

Issues with NO_y Data Quality: How do you tell if it's good?

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Presented at the NESCAUM MAC meeting, October 27, 2010

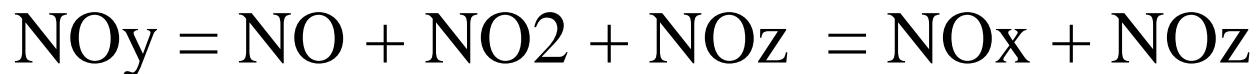
The Problem:

NO_y is a complex mixture of several species

Both particle and gas phase

Can not “challenge” an analyzer with the real thing

Definitions:



NO_z: the sum of “other” oxidized nitrogen species

Nitric Acid (HNO₃) - a gas

Ammonium Nitrate - a particle

PAN - a gas

Other organic nitrates

... does not include reduced N species (NH₃)

Measurement Issues

Traditional commercial “NO_y” instruments did not work
NO-what?

Did not follow “best practices”; data similar to “NO_x”
Good NO_y: custom research instruments

Newer “Trace” NO_y 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 NO₂

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_y 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_y 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 NO₂” photolytic instruments (API)

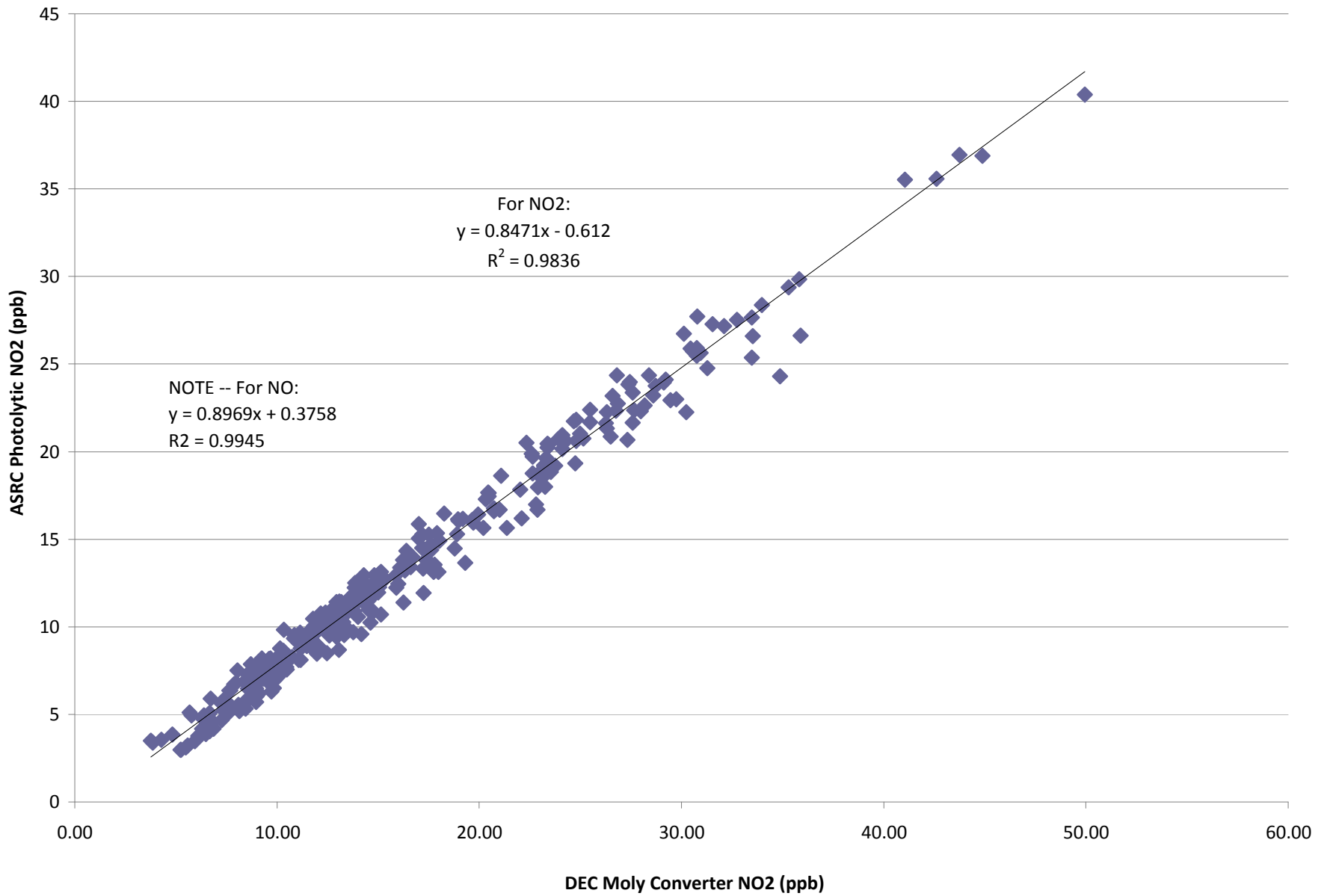
Robust measure of NO_x

Current NO₂/NO_x data is NO_x plus some NO_z

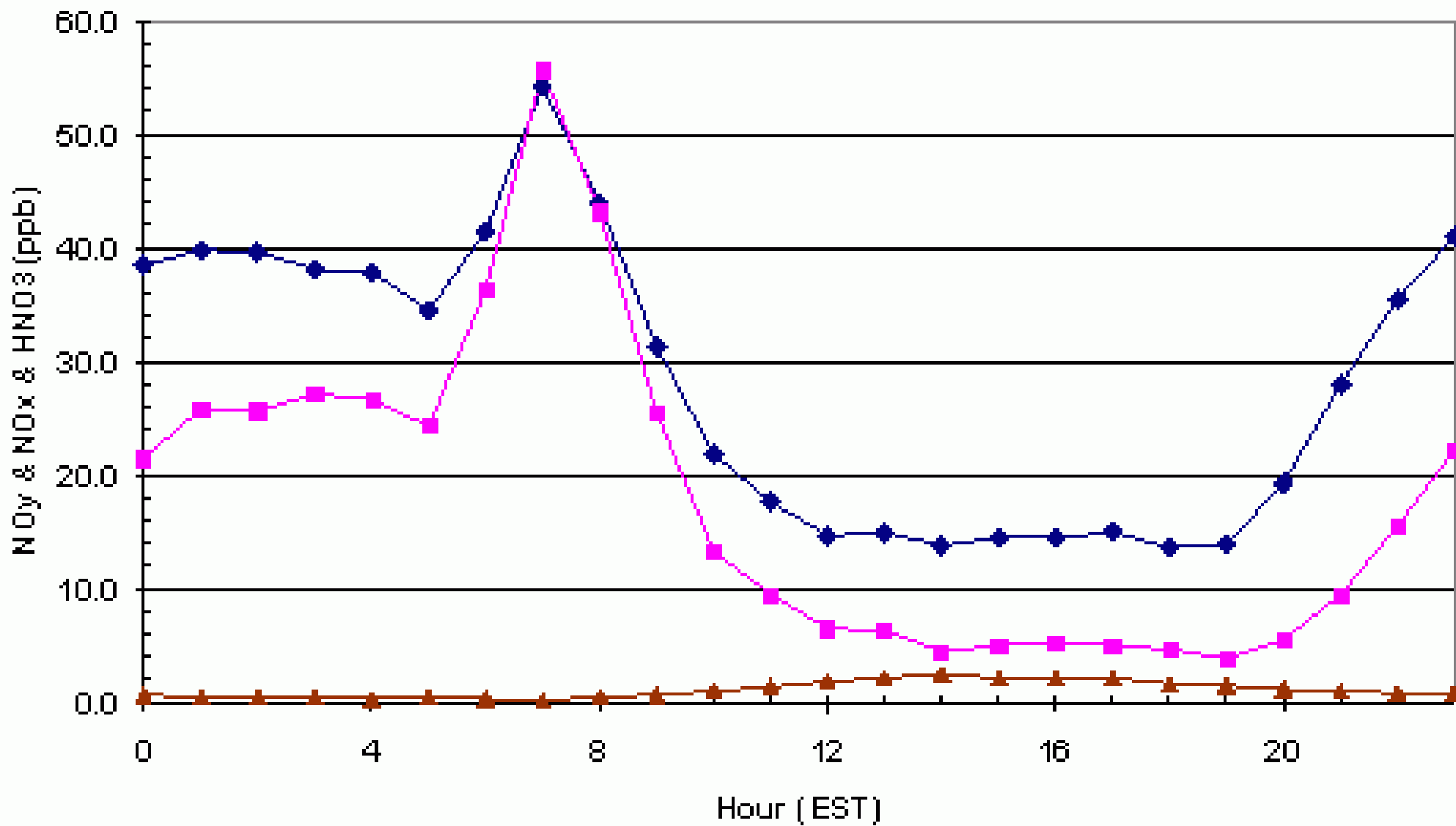
With True NO₂/NO_x measurements (lower NO₂):

Distinct NO_z temporal patterns at most sites (not NR or QC)

NO2 Correlation - DEC/ASRC - QC, July 2009

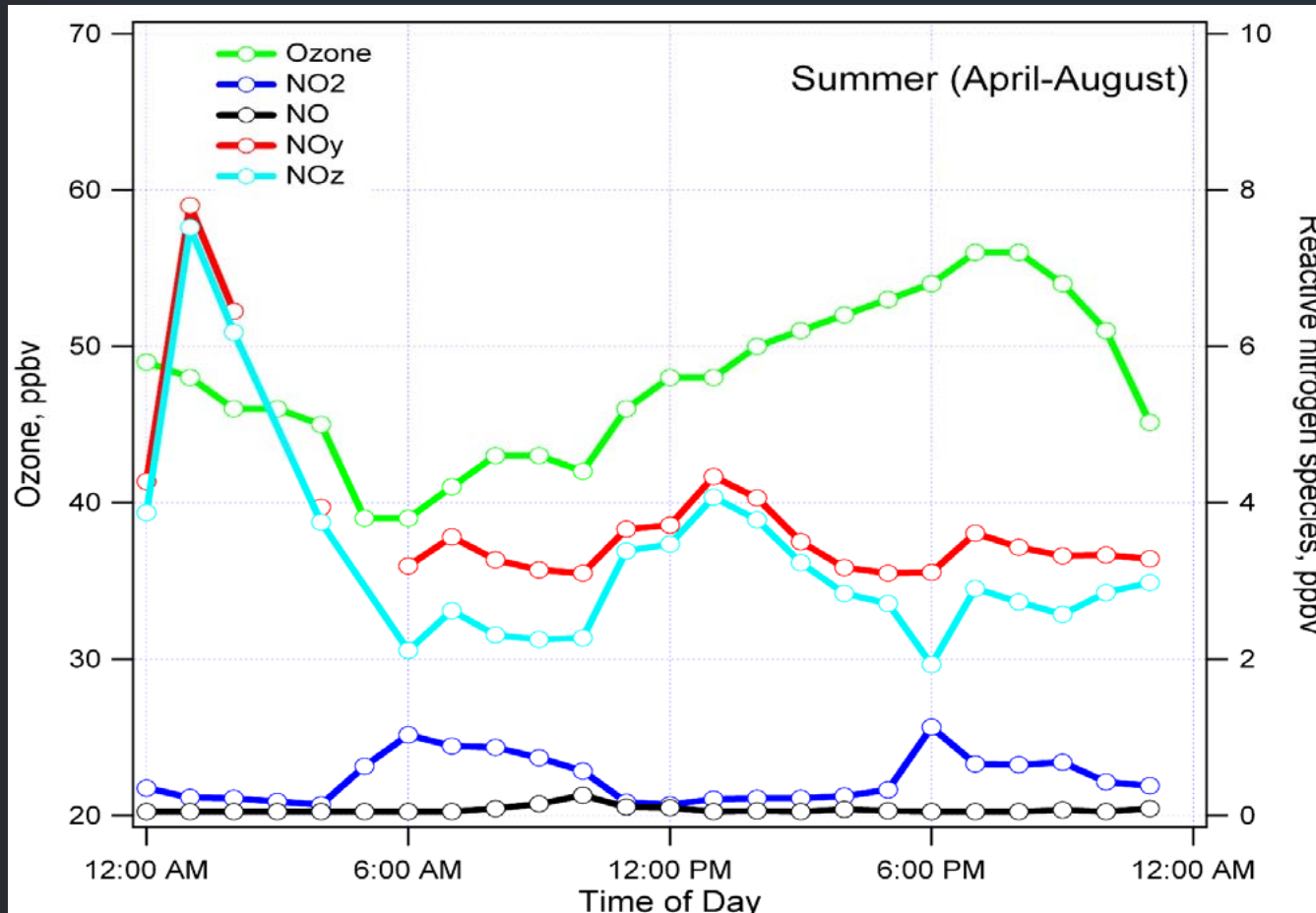


Atlanta-JST July 2001 Observed Diurnal NOy & NOx & HNO3



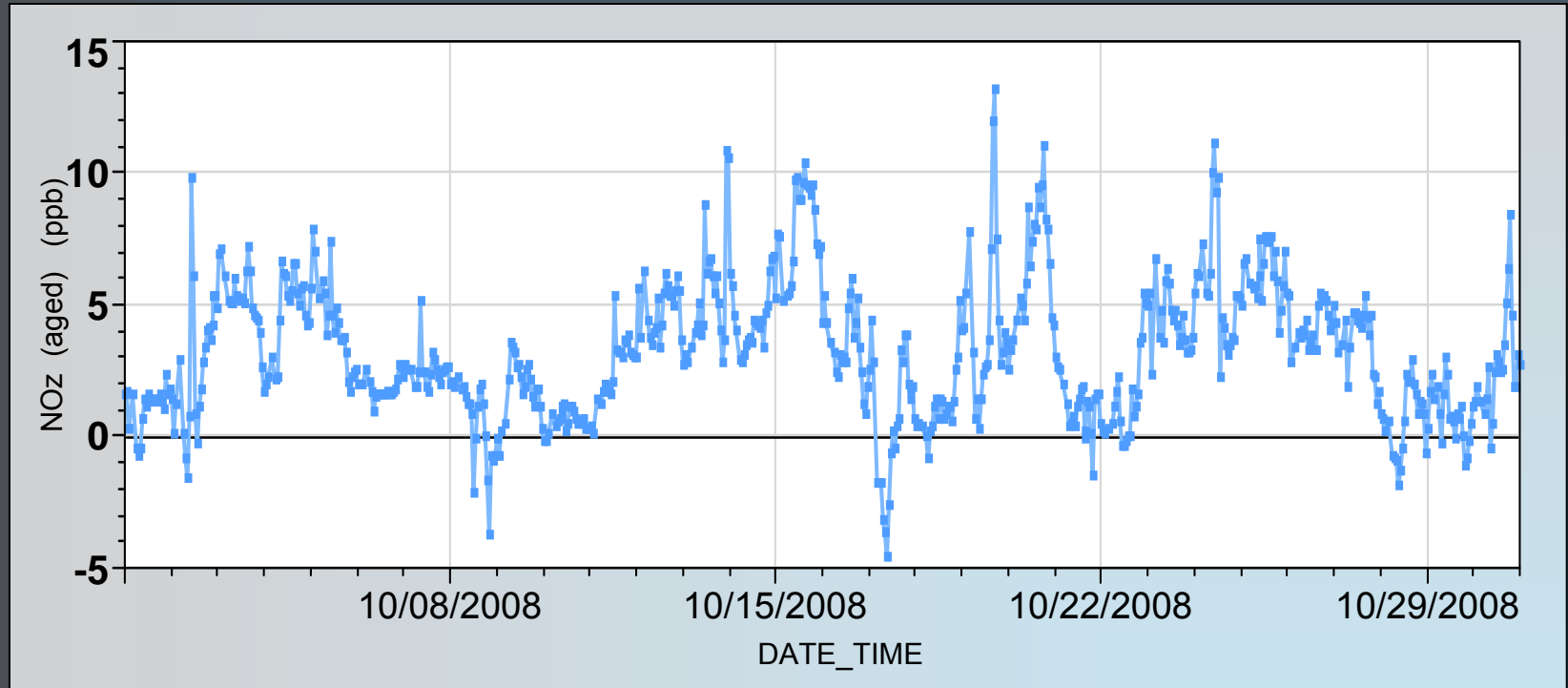
◆ JST NOy ■ JST NOx ▲ JST HNO3

Summer 2009 Diurnal Patterns



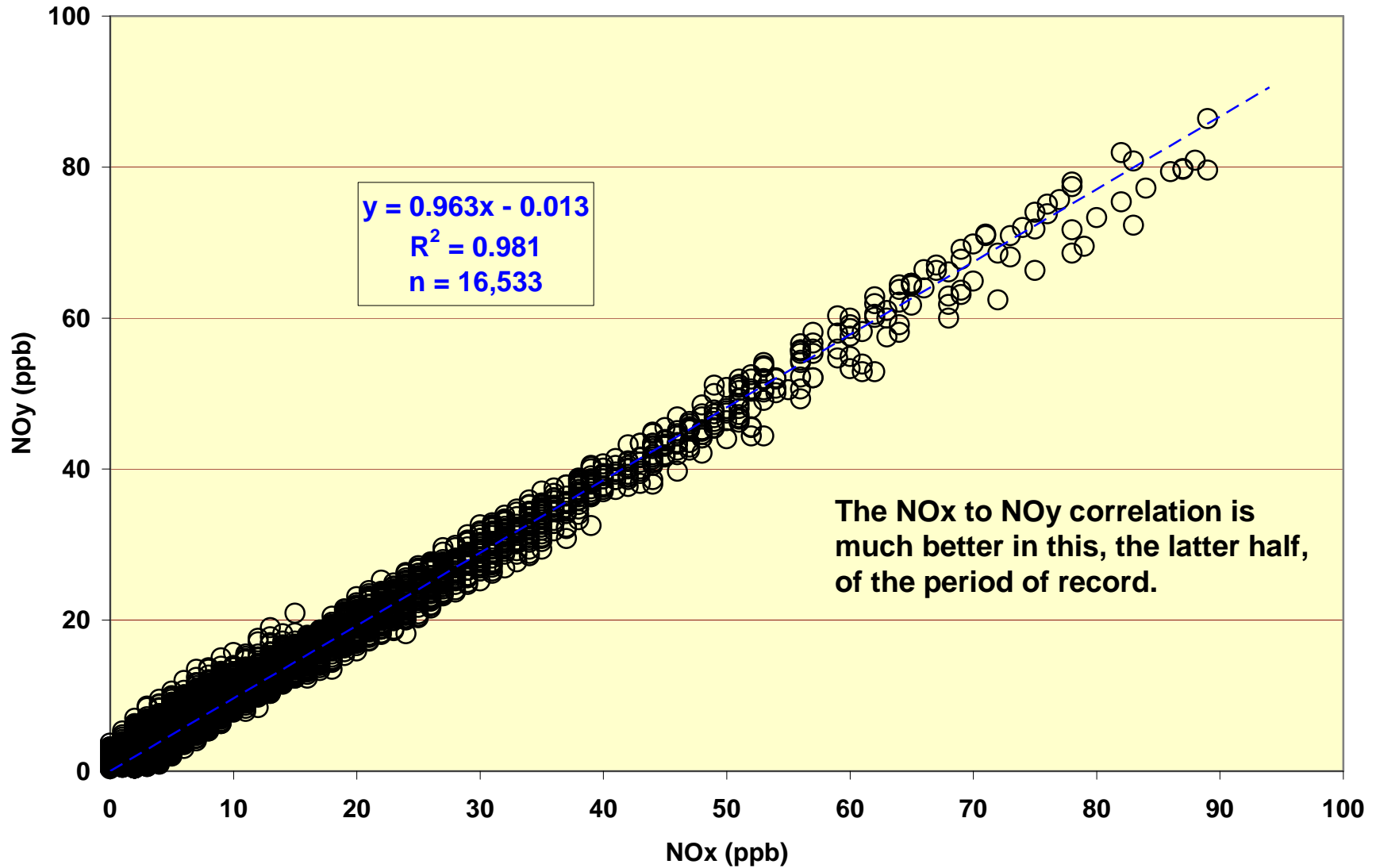
- Local ozone photochem production observed near solar noon, superimposed on a stronger transported ozone signal

Aged Nitrogen Oxides for Oct. 2008



- At Look Rock, most of the NO_y is aged
- NO_z is episodic; events lasting several days.
- Negative NO_z a problem. Instrument balance?

Ware NOx vs NOy 1/02-7/04



More information:

NO_z in the Smoky Mountains:

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

Classic S/L method NO_x and NO_y comparison (NO-w):

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

“Measurements of primary trace gases and NO_y 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/