

**Preliminary Comments from Members of the Clean Air Scientific  
Advisory Committee (CASAC) Air Monitoring and Methods  
Subcommittee (AMMS)  
Additional Preliminary Comments received on 2/16/11**

**Purpose:** To review and provide advice on the scientific adequacy and appropriateness of EPA draft documents on monitoring and methods for Oxides of Nitrogen (NO<sub>x</sub>) and Sulfur (SO<sub>x</sub>).

**Additional Preliminary Comments from Dr. George Allen**

# Issues with NO<sub>y</sub> Data Quality: How do you tell if it's good?

George Allen



Presented at the NESCAUM MAC meeting, October 27, 2010

## The Problem:

NO<sub>y</sub> is a complex mixture of several species

Both particle and gas phase

Can not “challenge” an analyzer with the real thing

## Definitions:



NO<sub>z</sub>: the sum of “other” oxidized nitrogen species

Nitric Acid (HNO<sub>3</sub>) - a gas

Ammonium Nitrate - a particle

PAN - a gas

Other organic nitrates

... does not include reduced N species (NH<sub>3</sub>)

## Measurement Issues

Traditional commercial “NO<sub>y</sub>” instruments did not work  
NO-what?

Did not follow “best practices”; data similar to “NO<sub>x</sub>”  
Good NO<sub>y</sub>: custom research instruments

Newer “Trace” NO<sub>y</sub> instruments address most issues  
Still not a “routine” measurement!!!

Calibration Issues:

is IPN necessary? Expert Poll results: Maybe.

ID’s aging converter eff. better than NO<sub>2</sub>

Cylinder analysis accuracy not as good as NO

Suggest using IPN as benchmark over time, w/ GPT

Run Moly at 340 C? (Eric Edgerton)

## How can you know if your NO<sub>y</sub> data are “good”?

You can't. Current option:

Follow best practices for instrumentation, siting (fetch), installation (inlet height), operation, calibration.

2005 EPA Trace Gas NO<sub>y</sub> TAD is helpful but dated

<http://www.epa.gov/ttnamti1/files/ambient/monitorstrat/precursor/tadverson4.pdf>

<http://www.epa.gov/ttnamti1/files/ambient/pm25/spec/noysum2.pdf>

Waiting for “True NO<sub>2</sub>” photolytic instruments (API)

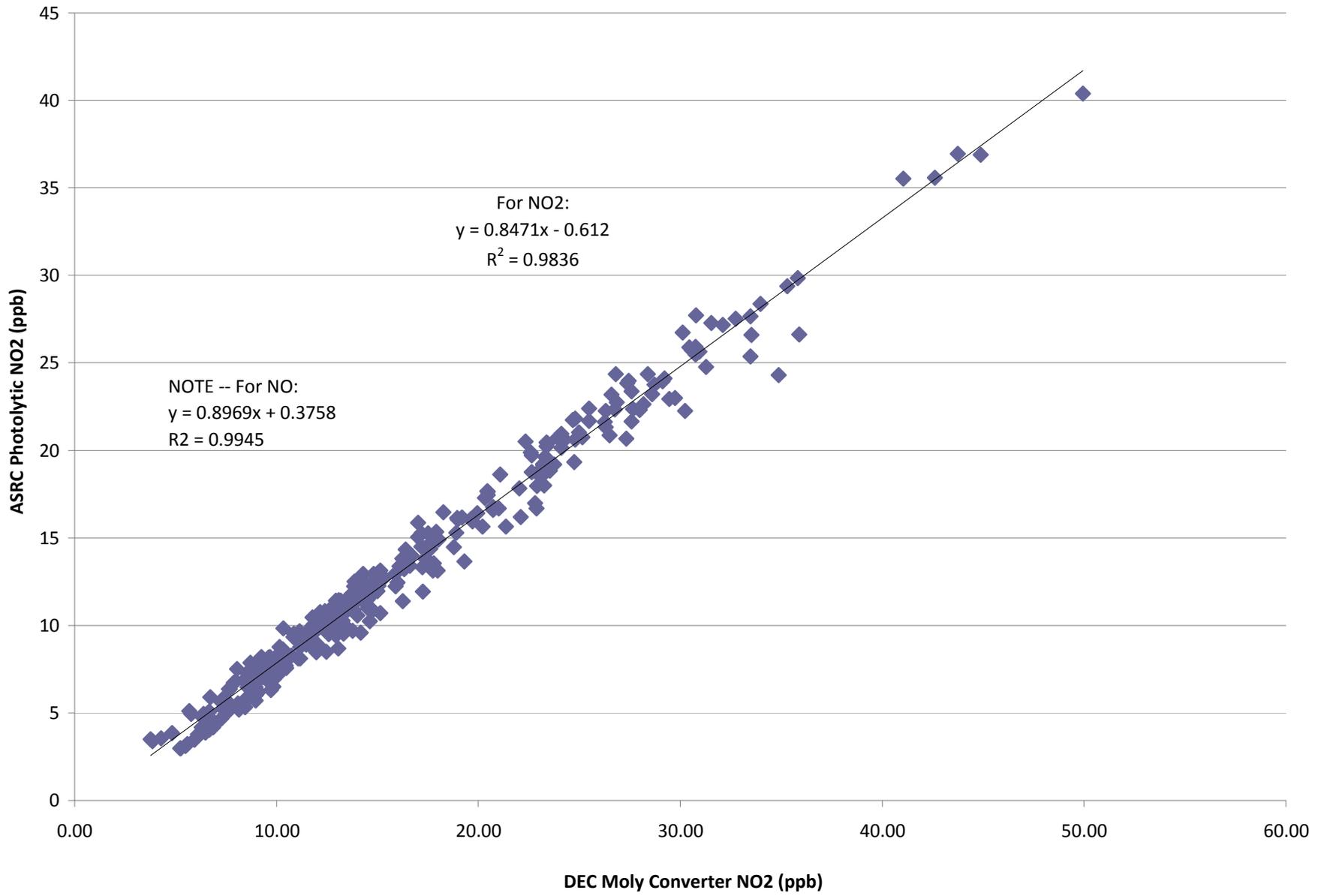
Robust measure of NO<sub>x</sub>

Current NO<sub>2</sub>/NO<sub>x</sub> data is NO<sub>x</sub> plus some NO<sub>z</sub>

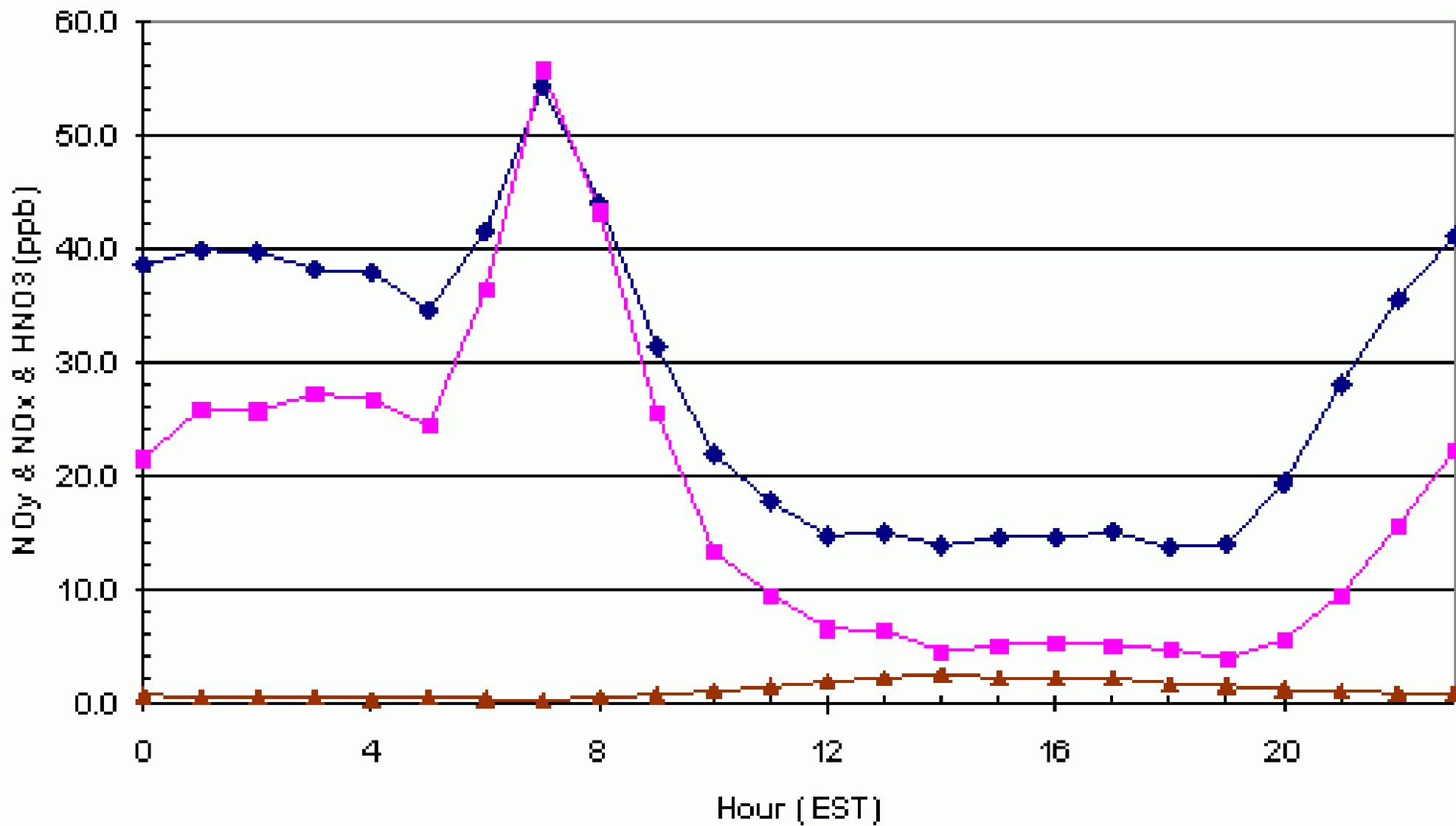
With True NO<sub>2</sub>/NO<sub>x</sub> measurements (lower NO<sub>2</sub>):

Distinct NO<sub>z</sub> temporal patterns at most sites (not NR or QC)

# NO2 Correlation - DEC/ASRC - QC, July 2009

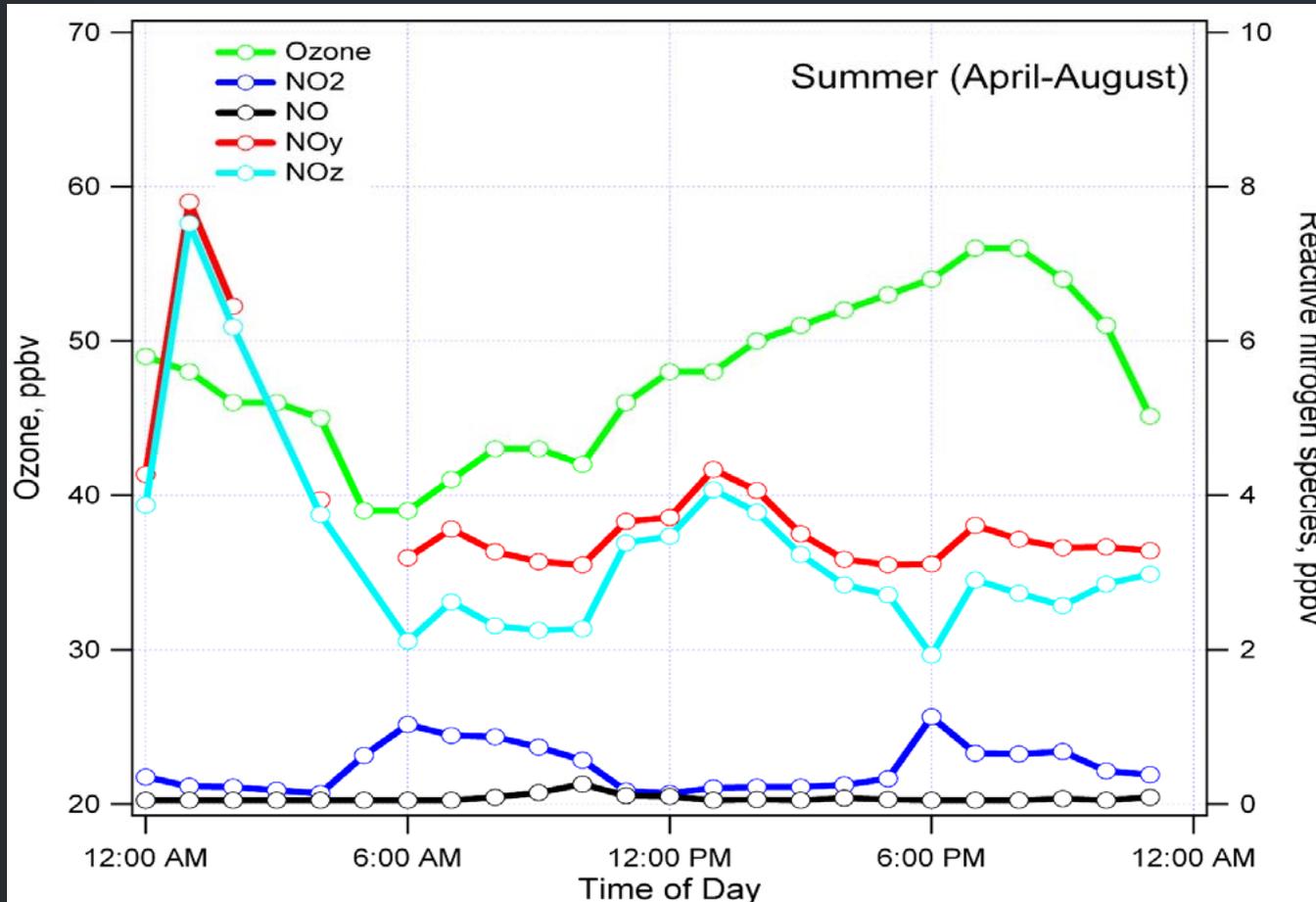


# Atlanta-JST July 2001 Observed Diurnal NOy & NOx & HNO3



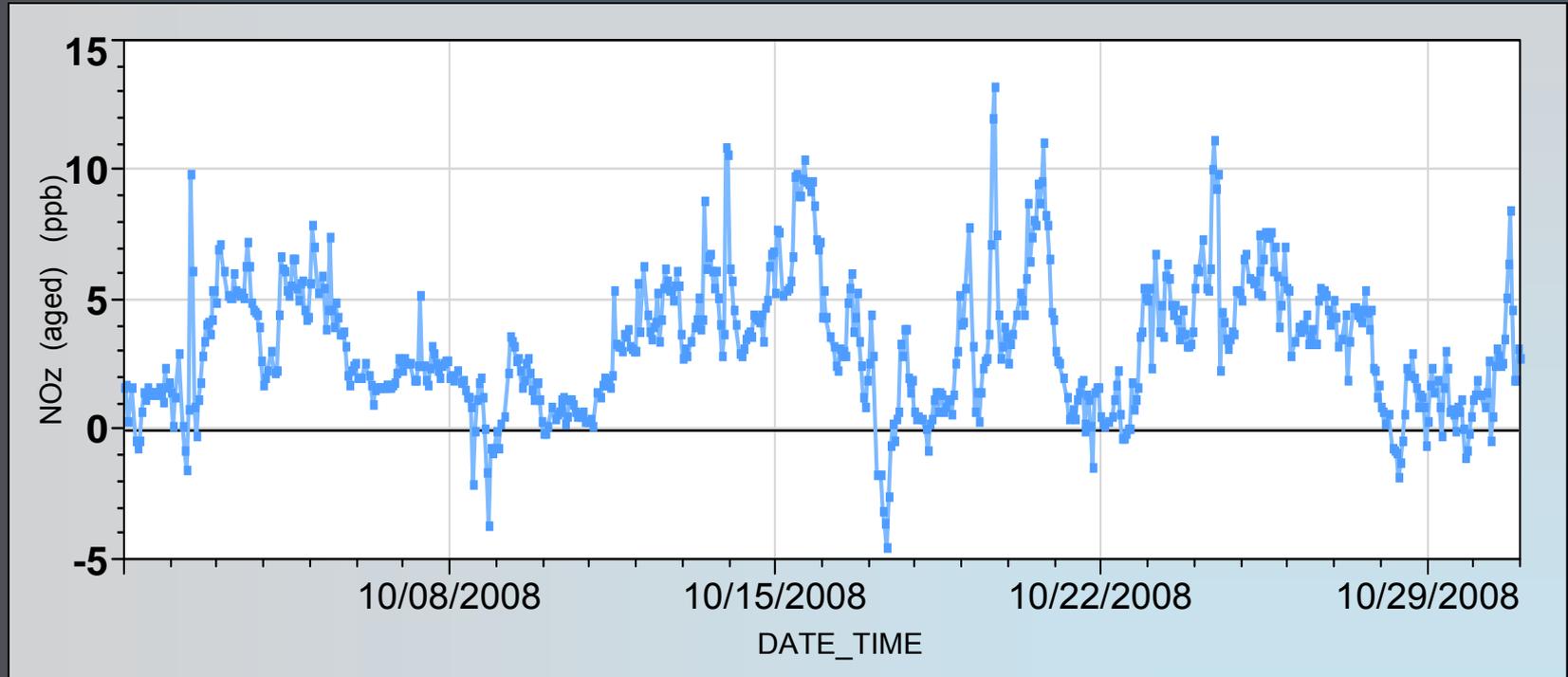
◆ JST NOy    ■ JST NOx    ▲ JST HNO3

# Summer 2009 Diurnal Patterns



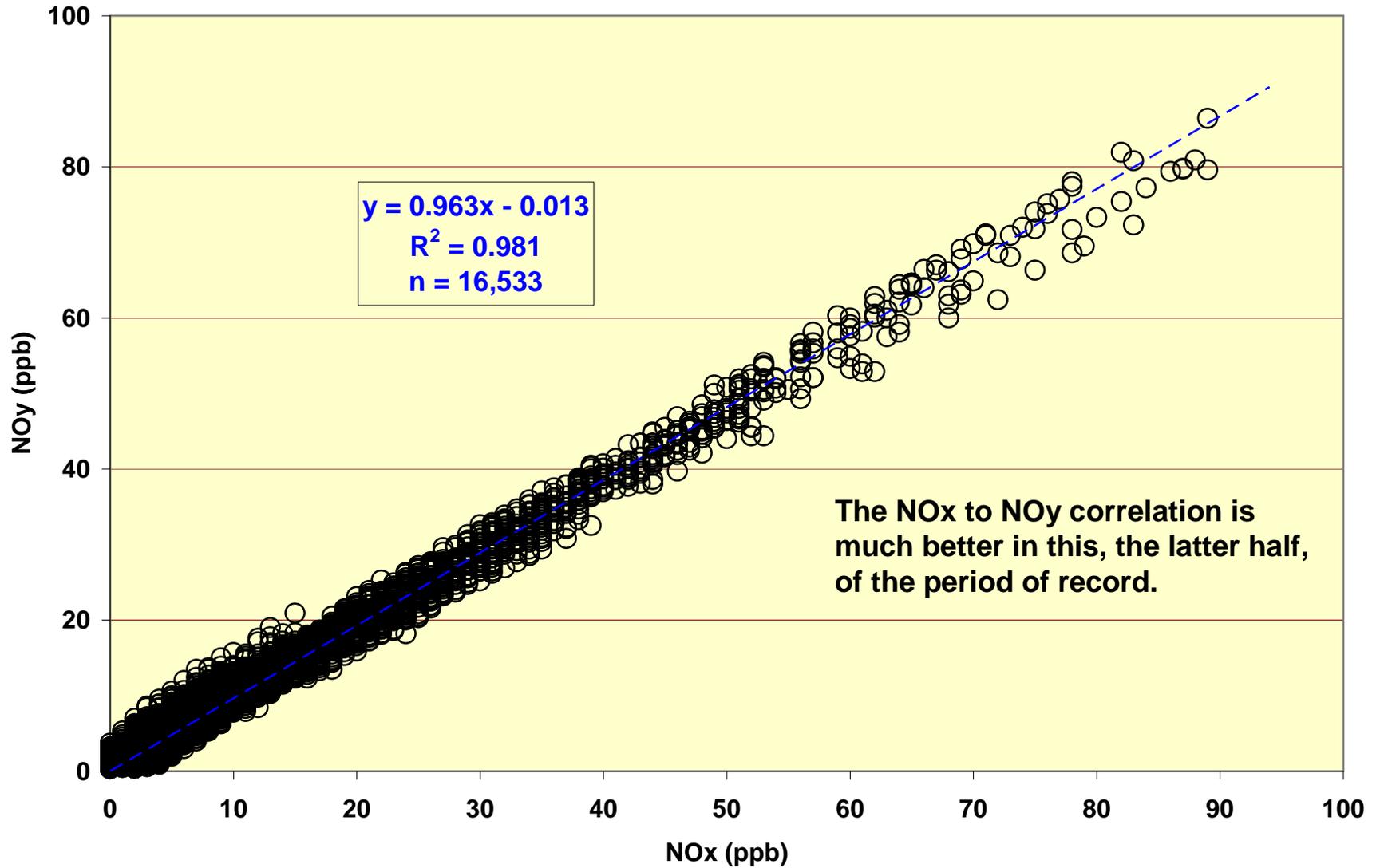
- Local ozone photochem production observed near solar noon, superimposed on a stronger transported ozone signal

# Aged Nitrogen Oxides for Oct. 2008



- At Look Rock, most of the  $\text{NO}_y$  is aged
- $\text{NO}_z$  is episodic; events lasting several days.
- Negative  $\text{NO}_z$  a problem. Instrument balance?

### Ware NOx vs NOy 1/02-7/04



## More information:

NO<sub>z</sub> in the Smoky Mountains:

<http://www.epa.gov/ttn/amtic/files/ambient/2009conference/Ray.pdf>

Classic S/L method NO<sub>x</sub> and NO<sub>y</sub> comparison (NO-w):

<http://bronze.nescaum.org/committees/monitoring/may05meeting/AI-NO-what.ppt>

“Measurements of primary trace gases and NO<sub>y</sub> composition in Houston, Texas”.  
Luke et. al., Atmos. Environ., in press, 2009. doi:10.1016/j.atmosenv.2009.08.014

“Evaluation of nitrogen dioxide chemiluminescence monitors in a polluted urban environment”. Atmos. Chem. Phys., 7, 2691–2704, 2007

[www.atmos-chem-phys.net/7/2691/2007/](http://www.atmos-chem-phys.net/7/2691/2007/)