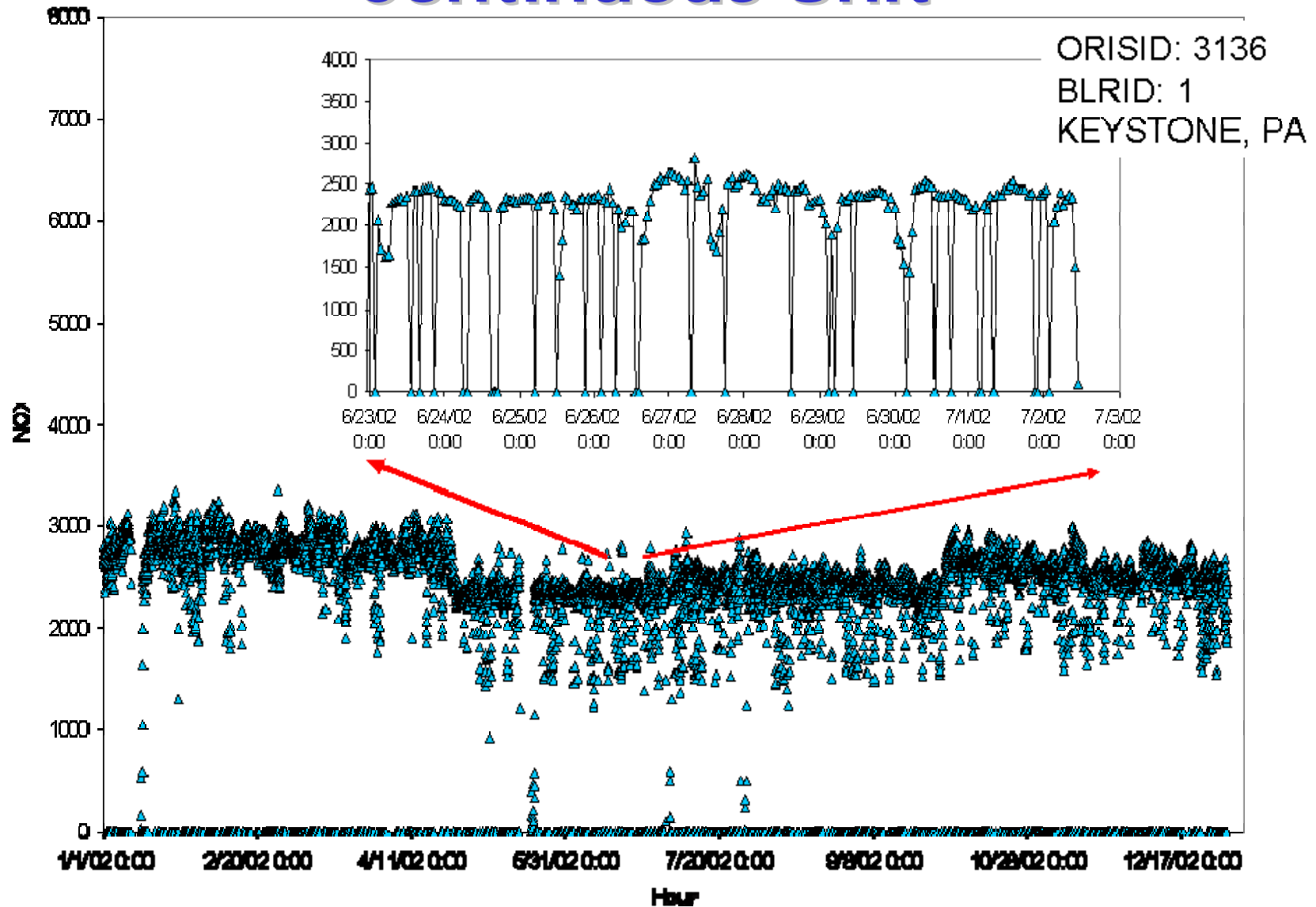
Electric Generating Units (EGUs) are significant contributors to  $\text{NO}_x$  and  $\text{SO}_2$

- $\approx$  20 percent of  $\text{NO}_x$  (MANE-VU Region)
- $\approx$  70 percent of  $\text{SO}_2$  (MANE-VU Region)

Improve Emissions Estimation and Processing for EGUs

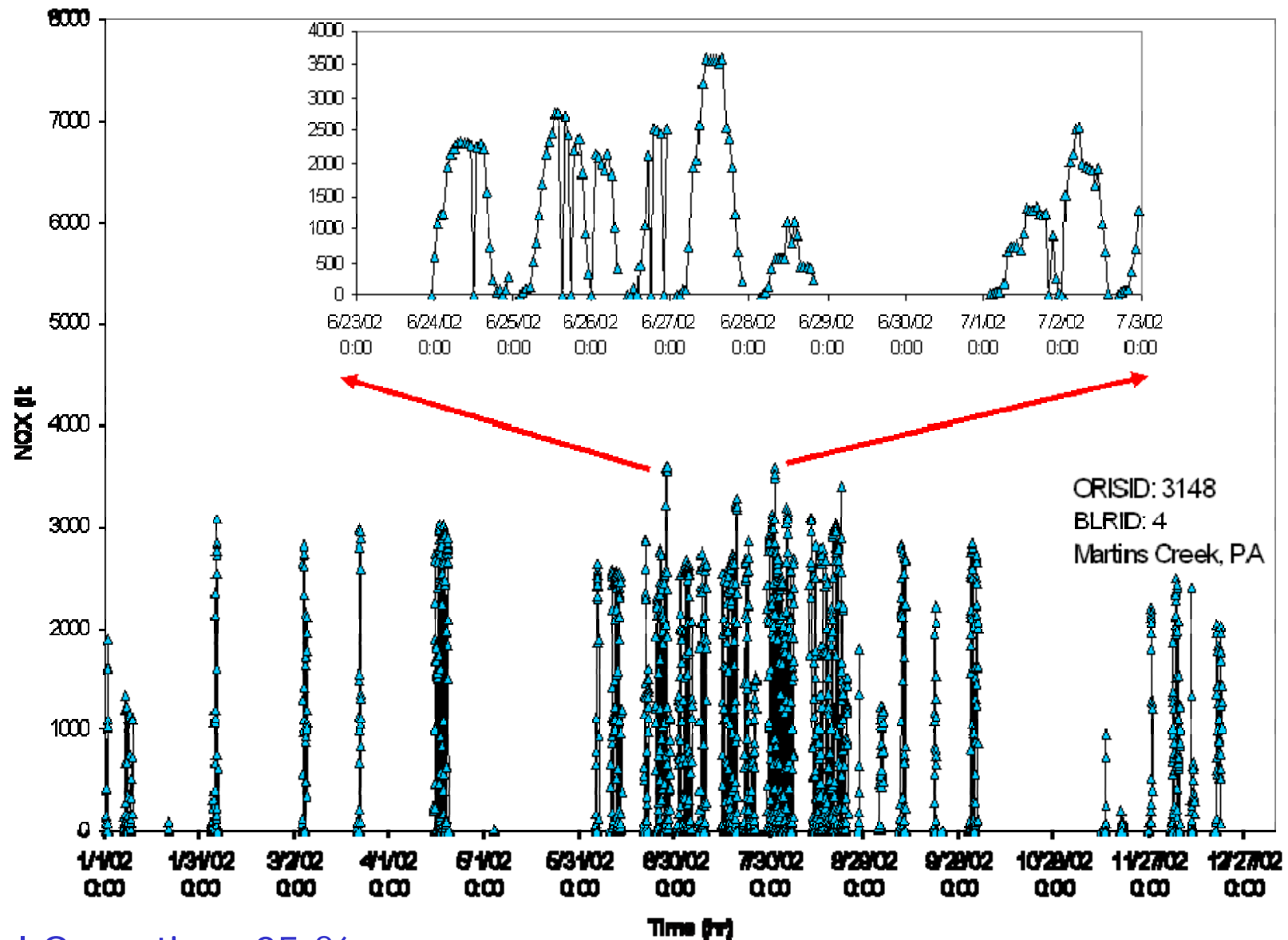
- Temporal Profiles
- Continuous Emissions Monitoring (CEM) Data

# NO<sub>x</sub> Contribution: Continuous Unit

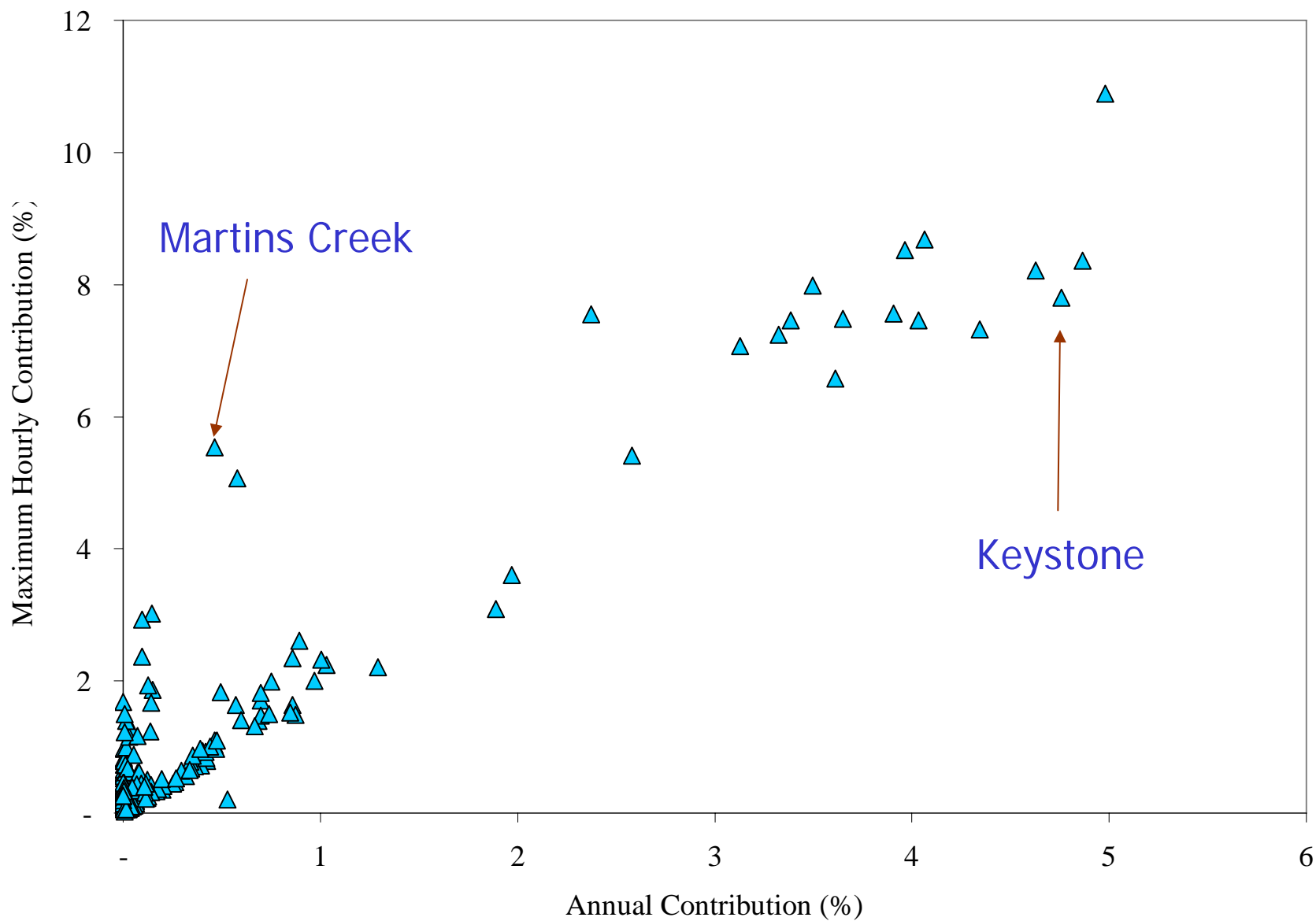


Annual Operation: 97 %

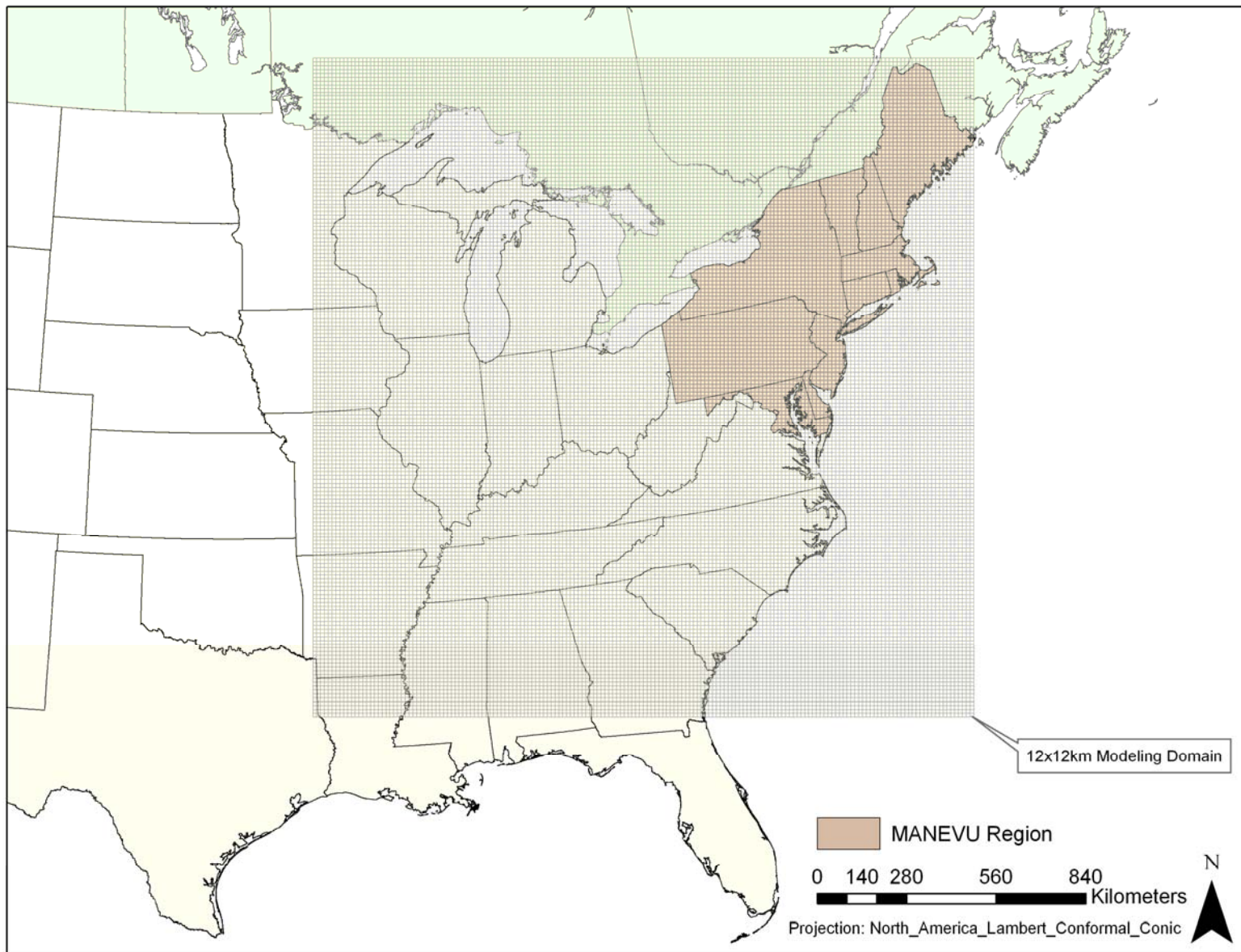
# NO<sub>x</sub> Contribution: Peaking Unit



# NO<sub>x</sub> Contribution: PA Units



# Modeling Domain



# Modeling

## Air Quality Study [August 6<sup>th</sup> -13<sup>th</sup> 2002]

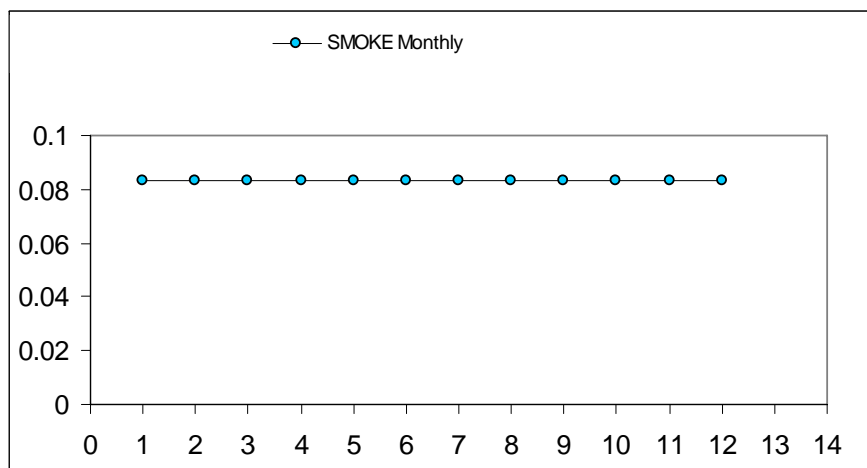
- Meteorological data: MM5 (UMD)
- Emissions Data / Emissions Processing:  
EI (RPO)+SMOKE (v2.1)
- CMAQ: CMAQ v4.4

# Emissions Processing

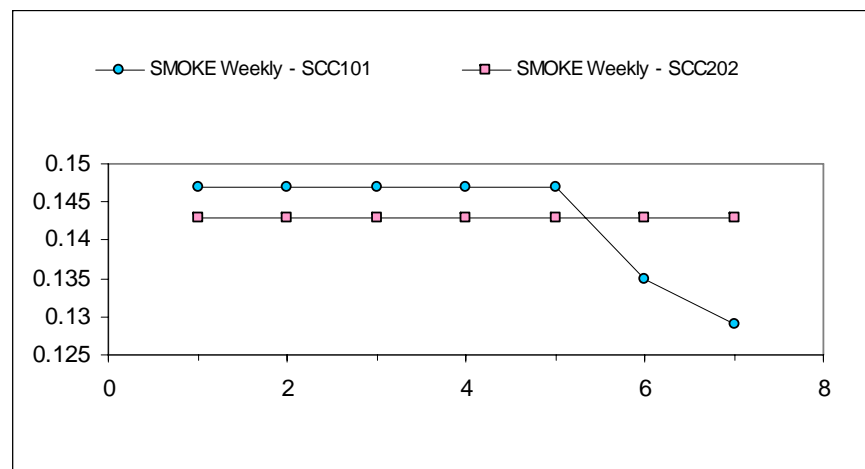
## Point Source Emissions

- SMOKE Default Temporal Profile
- Temporal Profile based upon CEM data
- Hourly CEM data

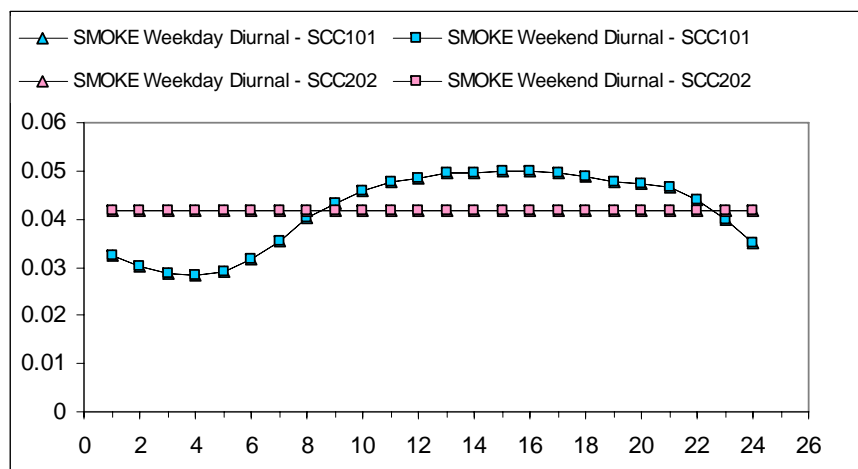
# Temporal Distribution: SMOKE Default



Monthly

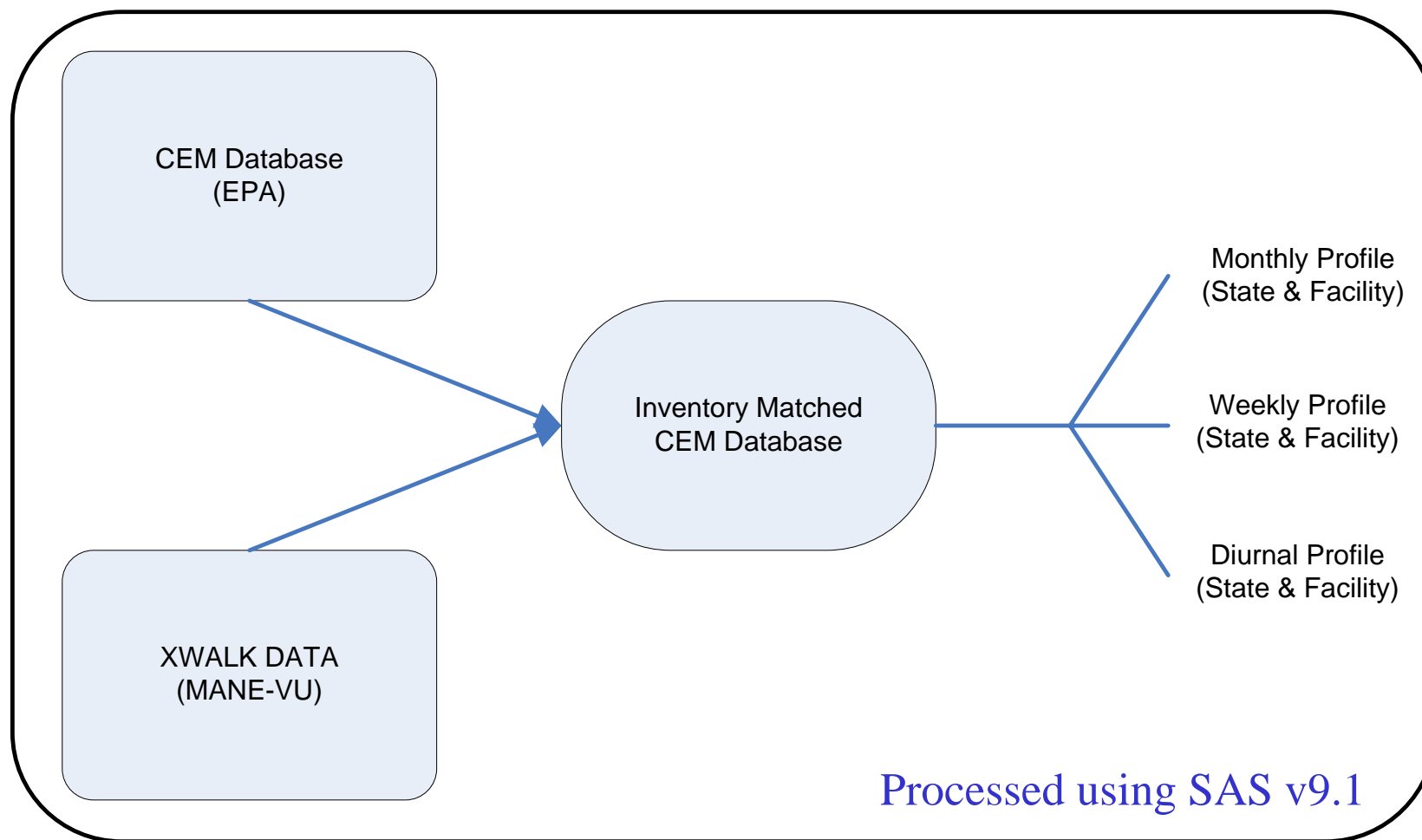


Weekly

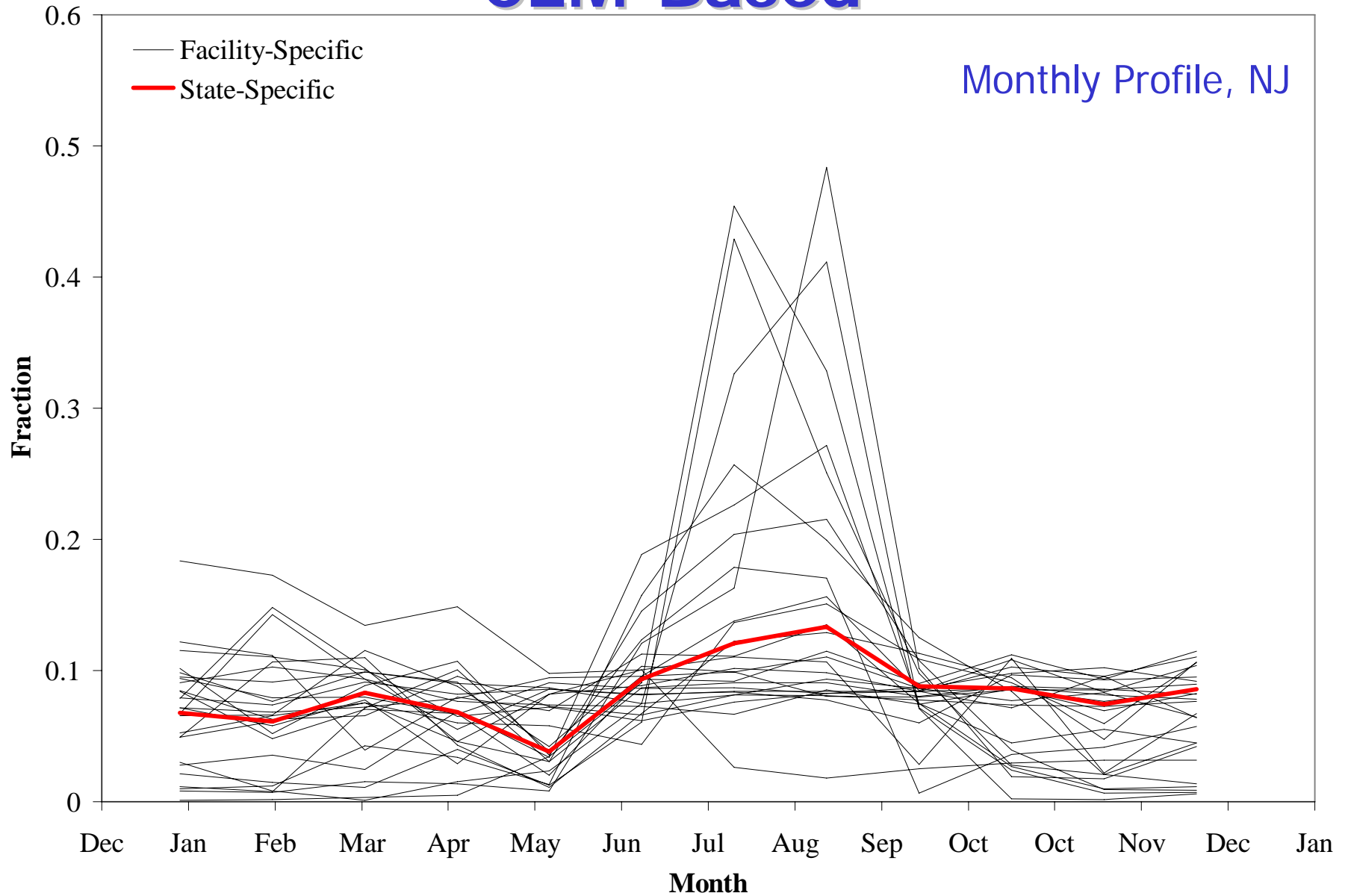


Diurnal

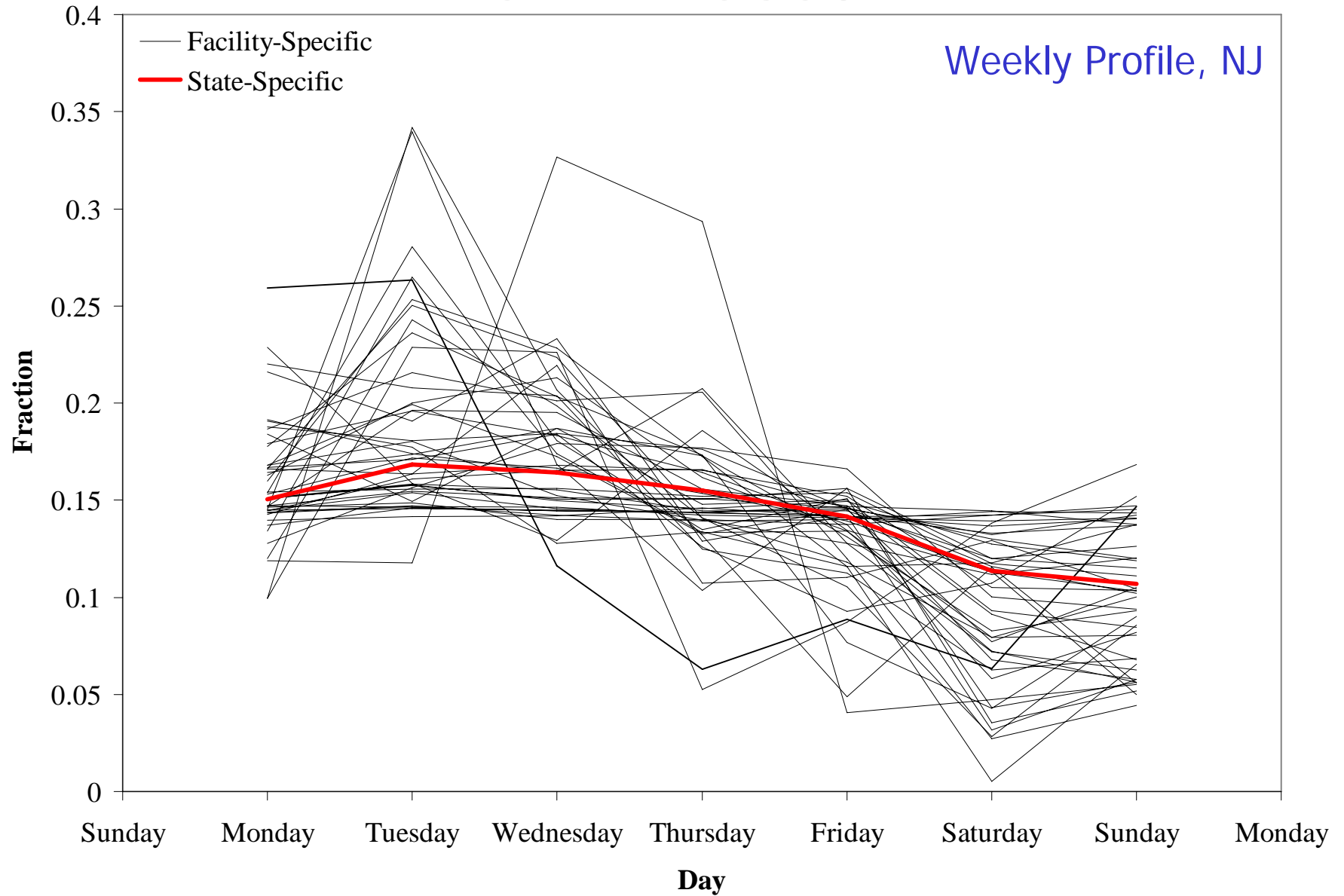
# Temporal Distribution: CEM-Based



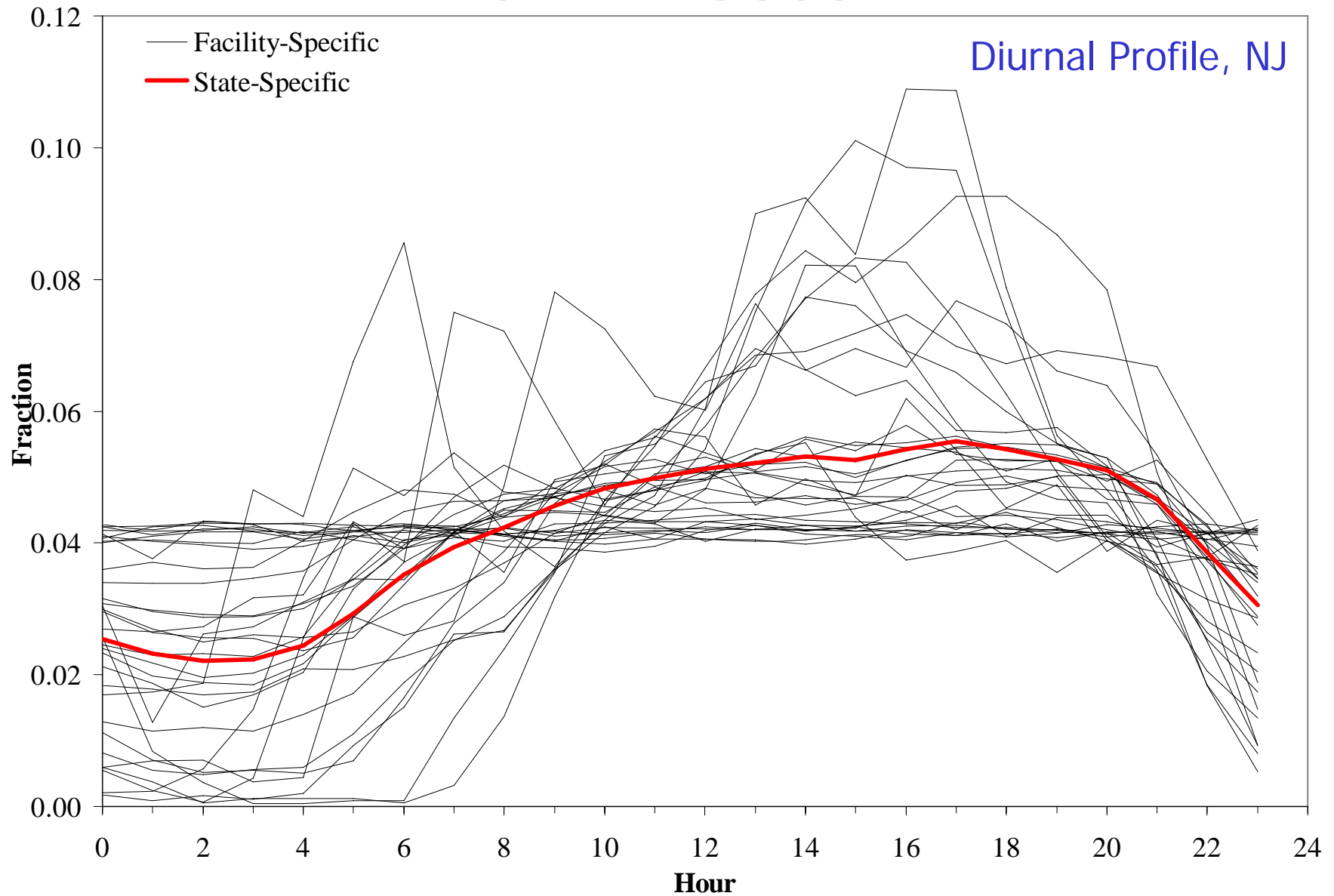
# Temporal Distribution: CEM-Based



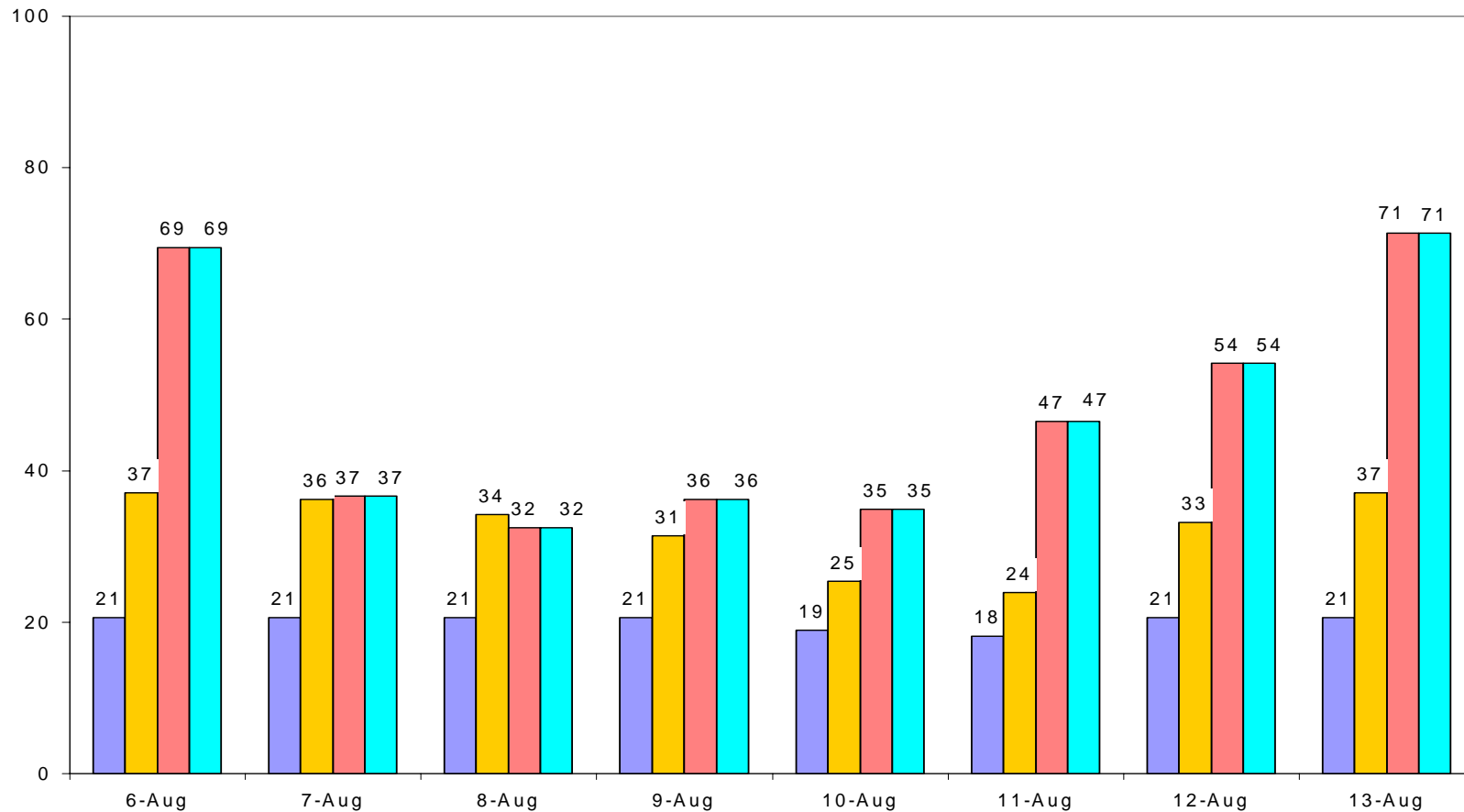
# Temporal Distribution: CEM-Based



# Temporal Distribution: CEM-Based



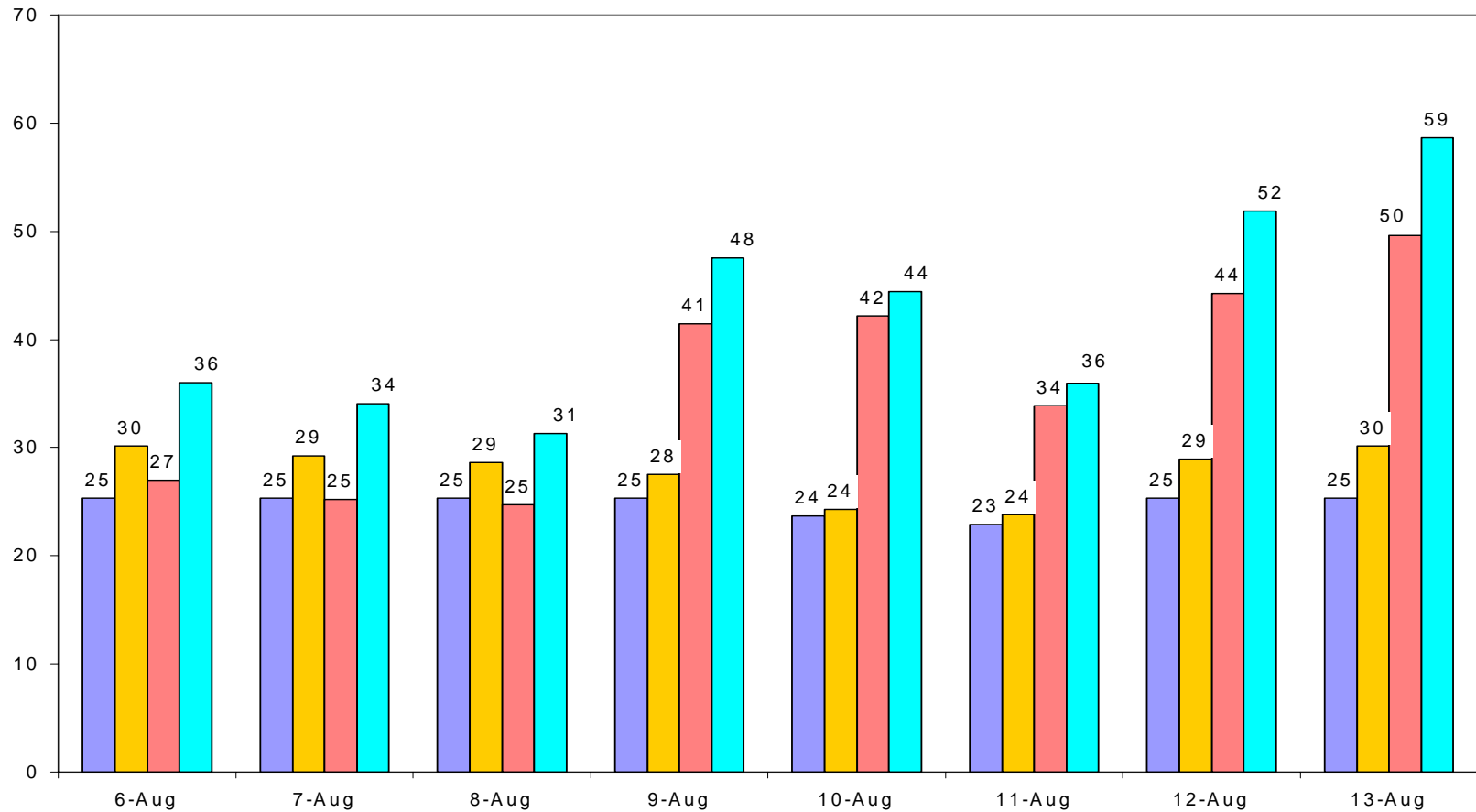
# Impact on NO<sub>x</sub> Emissions



Hudson County, NJ



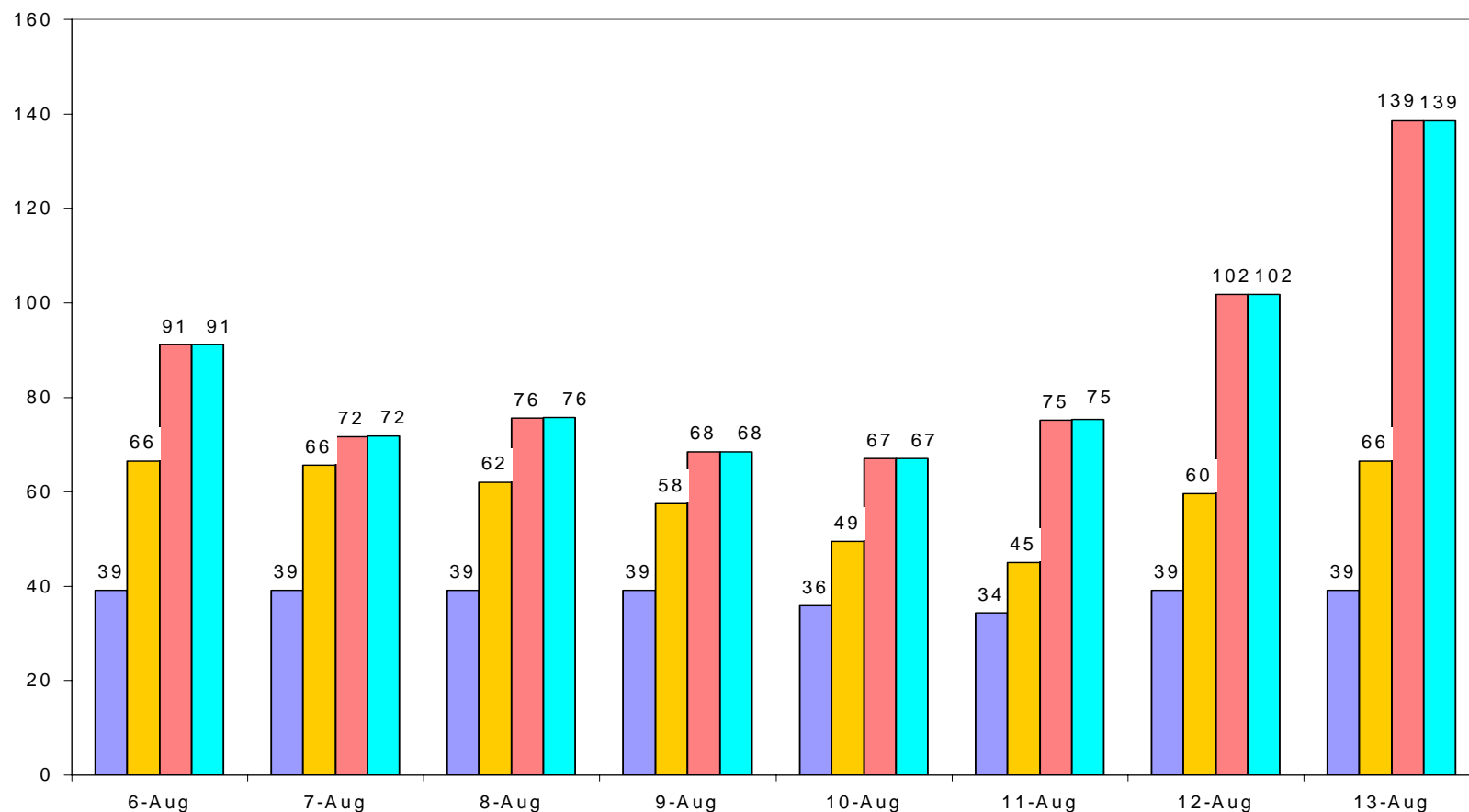
# Impact on NO<sub>x</sub> Emissions



Queens County, NY



# Impact on SO<sub>2</sub> Emissions



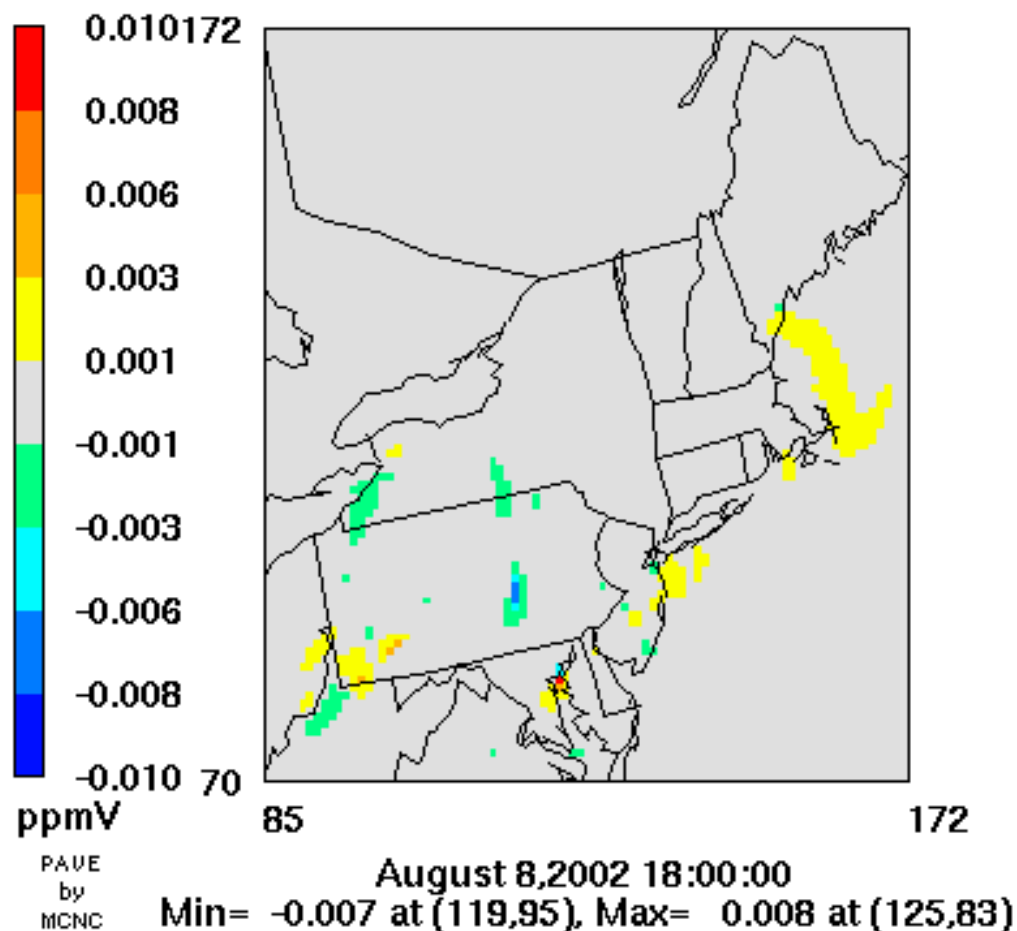
Hudson County, NJ

- SMOKE Default
- State-Specific
- CEM
- Facility-Specific

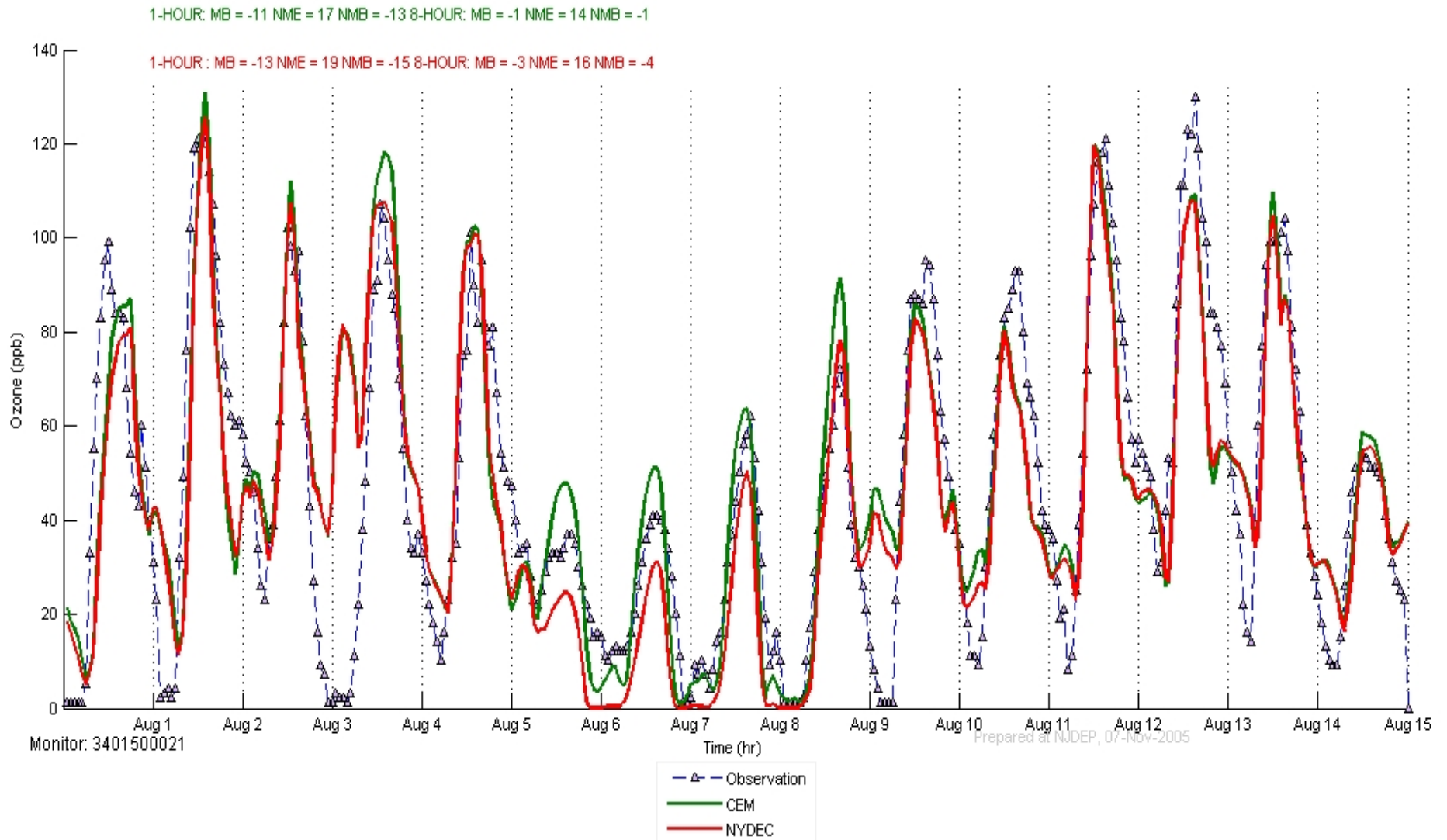
# Impact of CEM:

## O3\_Difference\_Plot

CEM\_Temporal-Default  
MANE-VU



# Impact on Ozone

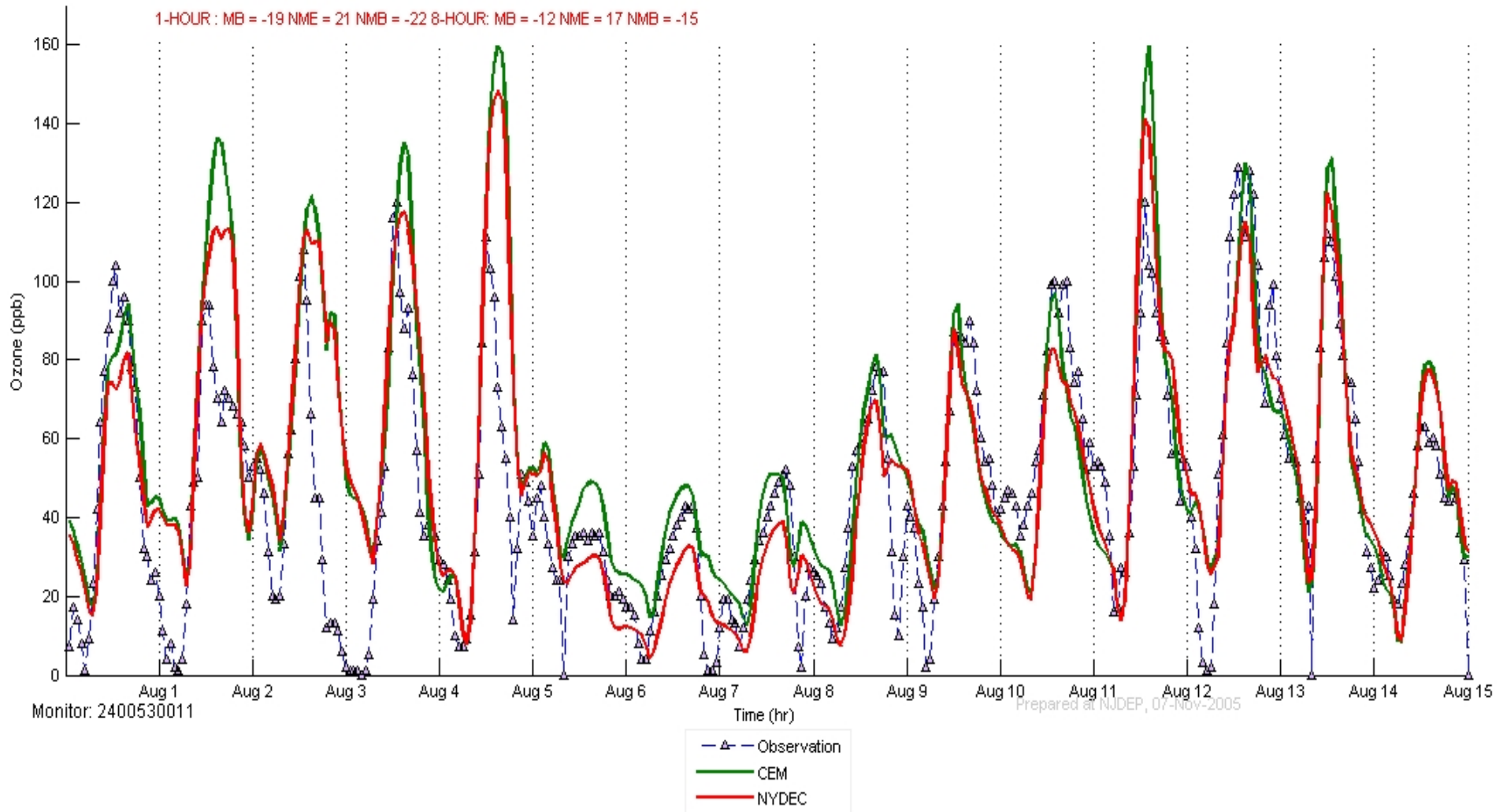


AQS Monitor at Gloucester, NJ (340150002)

# Impact on Ozone

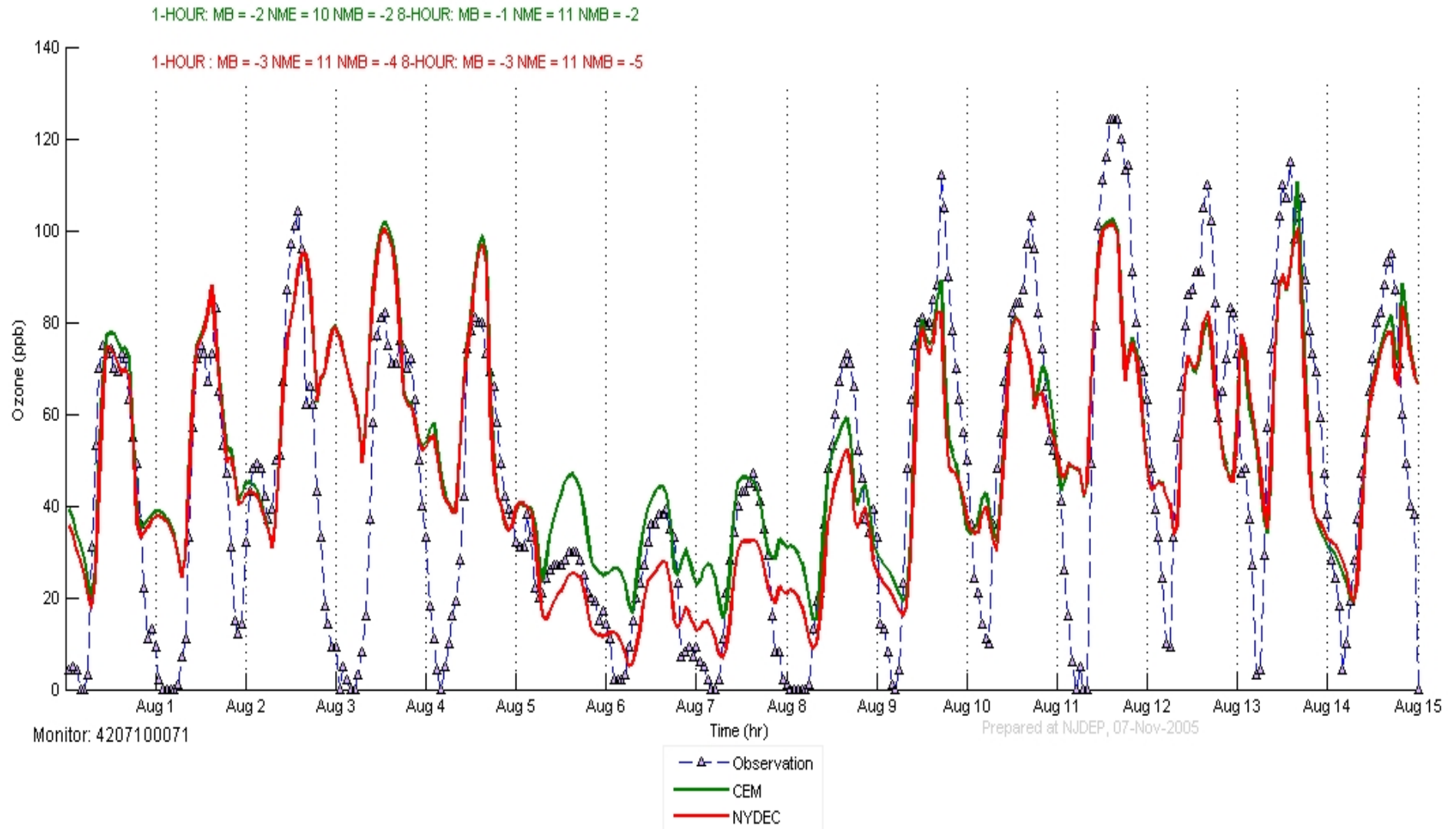
1-HOUR: MB = -16 NME = 18 NMB = -18 8-HOUR: MB = -10 NME = 15 NMB = -12

1-HOUR: MB = -19 NME = 21 NMB = -22 8-HOUR: MB = -12 NME = 17 NMB = -15



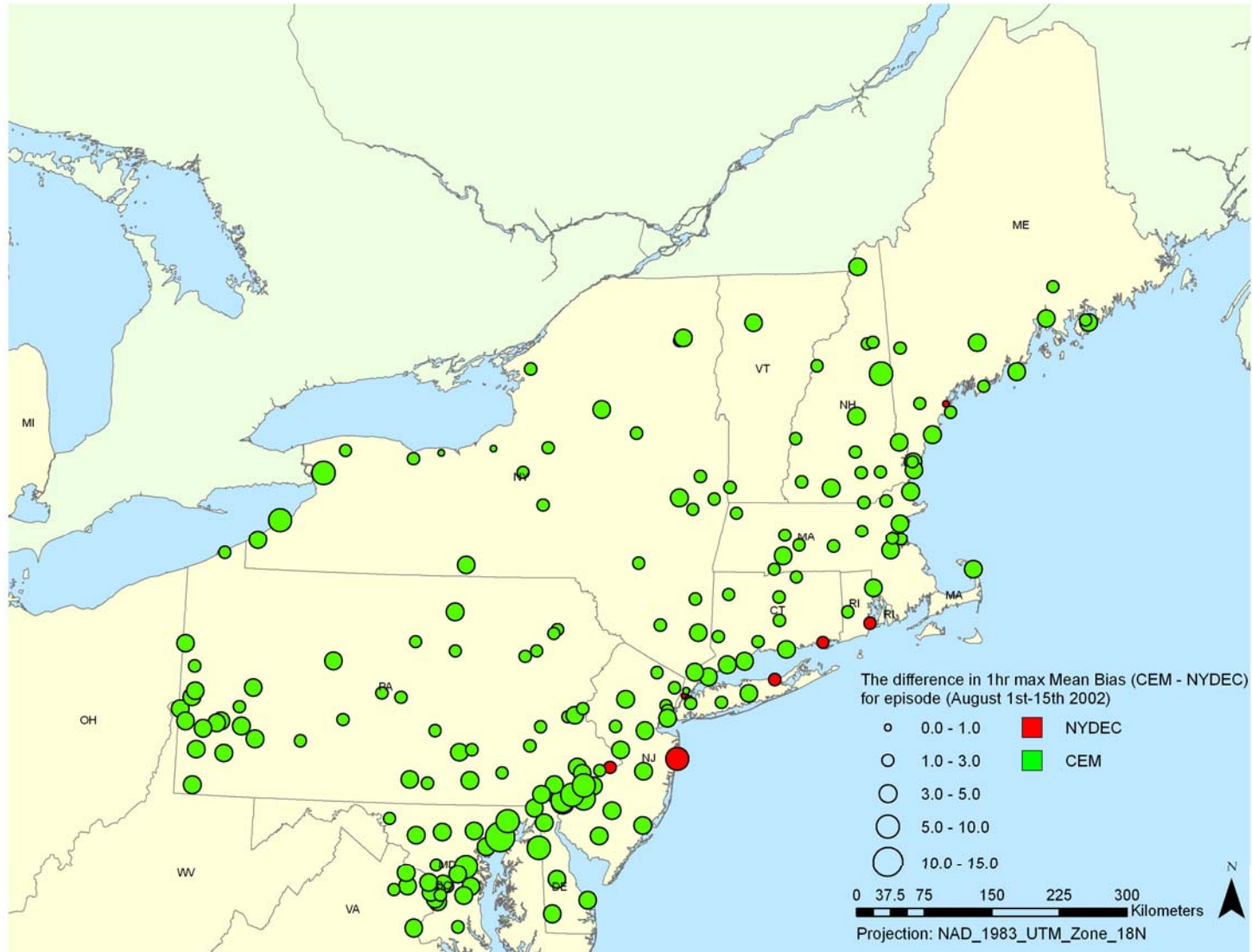
AQS Monitor at Baltimore, MD (2400530011)

# Impact on Ozone

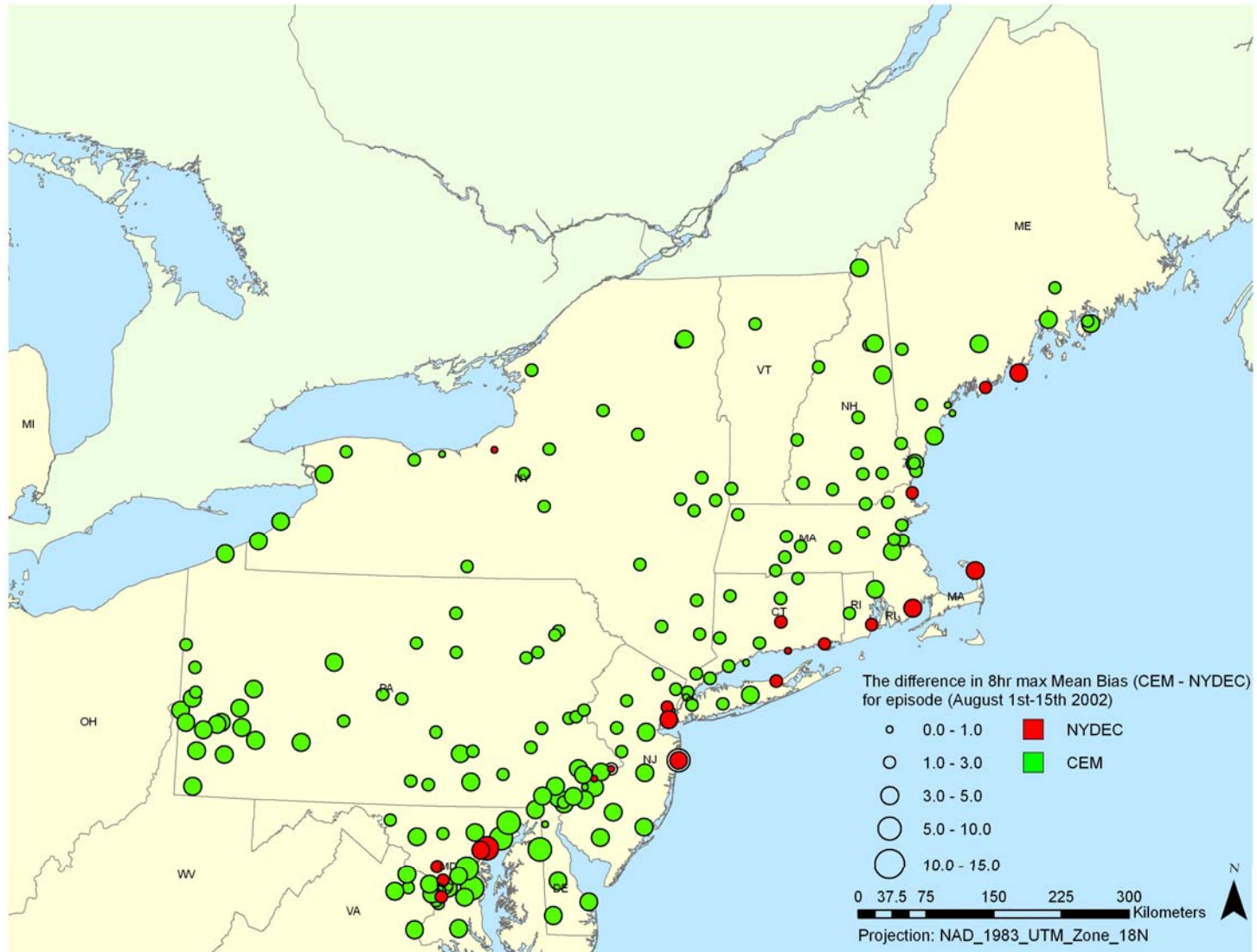


AQS Monitor at Lancaster, PA (4207100071)

# Impact on Ozone: 1 hr MB



# Impact on Ozone: 8 hr MB



# Findings

Incorporation of temporal profiles and CEM data changes emissions distributions: In some locations the difference in emissions can be as high as high as 3-4 times the default.

Impact on ozone is significant when using CEM data along with state-specific and facility-specific temporal profiles.

# Acknowledgements

New Jersey Department Environmental Protection (NJDEP)

Ozone Research Center (ORC), Rutgers University

New York Department of Environmental Conservation (NYDEC)

University of Maryland (UMD)

Mid-Atlantic Regional Air Management Association (MARAMA)

MANE-VU States