U.S. Environmental Protection Agency participation in DISCOVER-AQ

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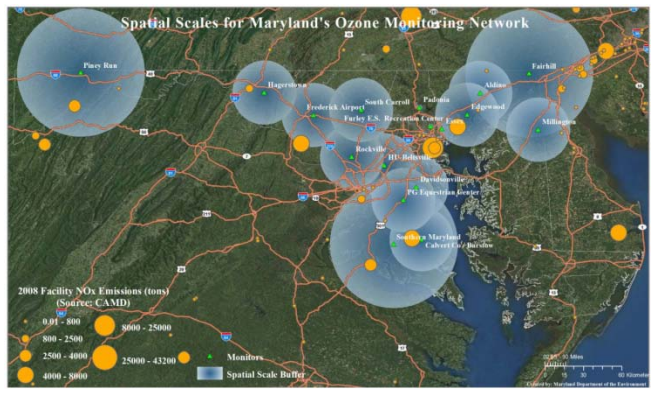
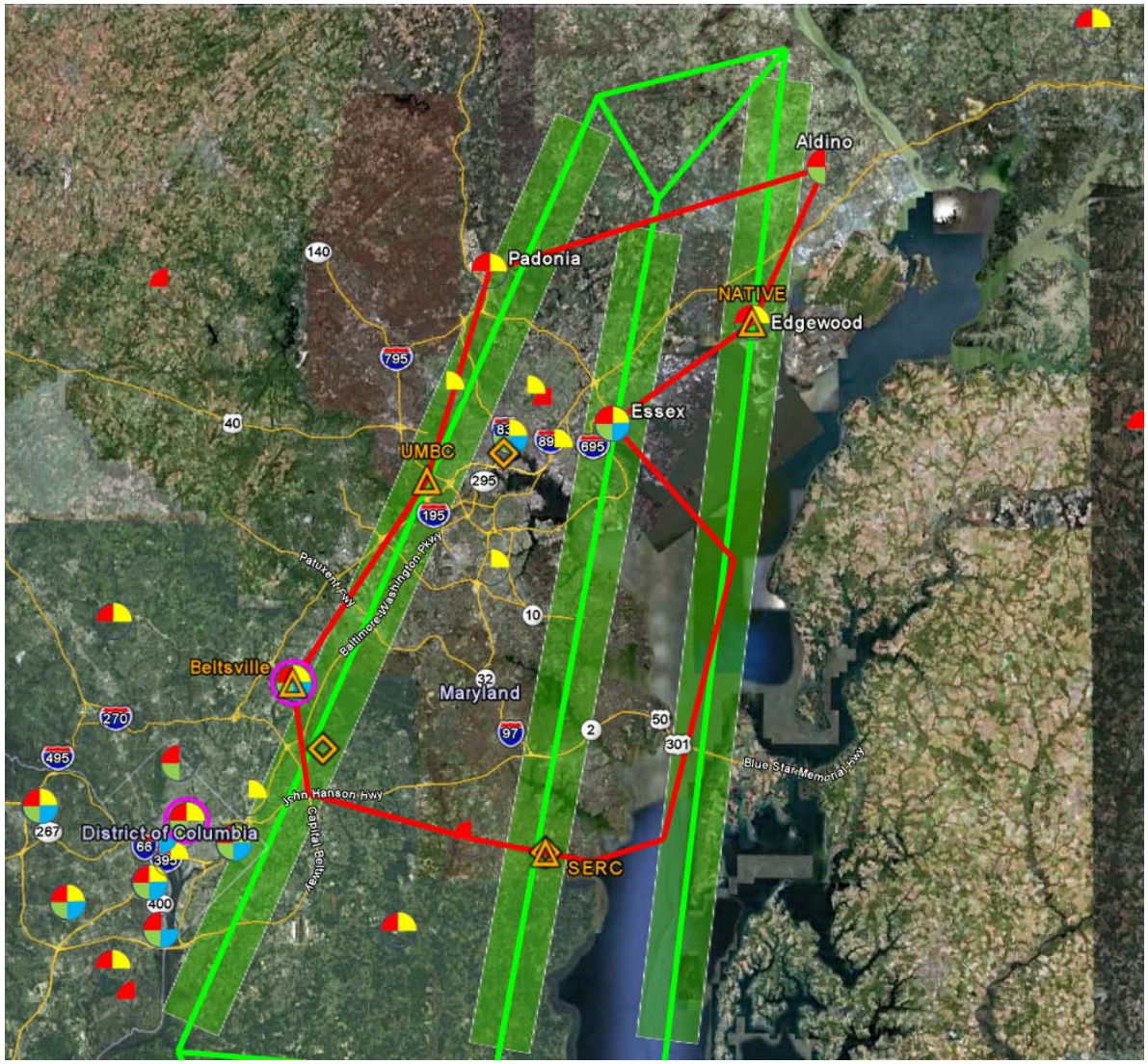


DISCOVER-AQ Science Team Meeting
October 5-7, 2010
National Institute for Aerospace
Hampton, VA

DISCOVER-AQ Proposed Flight Track

United States Environmental Protection Agency



Relevant National Ambient Air Quality Standards

- Annual PM2.5 (1997)
  - Form: Annual Arithmetic Mean
  - Level: 15.0 ug/m3
- 24-hr PM2.5 (2006)
  - Form: 98th percentile
  - Level= 35 ug/m3
- 8-hr O3 (2008)
  - Form: 4th daily max
  - Level =75 ppb
- (proposed 2010))
  - 60 to 70 ppb
- 1-hr NO2 (2010)
  - Form: 4th daily max
  - Level =100 ppb

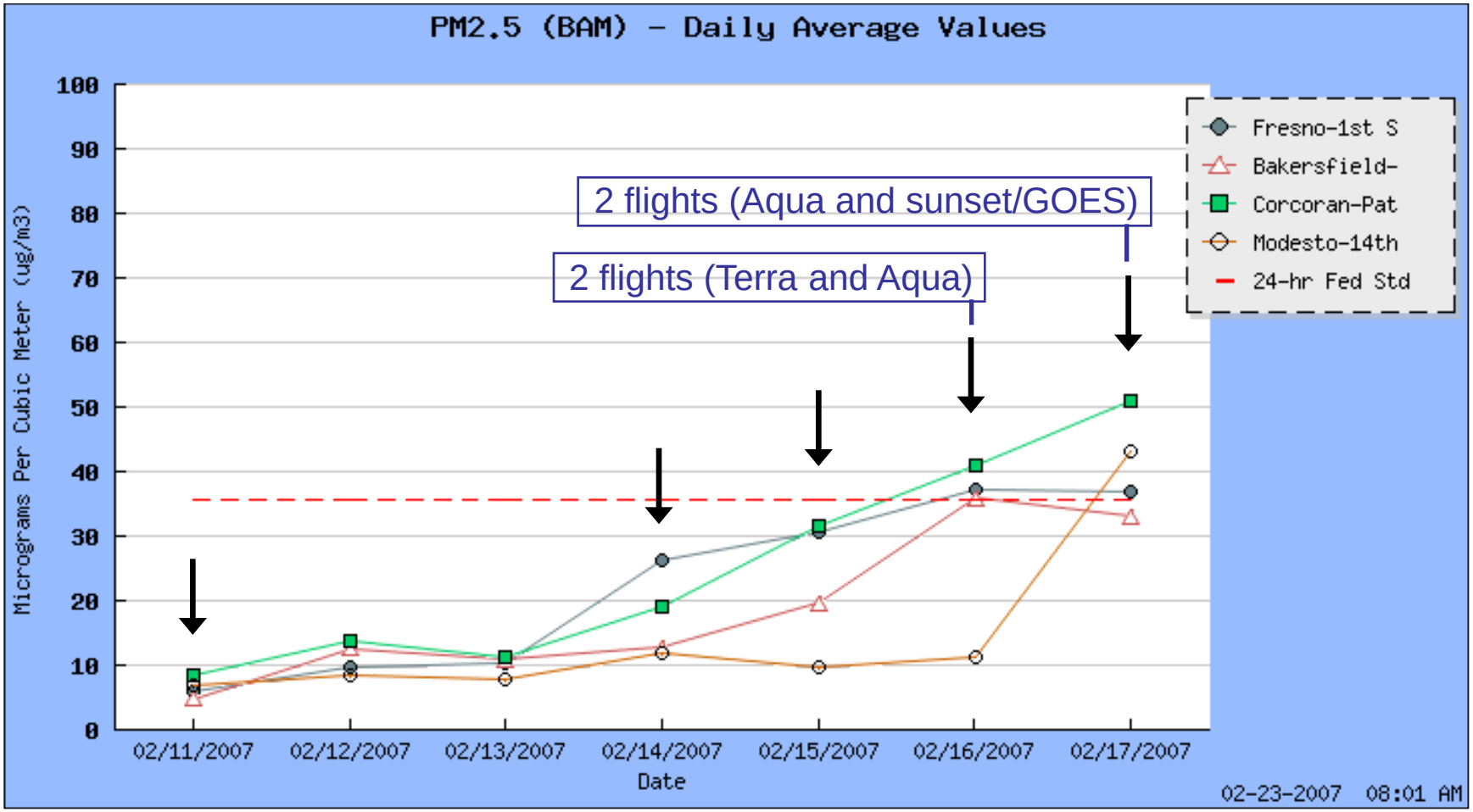
U.S. Environmental Protection Agency - New NO_2 monitoring requirements

- In urban areas, monitors are required near major roads as well as in other locations where maximum concentrations are expected.
- Additional monitors are required in large urban areas to measure the highest concentrations of NO2 that occur more broadly across communities.

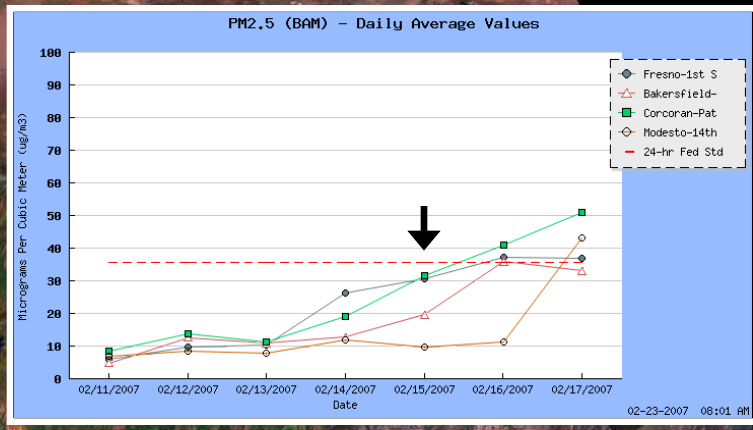
- **Near Road Monitoring**
- These NO2 monitors must be placed near those road segments ranked with the highest traffic levels by AADT, with consideration given to fleet mix, congestion patterns, terrain, geographic location, and meteorology in identifying locations where the peak concentrations of NO2 are expected to occur. Monitors must be placed no more than 50 meters (about 164 feet) away from the edge of the nearest traffic lane

$PM_{2.5}$ Concentrations in SJV (February 8-17, 2007)

United States Environmental Protection Agency



February 15, 2007: Aerosol measurements in SJV



SIERRA NEVADA RANGE

STOCKTON

MODESTO

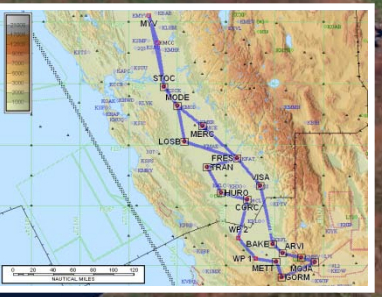
MERCED

FRESNO

VISALIA

BAKERSFIELD

THE DEAD ZONE

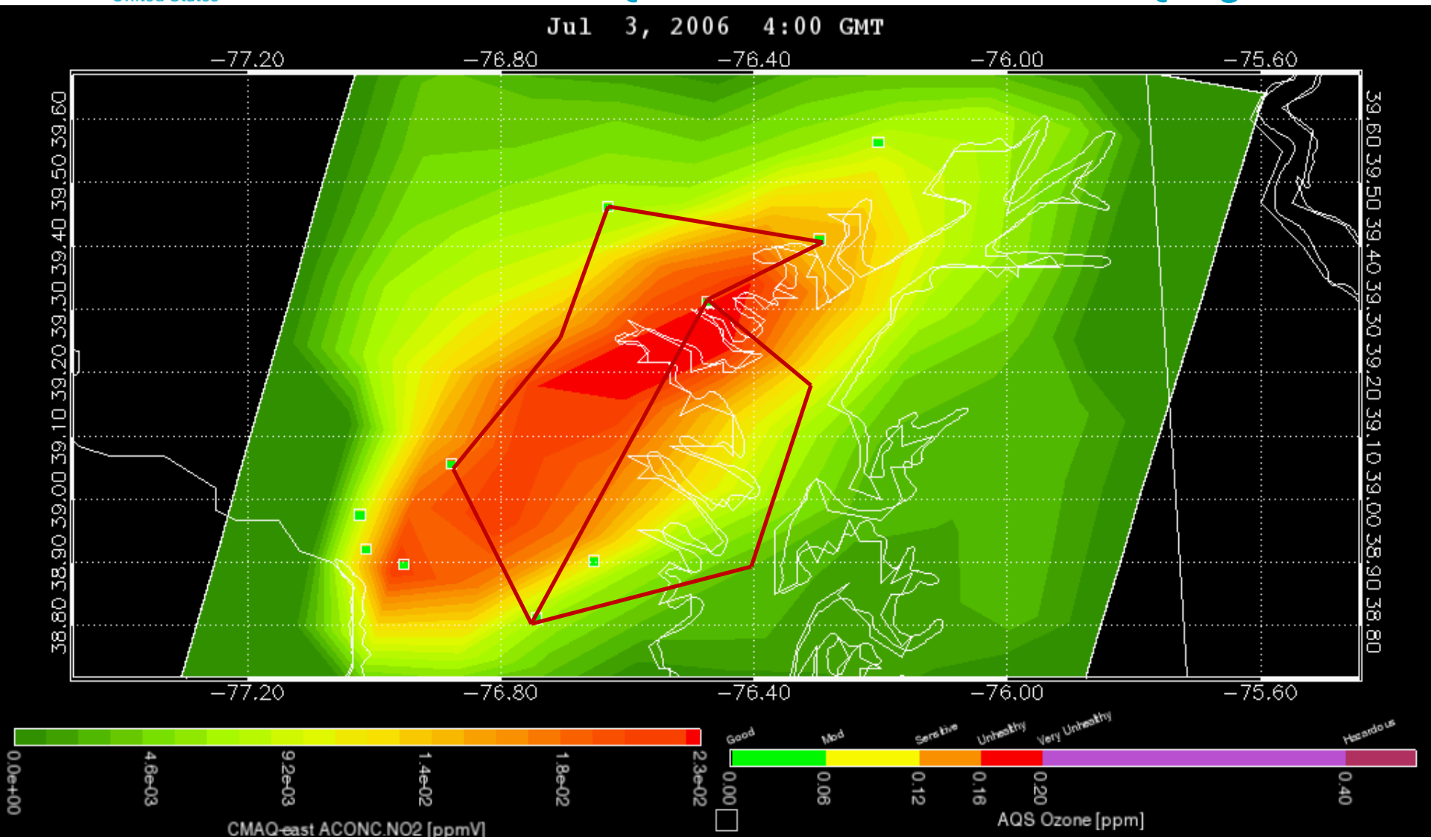


February 15, 2007

aerosol scattering ratio (532nm) from 0-5 km

0.01 0.03 0.10 0.32 1.00 3.16 10.00

2 July 2006 hourly NO_2 surface Concentrations
Internal EPA CMAQ run w/ iniital DISCOVER AQ flight track

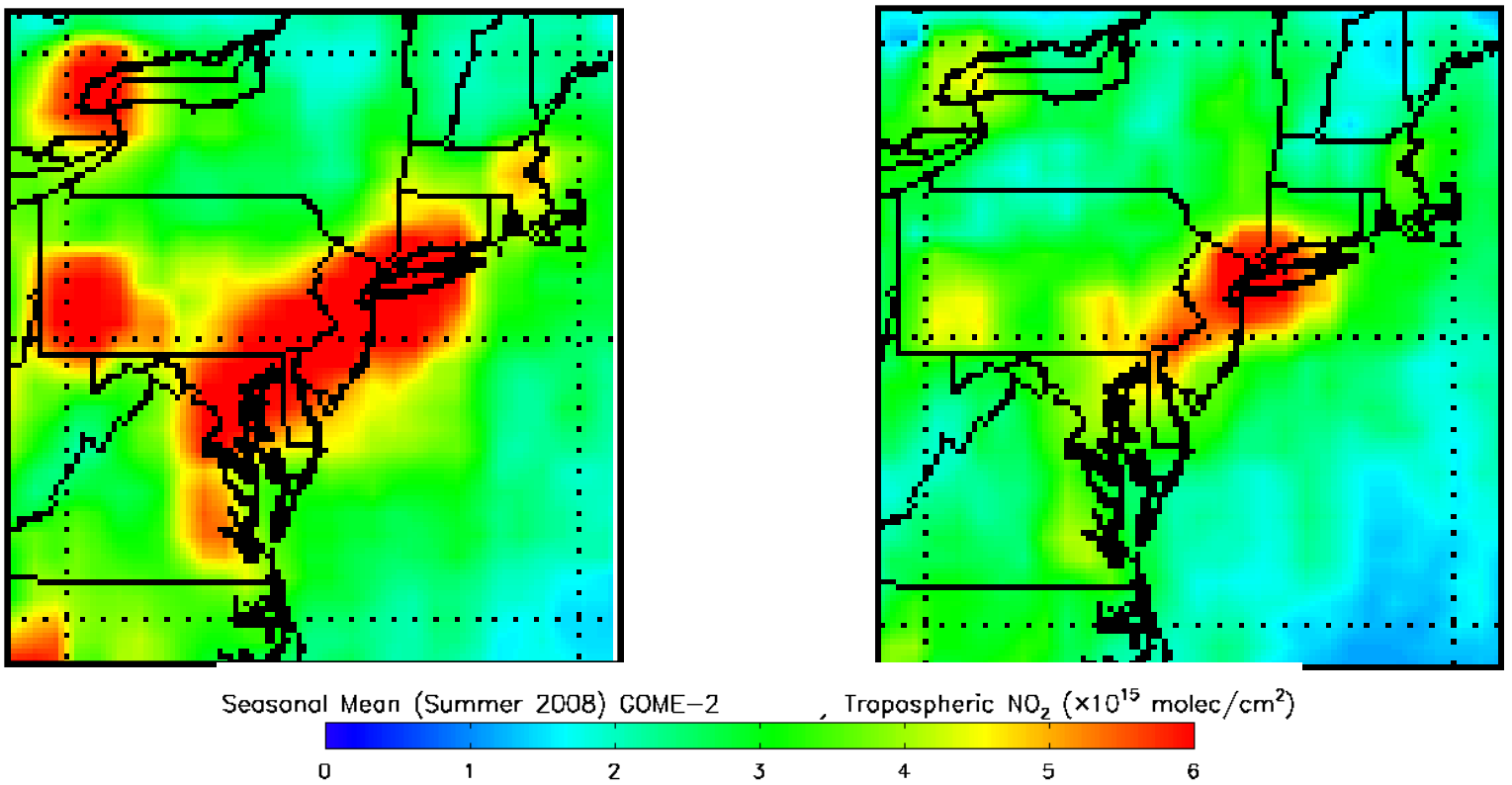


GOME-2 NO_2 Data

Summer 2008

Weekday

Weekend



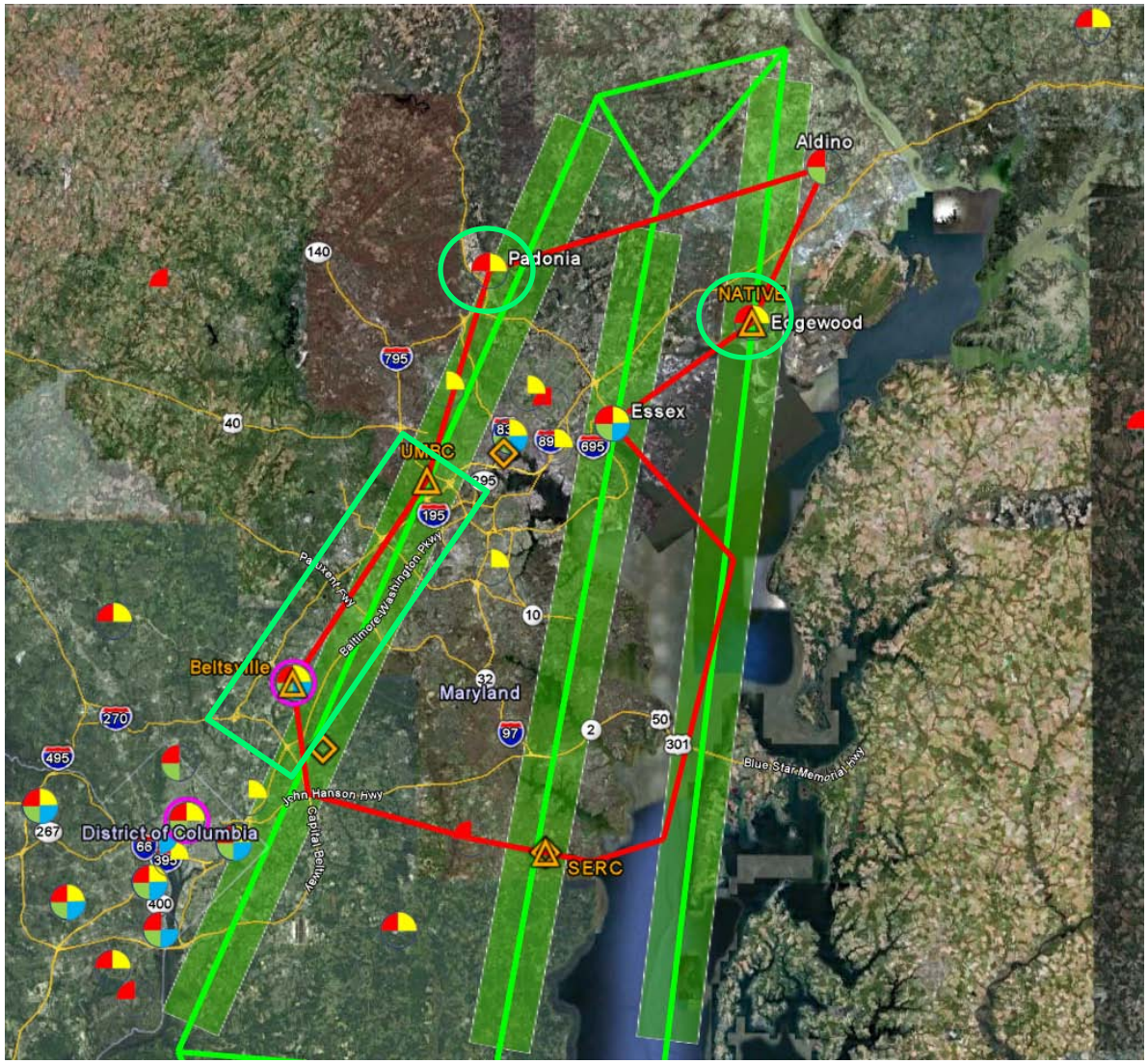
Source: S. Kondragunta NOAA/NESDIS

NASA Cessna 206 w/ EPA sensors
Flight Considerations

- Straight and level flight pattern
- Flight altitude 1000 to 2000 ft AGL
- Constant airspeed 100-120knots
- Winds < 20 knots
- Cloud cover <= 50%
- Visibility >= 3 miles

DISCOVER-AQ Proposed Flight Track
Additional NO_2 Instruments

United States Environmental Protection Agency



-Potential location for EPA NO_2 photolytic monitors at fixed sites

-Potential area to be covered by mobile EPA NO_2 QC Laser system.

NASA Cessna 206
with EPA sensors for derived Chl

- Hyperspectral Ocean Color Radiometers

-one irradiance (Es) sensor

-two radiance (Lt & Li) sensors

- Specifications:

-Spectral range: 350 nm to 800nm

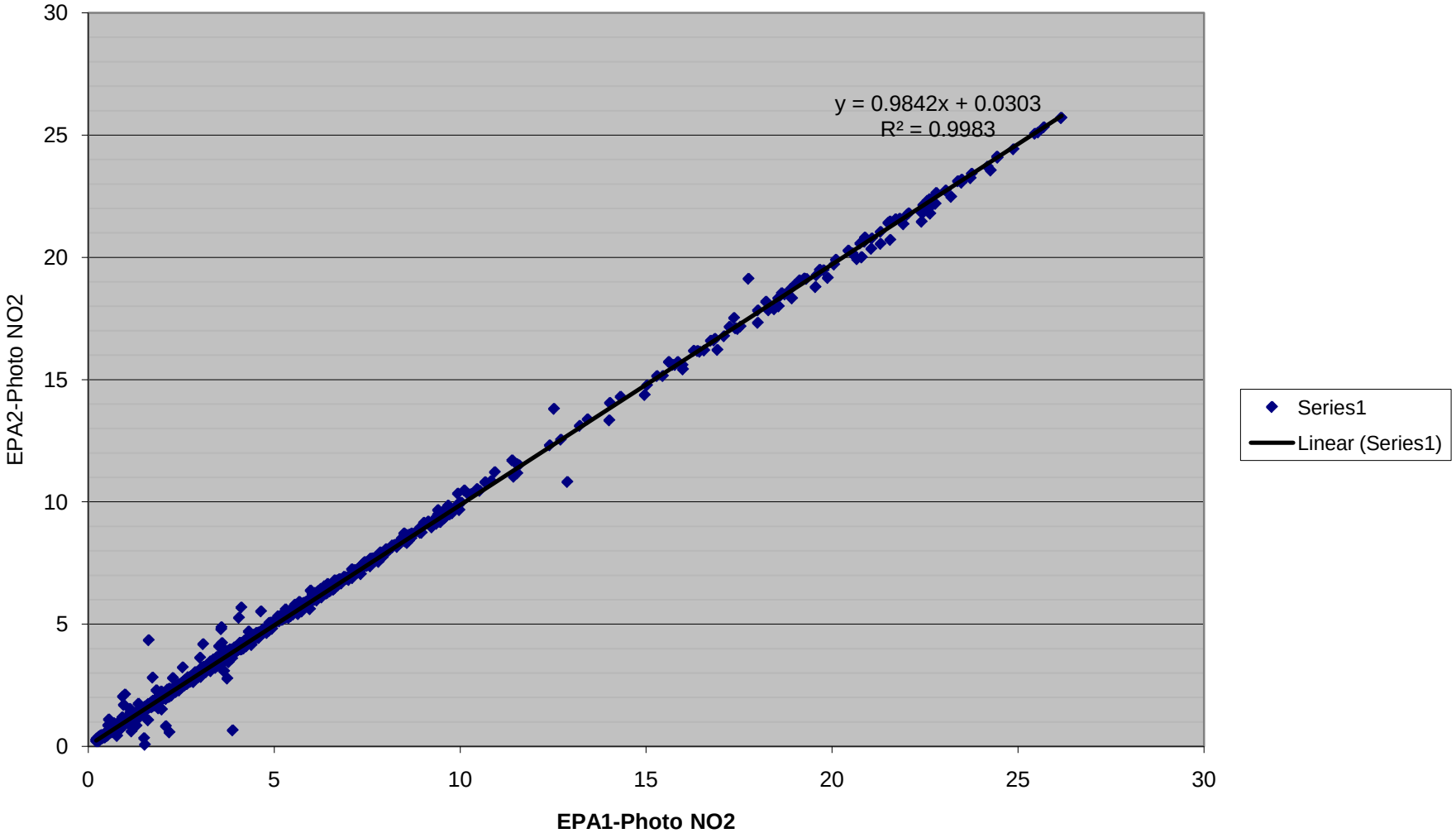
-Spectral resolution 10nm

-FOV 3°

- Infrared radiation pyrometer – measures SST

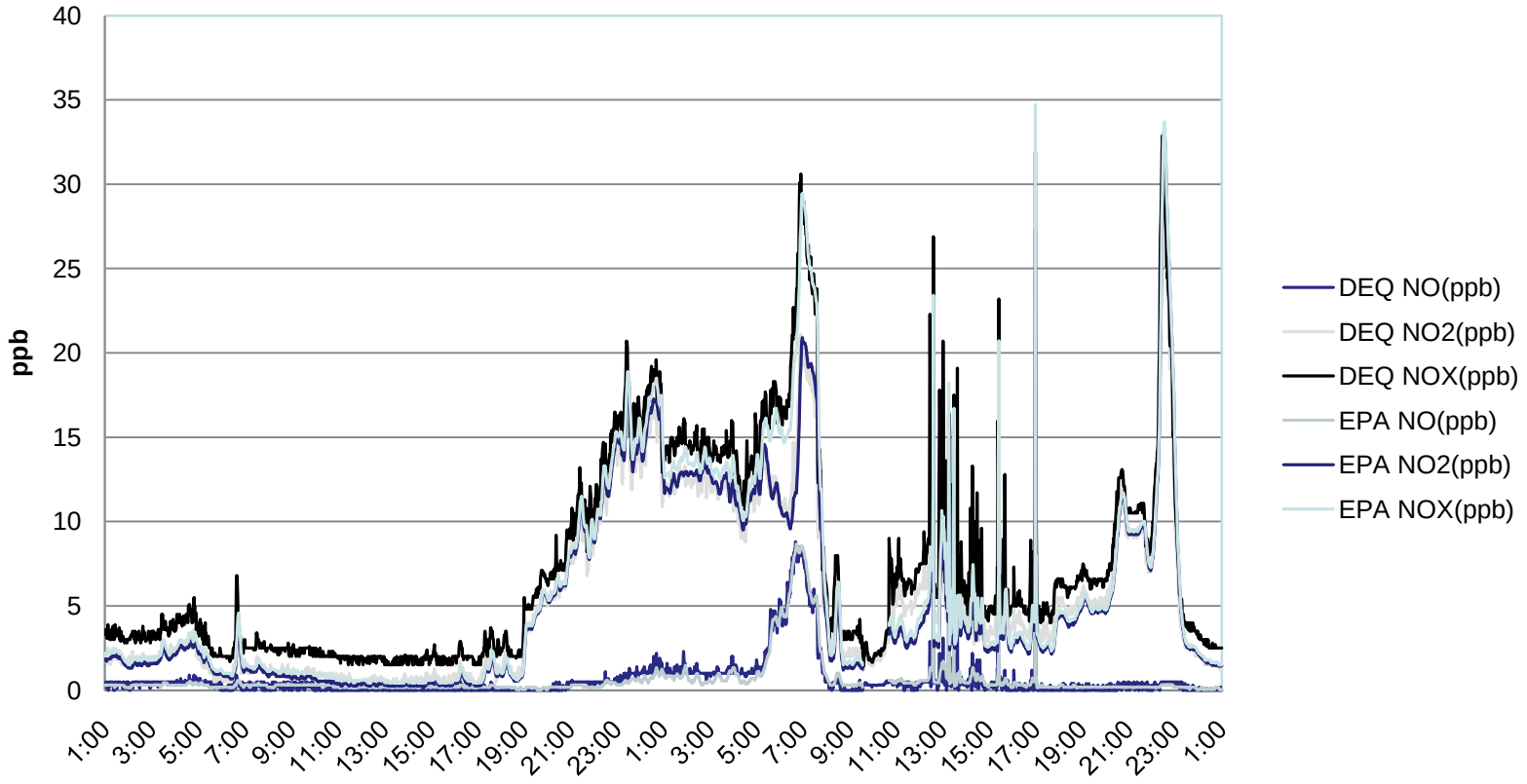
- EMVIS hyperspectral imager
- Vis-NIR spectral range: 400-1000 nm
- 240 bands at 2nm resolution
    - Data useful for atmospheric modeling using MODTRAN

Comparison of EPA Photolytic NO2 Instruments
Burden Creek Site, RTP, NC
5 min. avg.



United States Environmental Protection Agency

26-27 Jul 2010 (EST)
DEQ TECO (Moly) NOx vs. EPA API (Photolytic) NOx
NASA Langley Station - Hampton, VA



2010 Chemistry and Physics Atmospheric Boundary Layer Experiment
CAPABLE summer intensive (21 June – 6 August 2010)

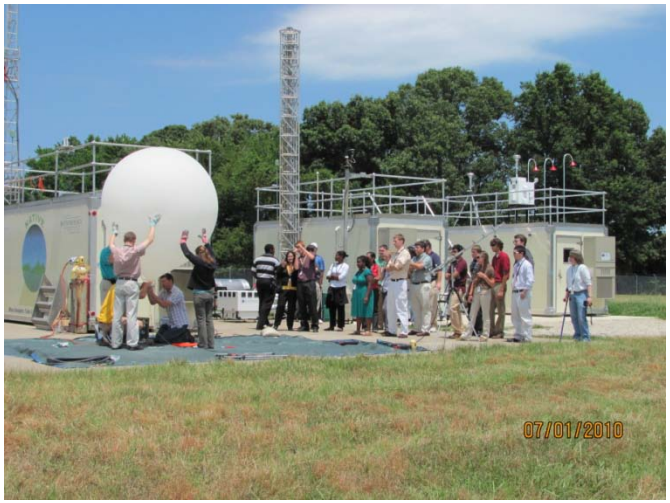
NASA Langley Research Center: Pandora – NO_2 Column Density; Leosphere Wind Lidar (derived boundary layer height); Sondes – temperature, pressure, H_2O vapor, wind speed, wind direction

VA DEQ: *in situ* CO, NO, NO_2 (molybdenum converter), NOx, O_3, SO_2, $PM_{2.5}$, PM_{10}

EPA: NO_2 (photolytic converter)

Pennsylvania State University: NATIVE – CO, NO, NOy, O_3, SO_2, temperature, pressure, wind speed, wind direction, UV spectra, Jno_2, NO_2 (estimated from NO, O_3, and Jno_2 values); Sondes – O_3, temperature, pressure, relative humidity

Hampton University: ASSIST (Atmospheric Sounder Spectrometer for Infrared Spectral Technology) – Downwelling atmospheric radiance to profile temperature and moisture (derived boundary layer height); inter-comparison with LaRC NAST-I



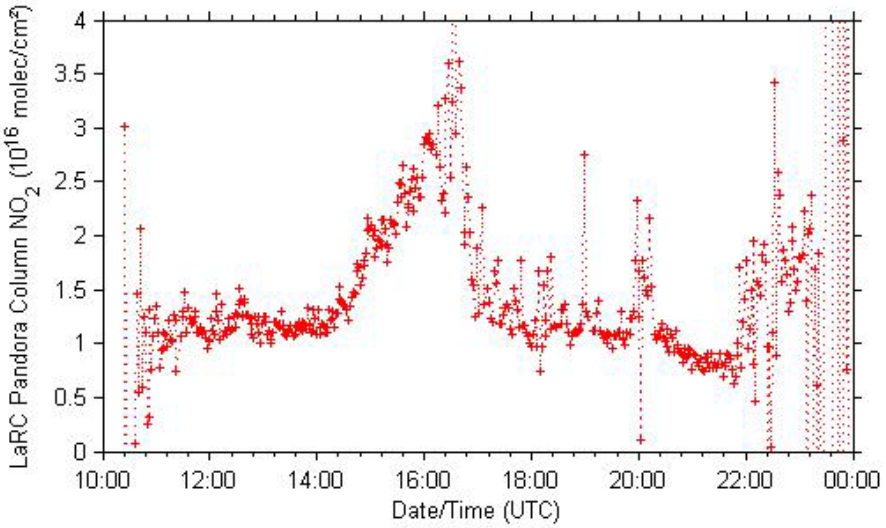
NATIVE, CAPABLE and VA DEQ

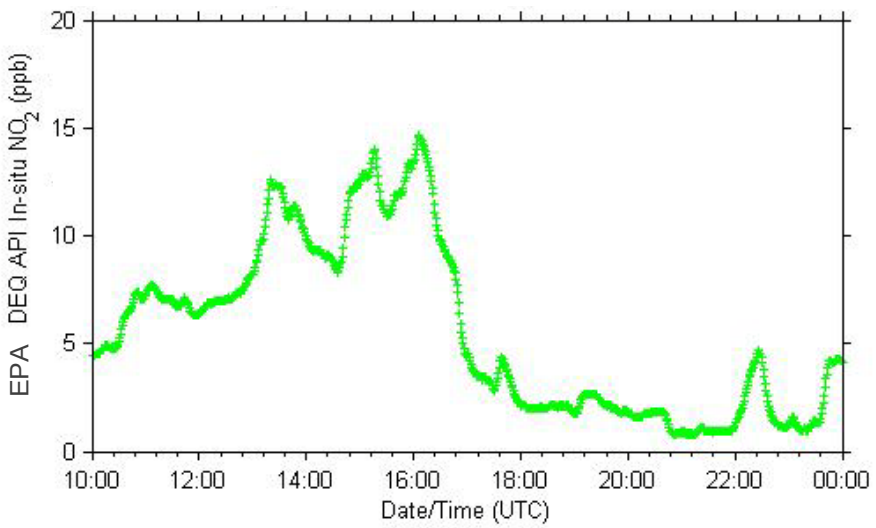
Leosphere, ASSIST and NAST-I

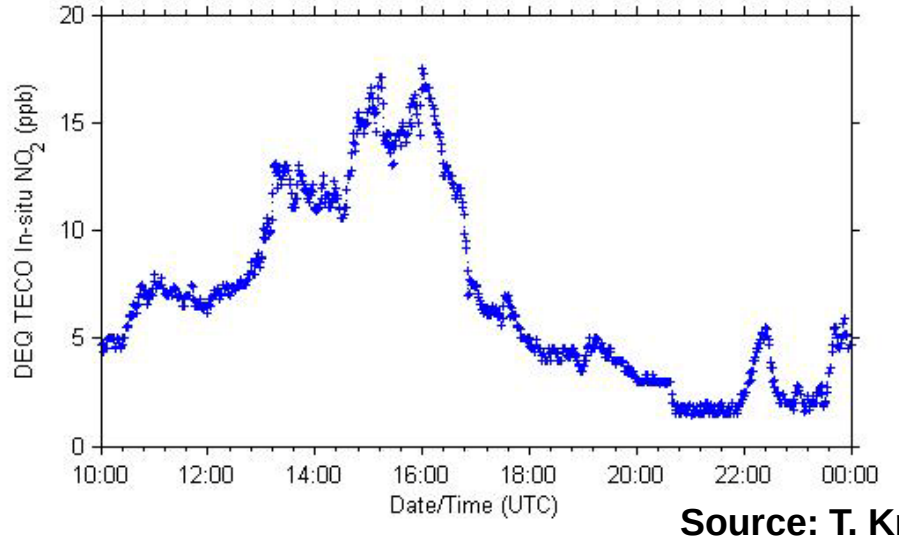
Source: M. Pippin, CAPABLE-PI

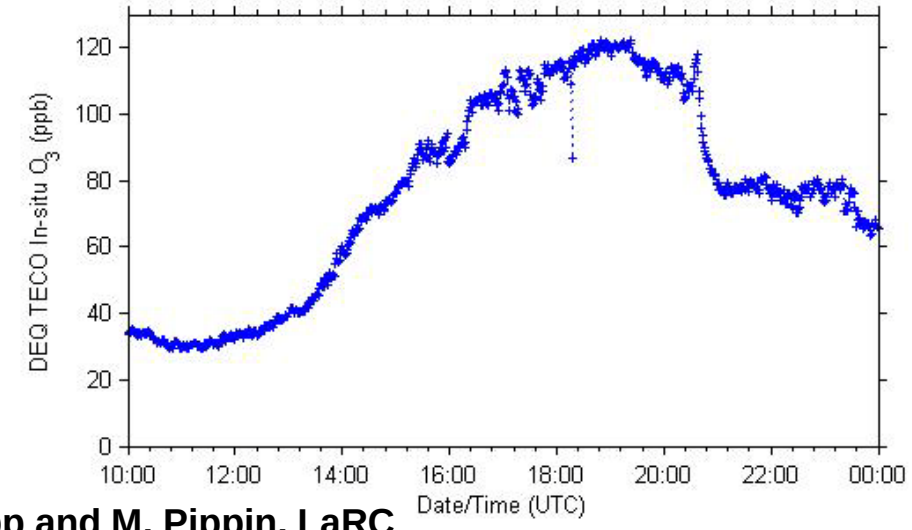
Summer 2010 CAPABLE Site Preliminary Data
Good Agreement - NO2 Column and In-situ Times Series

11 Aug 2010 LaRC Pandora NO_2, EPA (API) NO_2, DEQ (TECO) NO_2 and O_3







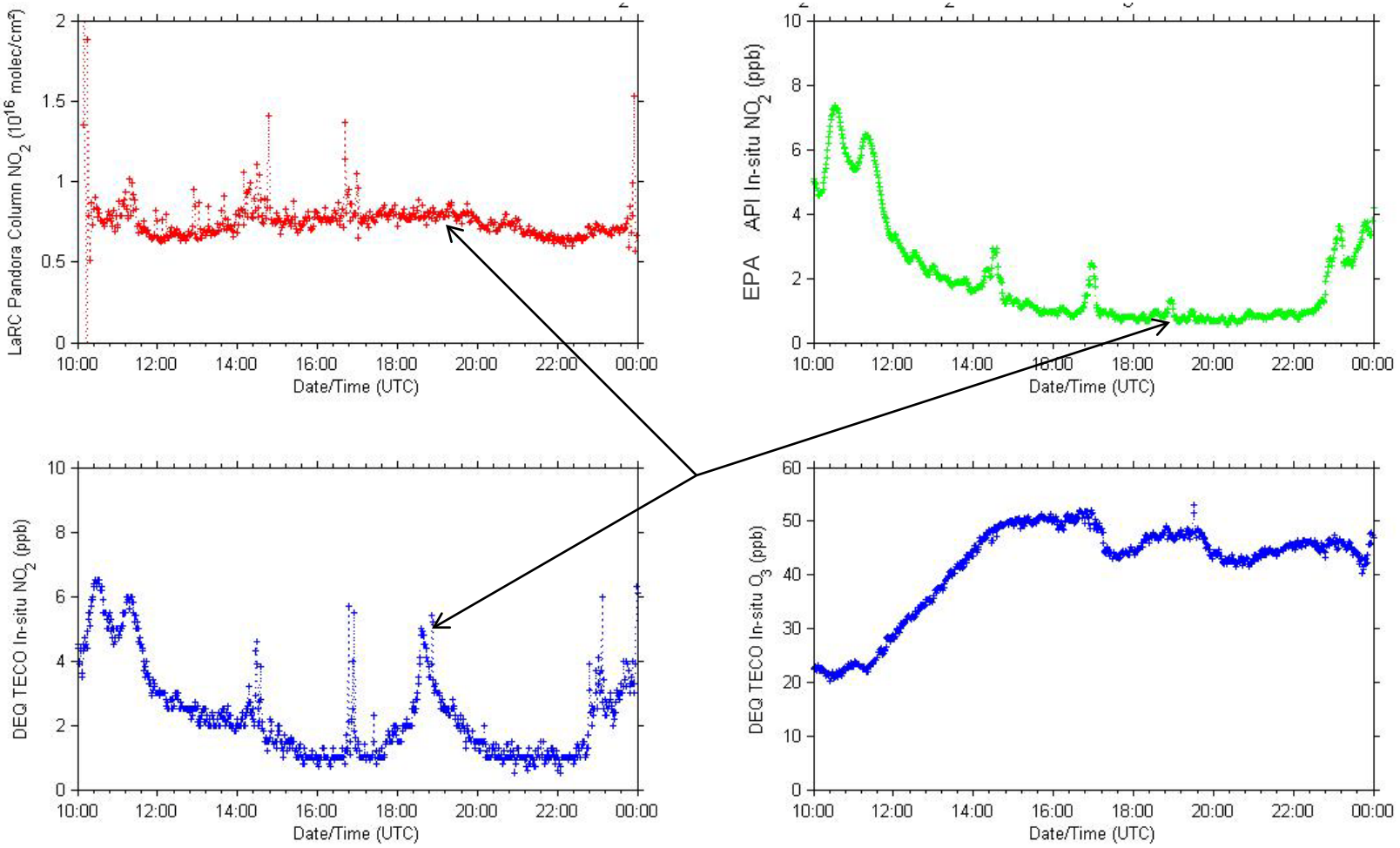


Source: T. Knepp and M. Pippin, LaRC

Summer 2010 CAPABLE Preliminary Data

Potential Conversion of NOy compounds by TECO instrument

24 Jul 2010 LaRC Pandora NO_2, EPA (API) NO_2, DEQ (TECO) NO_2 and O_3



Source: T. Knepp and M. Pippin, LaRC

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Disclaimer

Although this work was reviewed by EPA and approved for publication, it may not necessarily reflect official Agency policy.