



Atmospheric Nitrogen Research

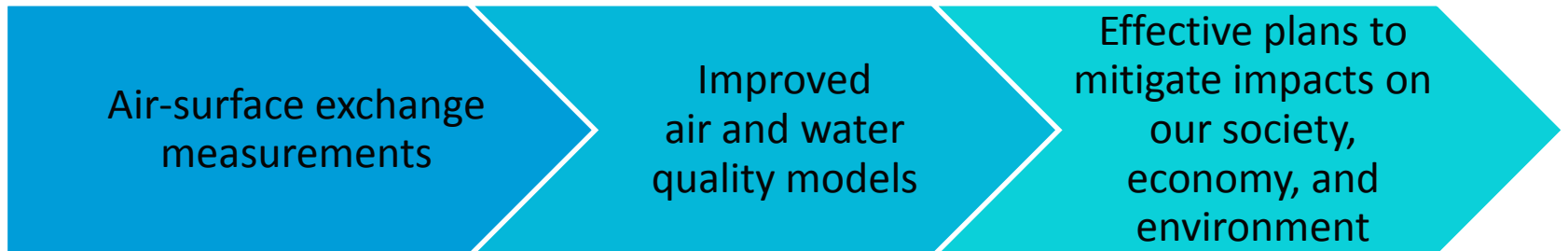
LaToya Myles
Air Resources Laboratory

ARL Laboratory Review
May 3-5, 2011

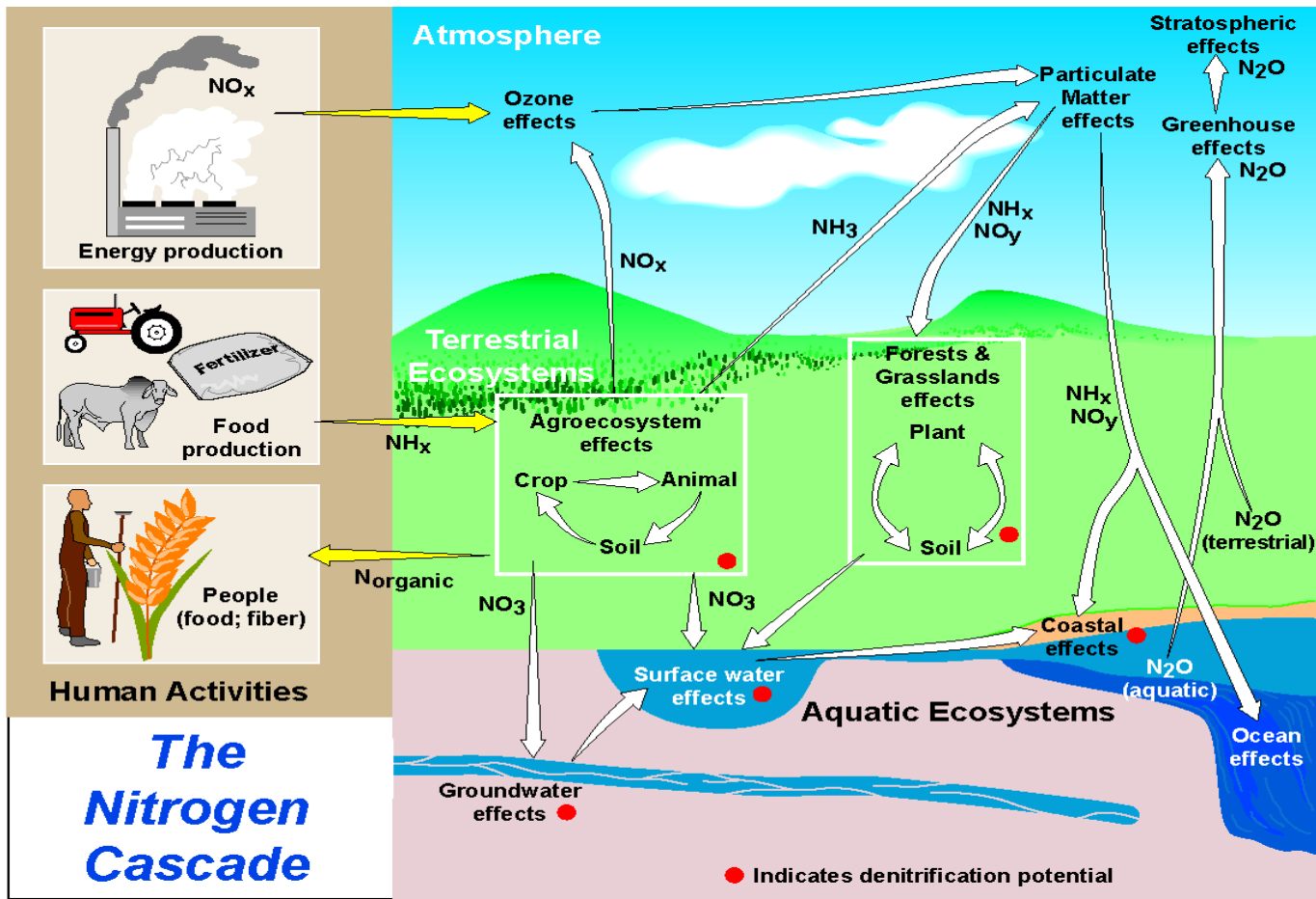


Goal

- Provide sound scientific information on the emission, transformation, and air-surface exchange of nitrogen compounds in the air.



“Cascading” Effects of Nitrogen in the Environment



(Galloway et al., 2003)

Approach

- Short-term Research Intensives
 - Fast-response and integrated trace gas measurements
 - Extensive collaboration in major process studies to better understand the cycling of nitrogen compounds



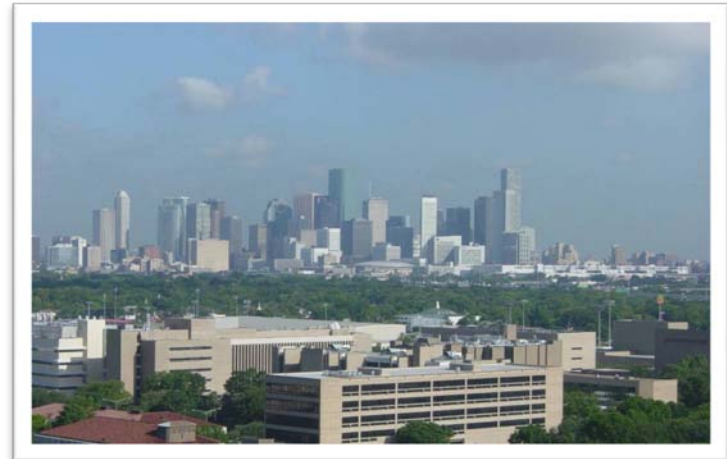
Measurement scaffold atop the Moody Tower on the University of Houston campus.



Fast-response sensor (inlet shown center) and traditional annular denuder samplers in California.

TexAQSI Radical and Atmospheric Measurement Project (TRAMP)

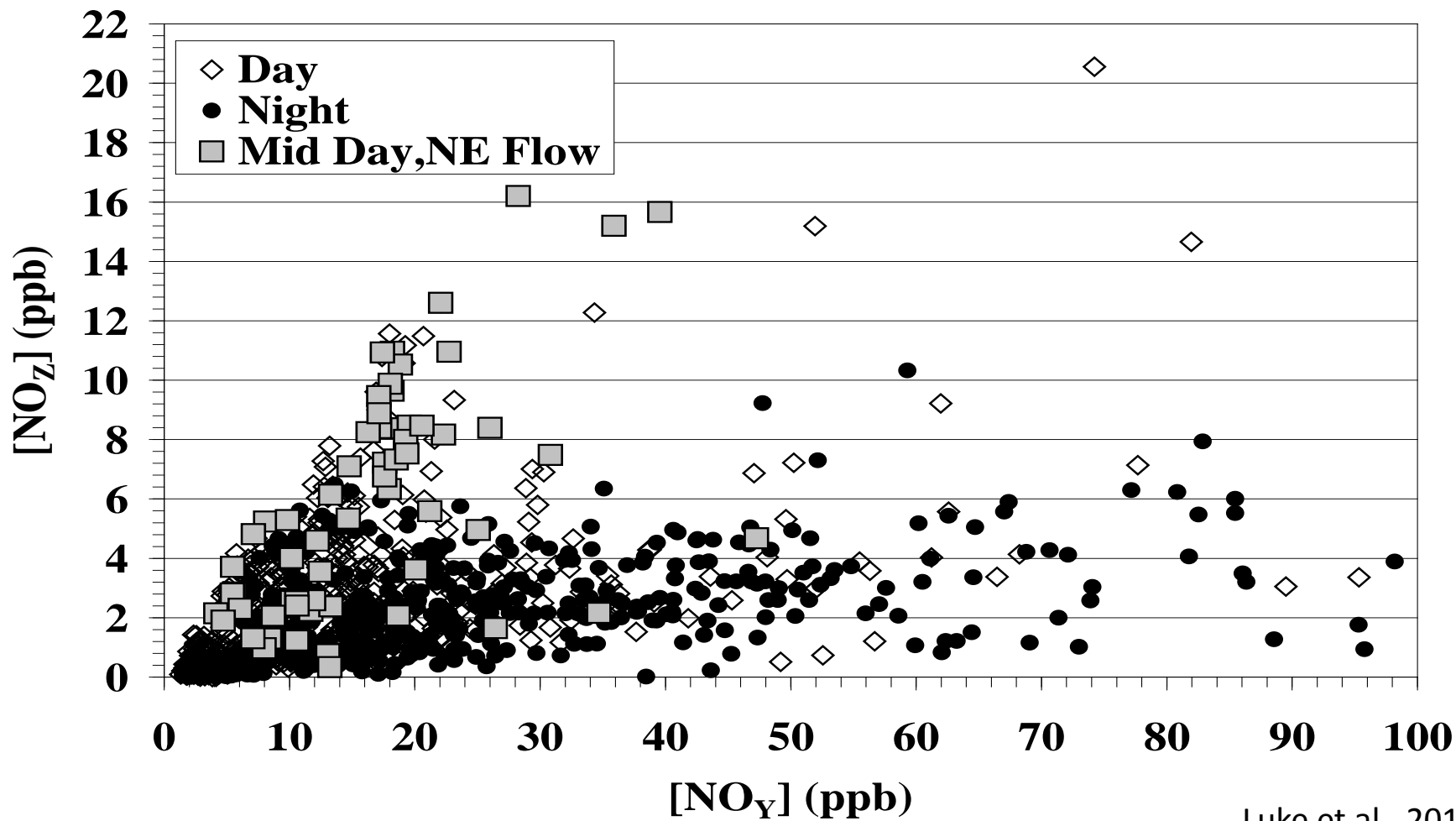
- Summertime air quality study in Houston in 2006
- Emissions from mobile sources and numerous electrical generation units, petrochemical facilities and other industrial sources



View of downtown Houston from Moody Tower under clear and polluted conditions.

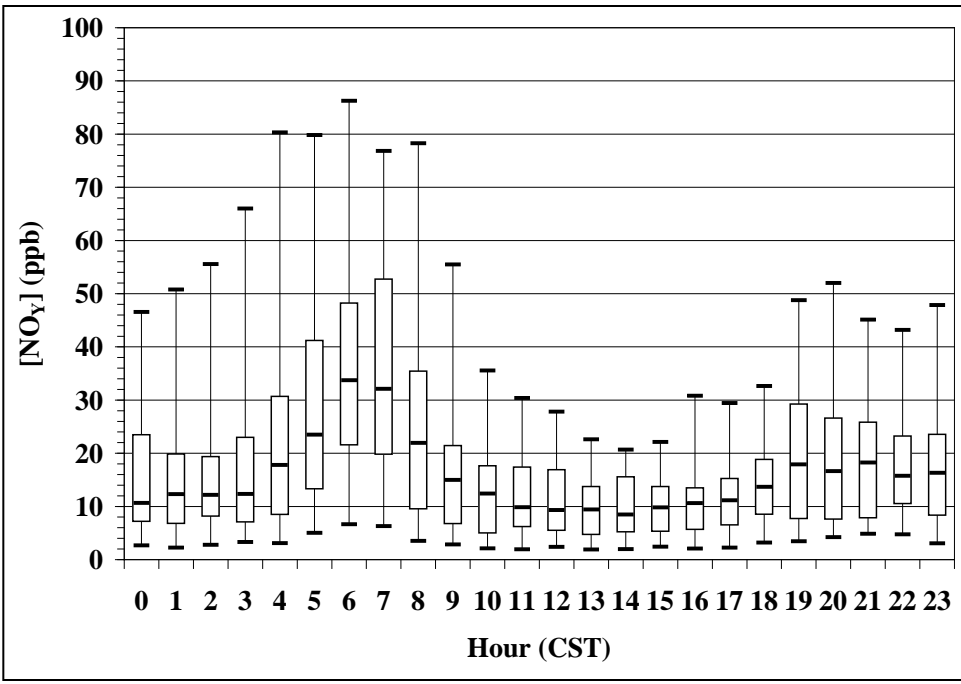


TRAMP Study

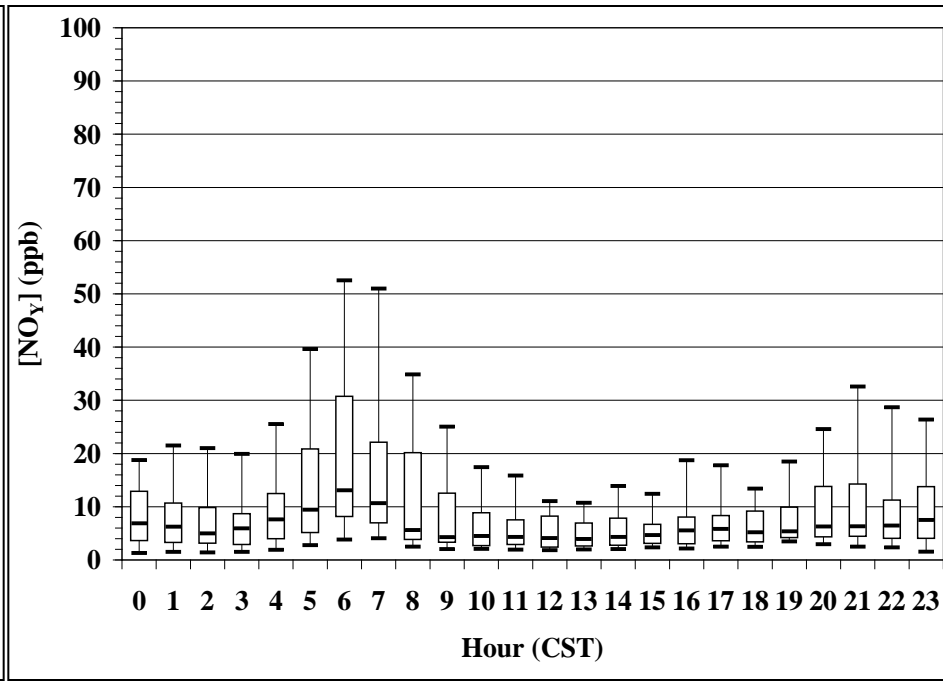




Study of Houston Atmospheric Radicals Project (SHARP)

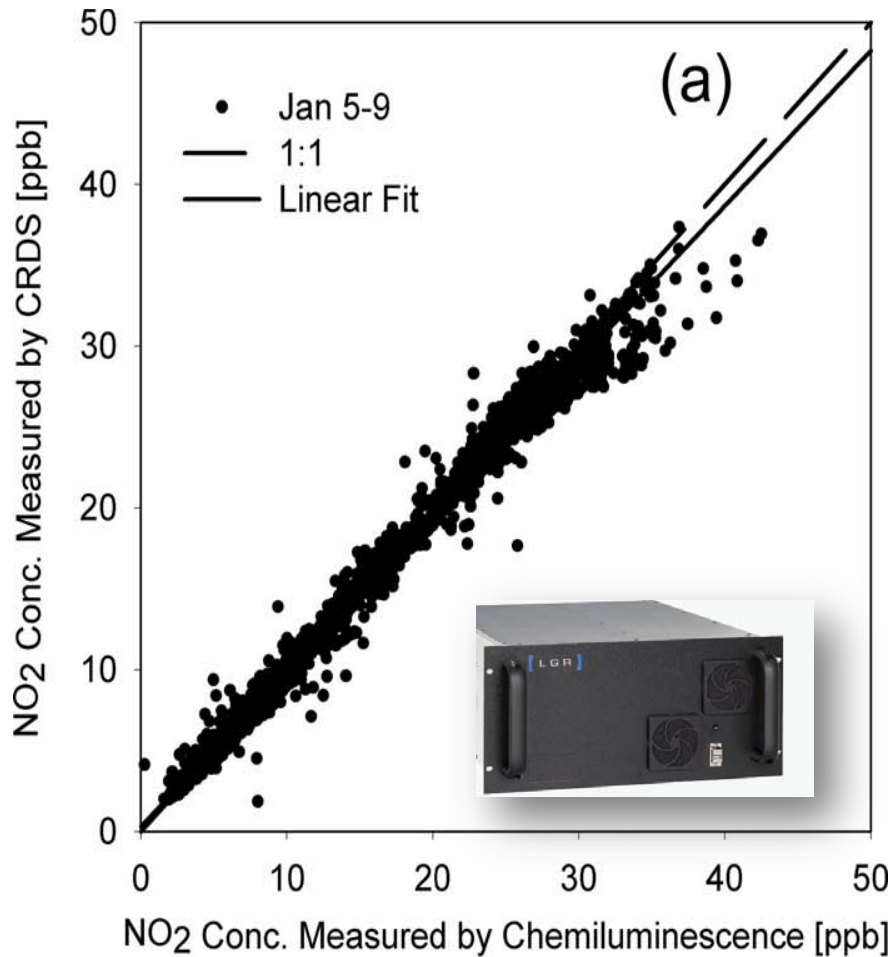


2006



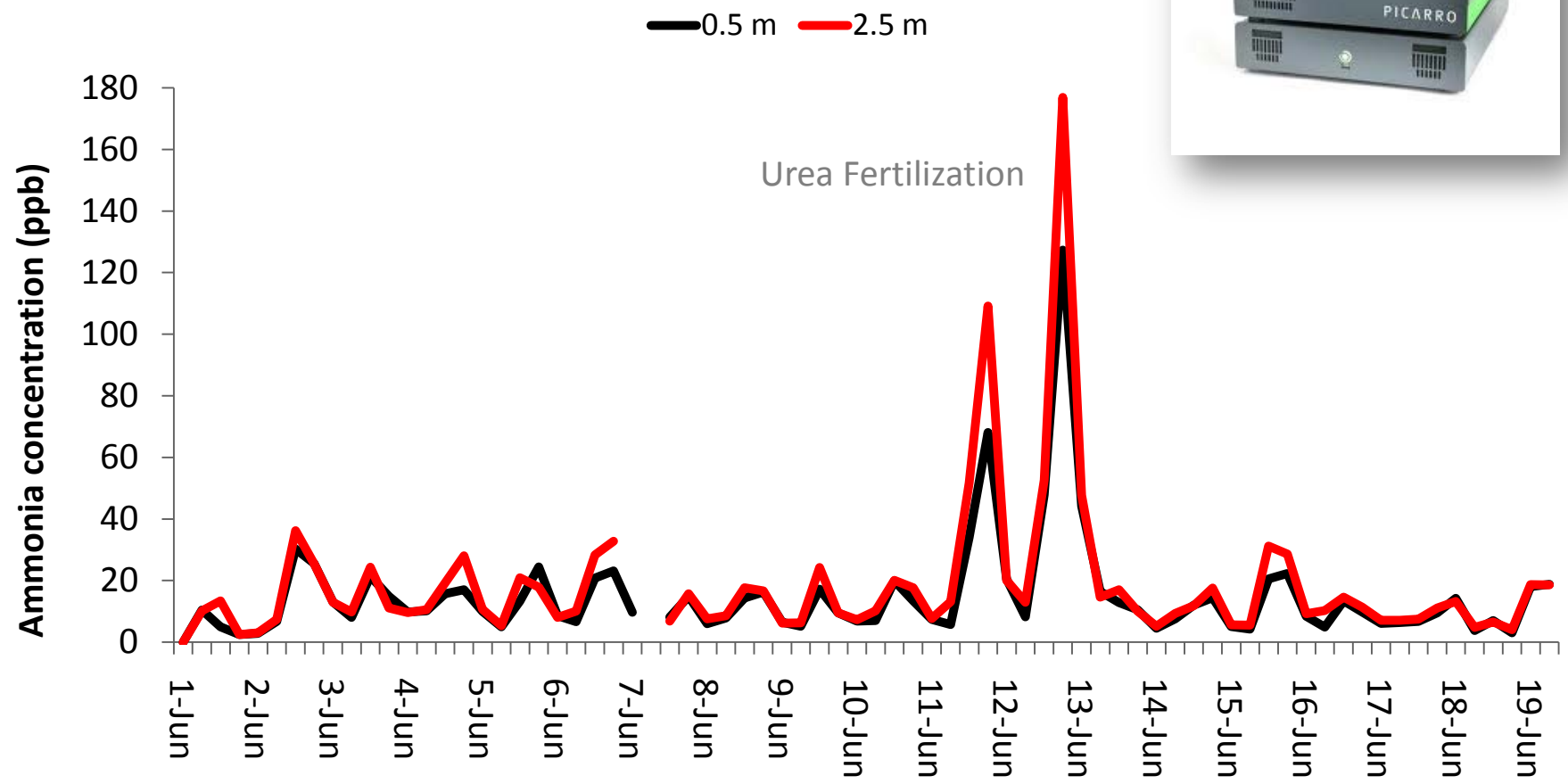
2009

NO₂ Detection Techniques



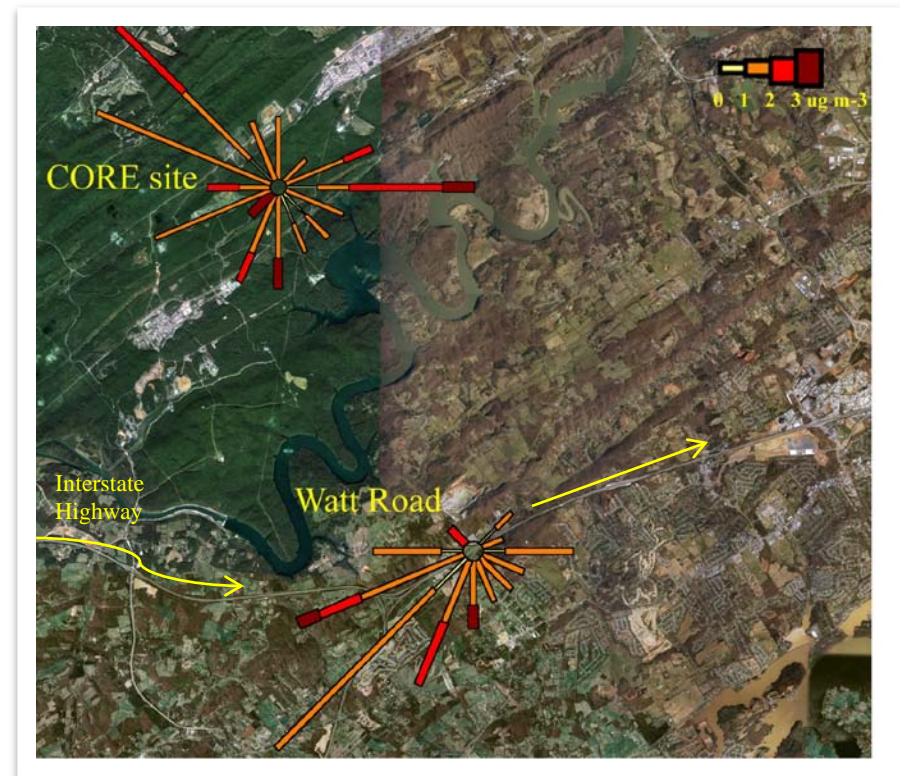
- Characterization of a commercial NO₂ detector
 - University of Maryland commercial spectrometer
 - ARL custom-built chemiluminescence detector

CalNex 2010 Study



Ammonia in East Tennessee Study

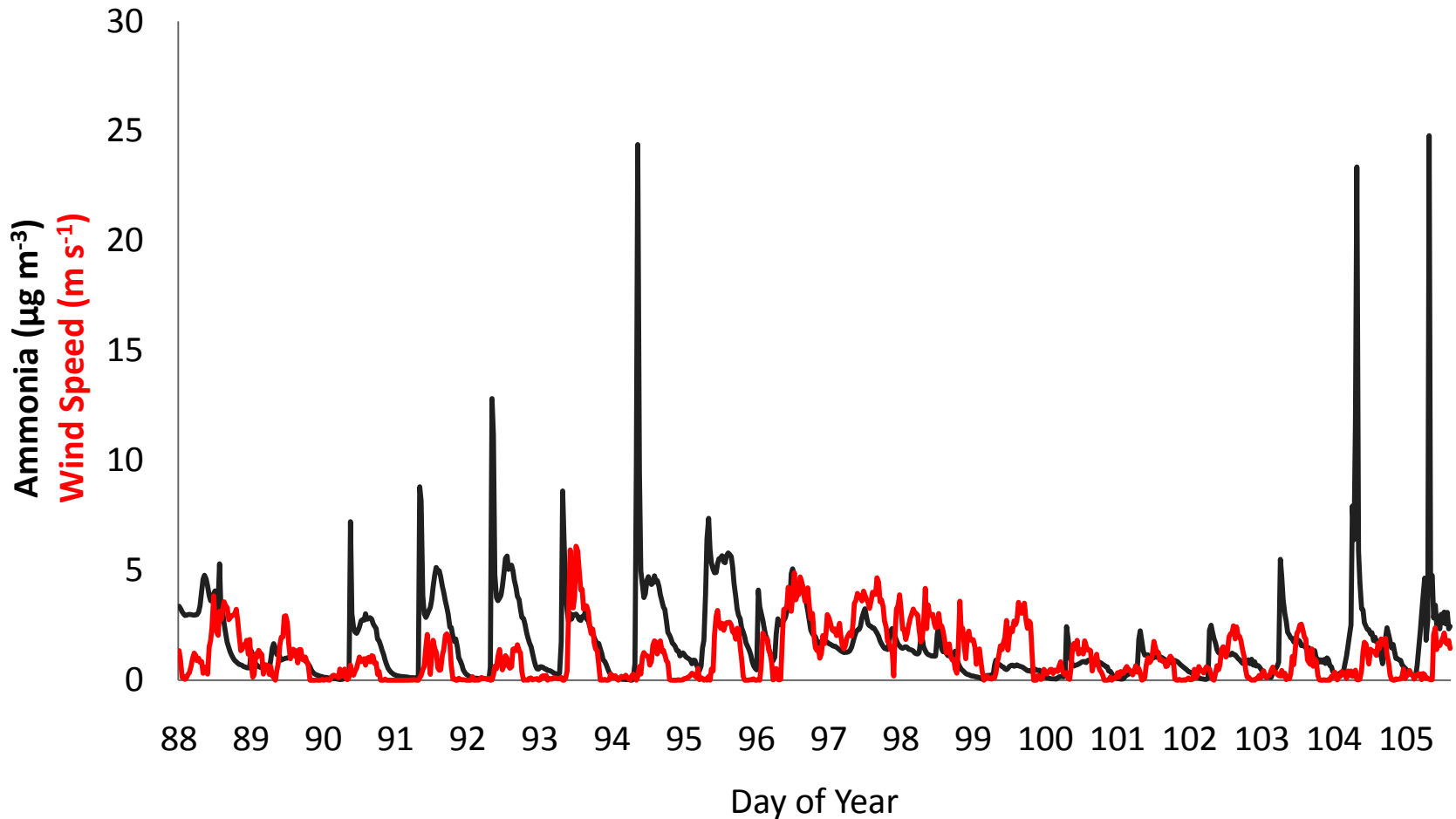
- Ammonia concentrations were slightly higher in winds emanating from the direction of the interstate highway.
- Complex topography in the Tennessee Valley channels winds and limits influx from certain directions.



Allen et al., 2011

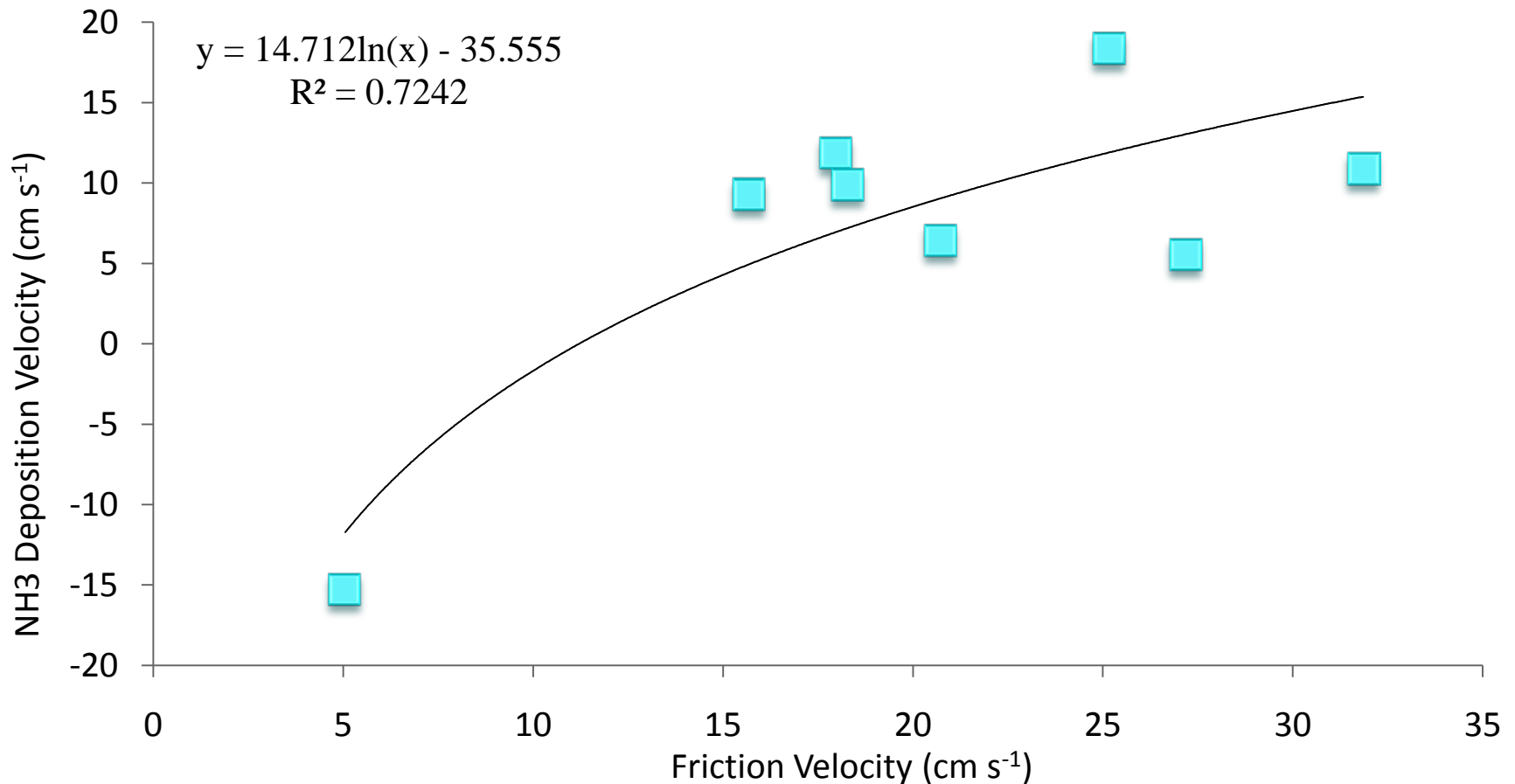


Atmospheric Deposition of Ammonia Study





Drivers for Ammonia Air-Surface Exchange



Myles et al., 2010



Indicators of Success

- Publications
 - Recent papers in peer-reviewed journals
 - *Atmospheric Environment, Nature Geoscience, Journal of Environmental Quality, Environmental Research Letters, Review of Scientific Instruments*
 - Invited commentary and review articles
- Datasets
 - Historic air-surface exchange measurements
 - Atmospheric Integrated Research Monitoring Network (AIRMoN)
 - Research intensives and collaborative projects
- Improved Measurement Techniques
 - Evaluation of cavity-ring down spectroscopy
 - Custom-built chemiluminescence detector



Collaborators



PICARRO



Aerodyne Research Inc.



National Atmospheric Deposition Program





Future Directions

- Products
 - Communication of findings to collaborators and the public
 - Accessible historical datasets
- Measurement studies
 - Determine suitability of real-time sensors for long-term air-surface exchange research
 - Conduct research intensives in coastal ecosystems
 - Investigate contribution of organic nitrogen to the reactive nitrogen budget and possible effects on regional air quality