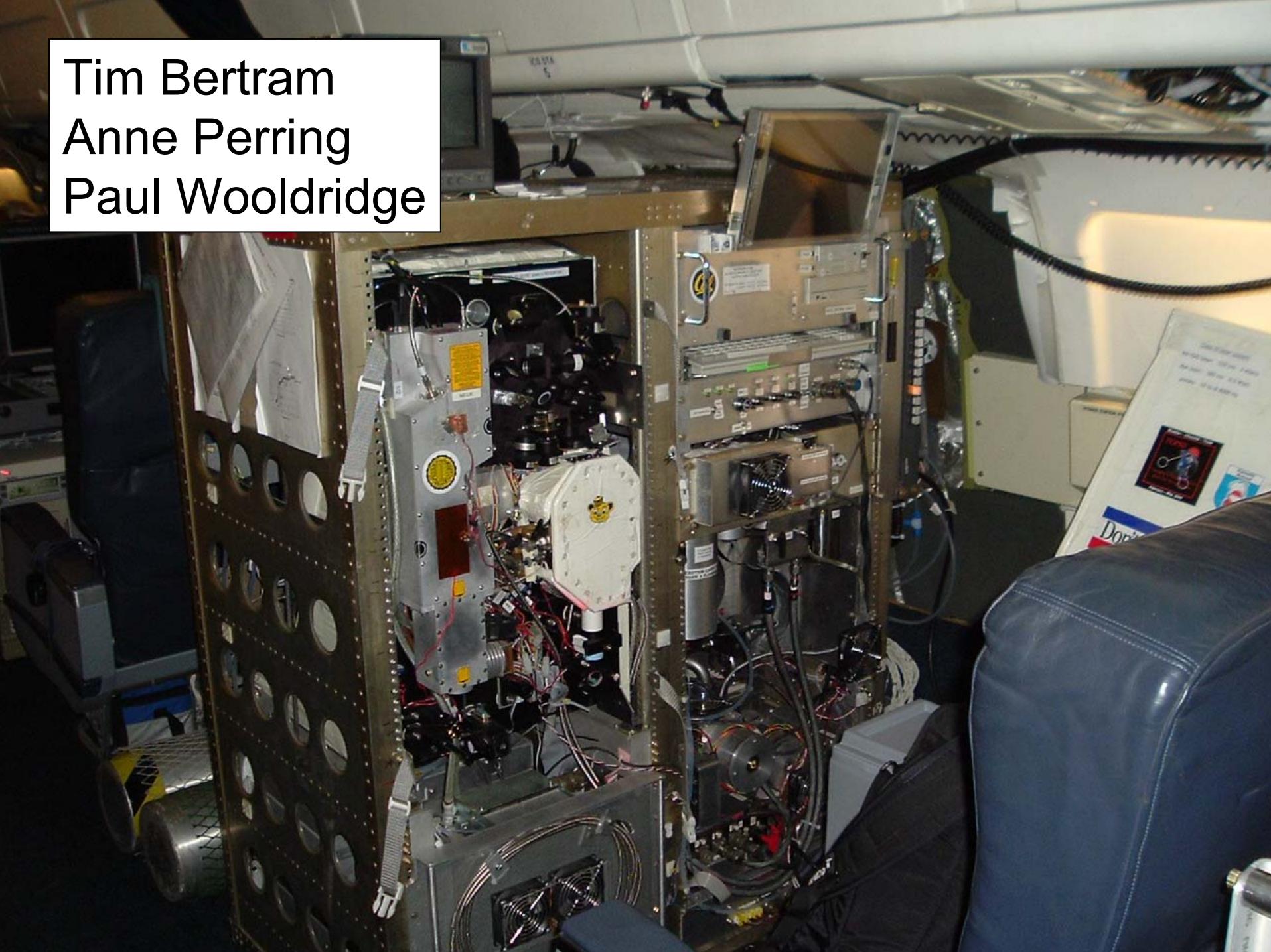


Nitrogen Oxides

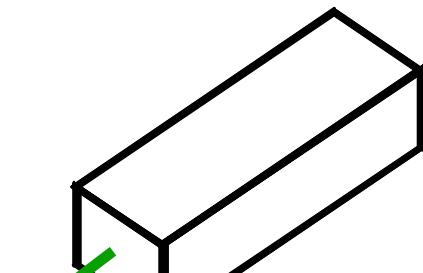
- **The Berkeley TD-LIF
Instrument/Comparisons**
- **Convection, NO_2 peak at 10km,
Age of air,**
- **HO_x chain termination (by NO_x) in
the continental boundary layer**

Tim Bertram
Anne Perring
Paul Wooldridge

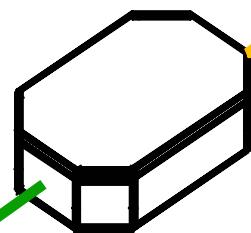


LIF Detection of NO₂

Nd³⁺:YAG

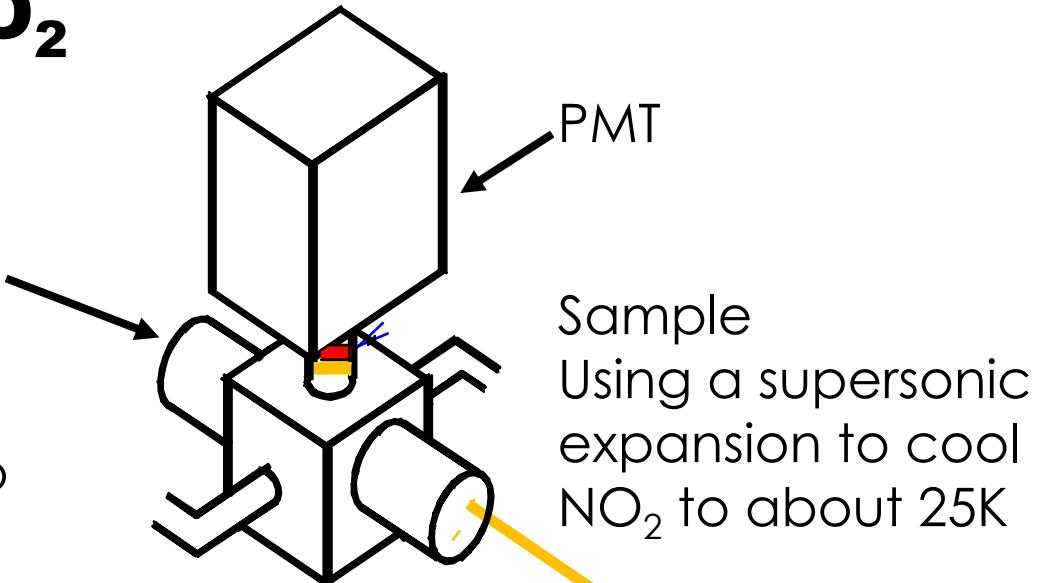


532 nm

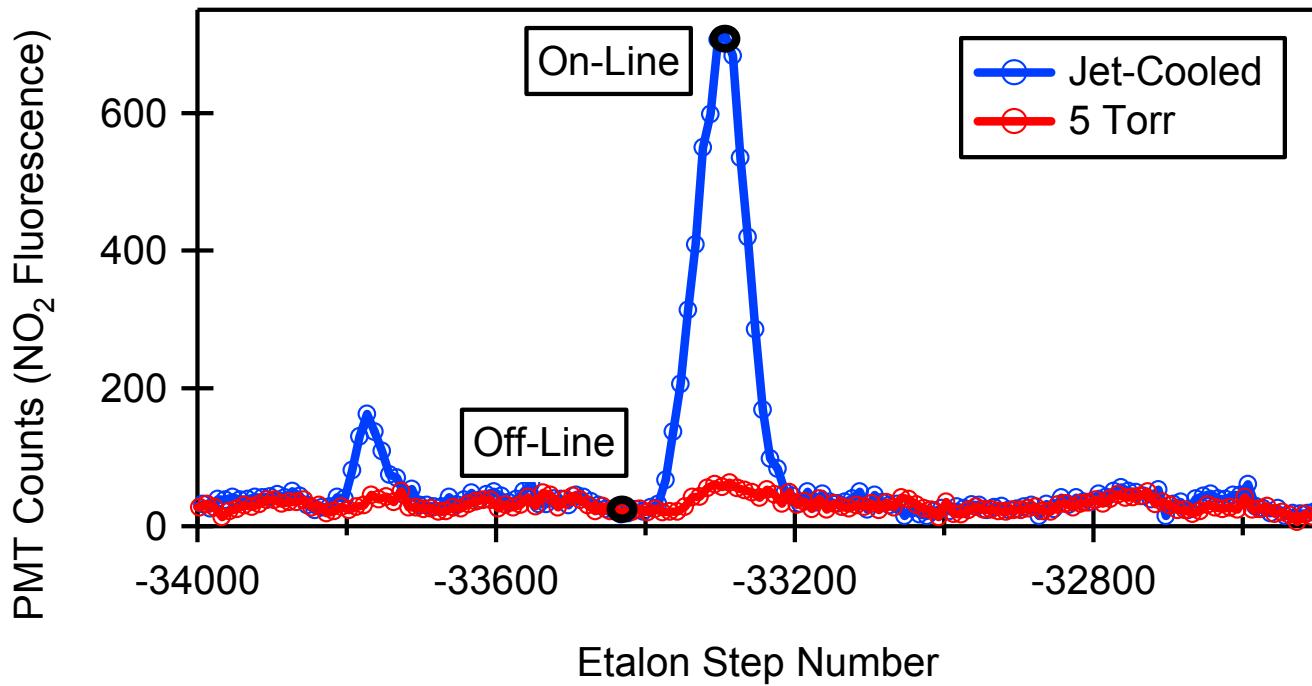
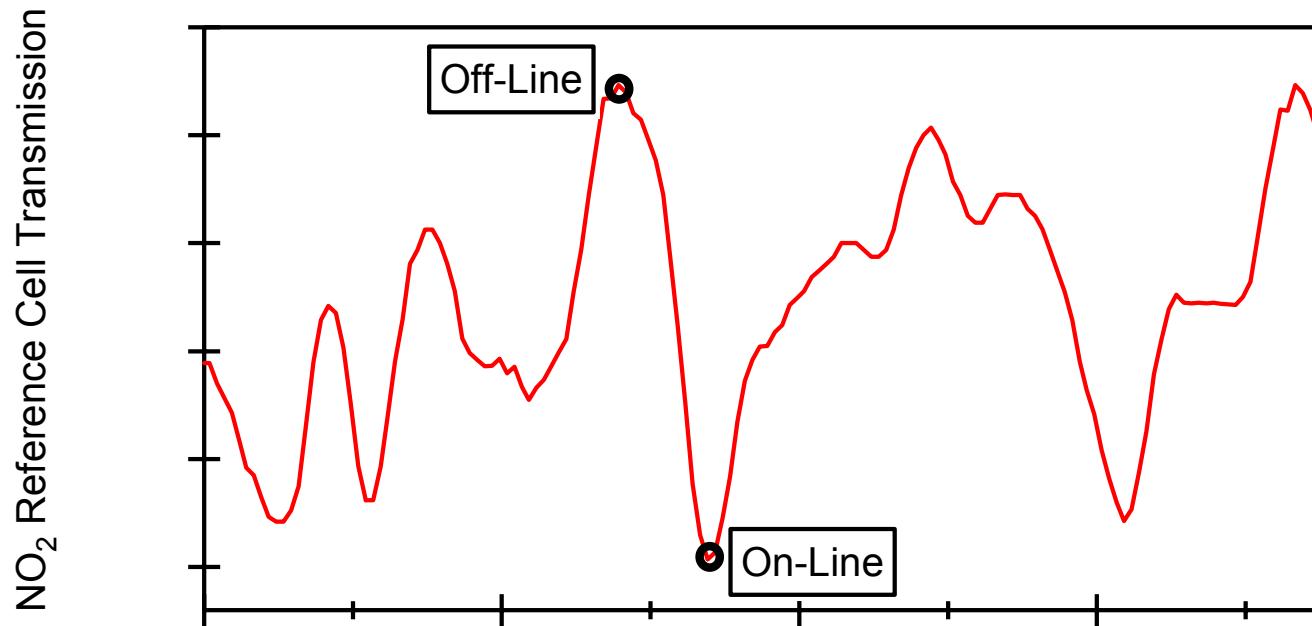


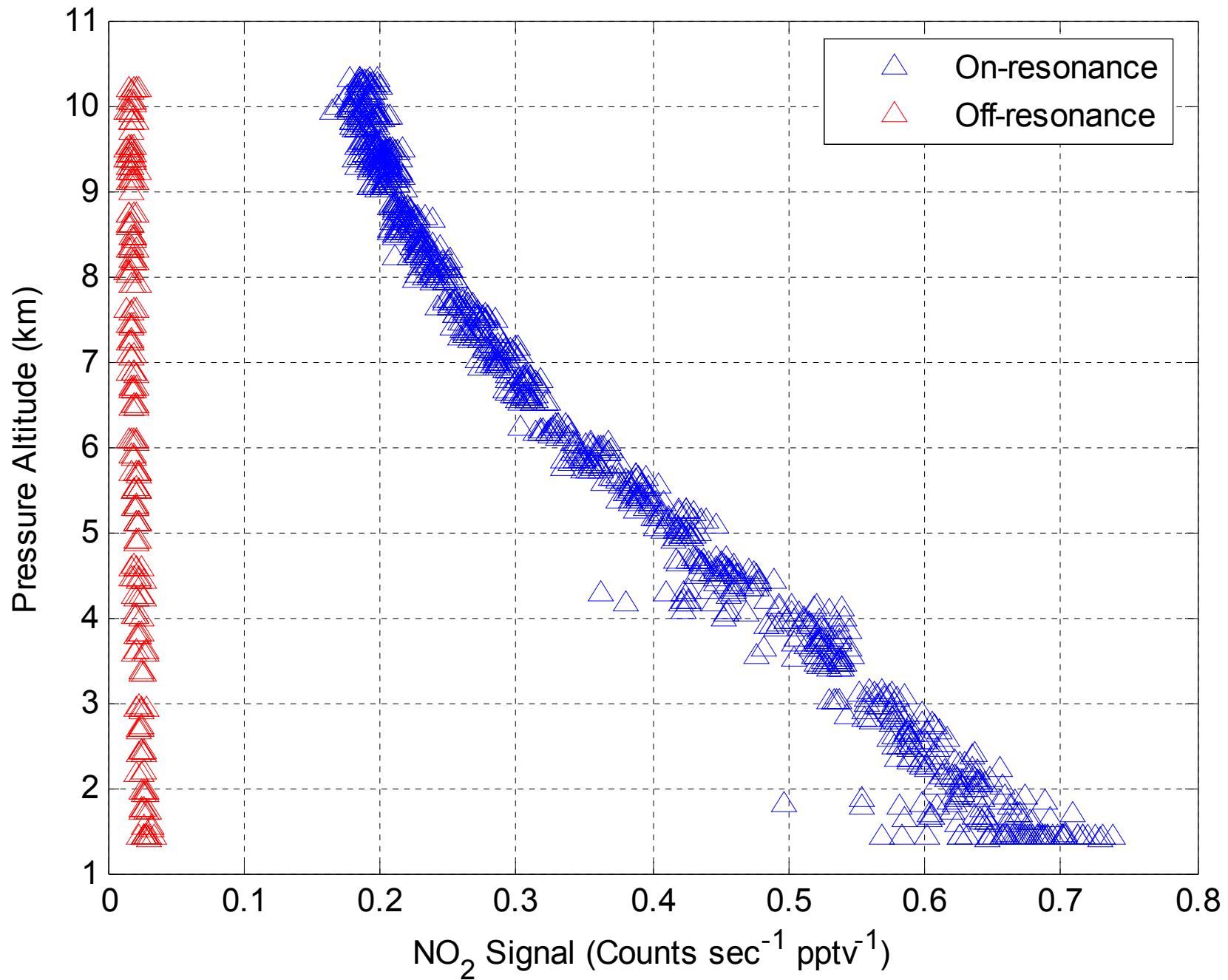
To Pump

Multi-pass Cell
(1 of 2)



Thornton et al. Anal. Chem. **72**, 528, 2000
Cleary et al. Appl. Opt. **41**(33), 6950, 2002



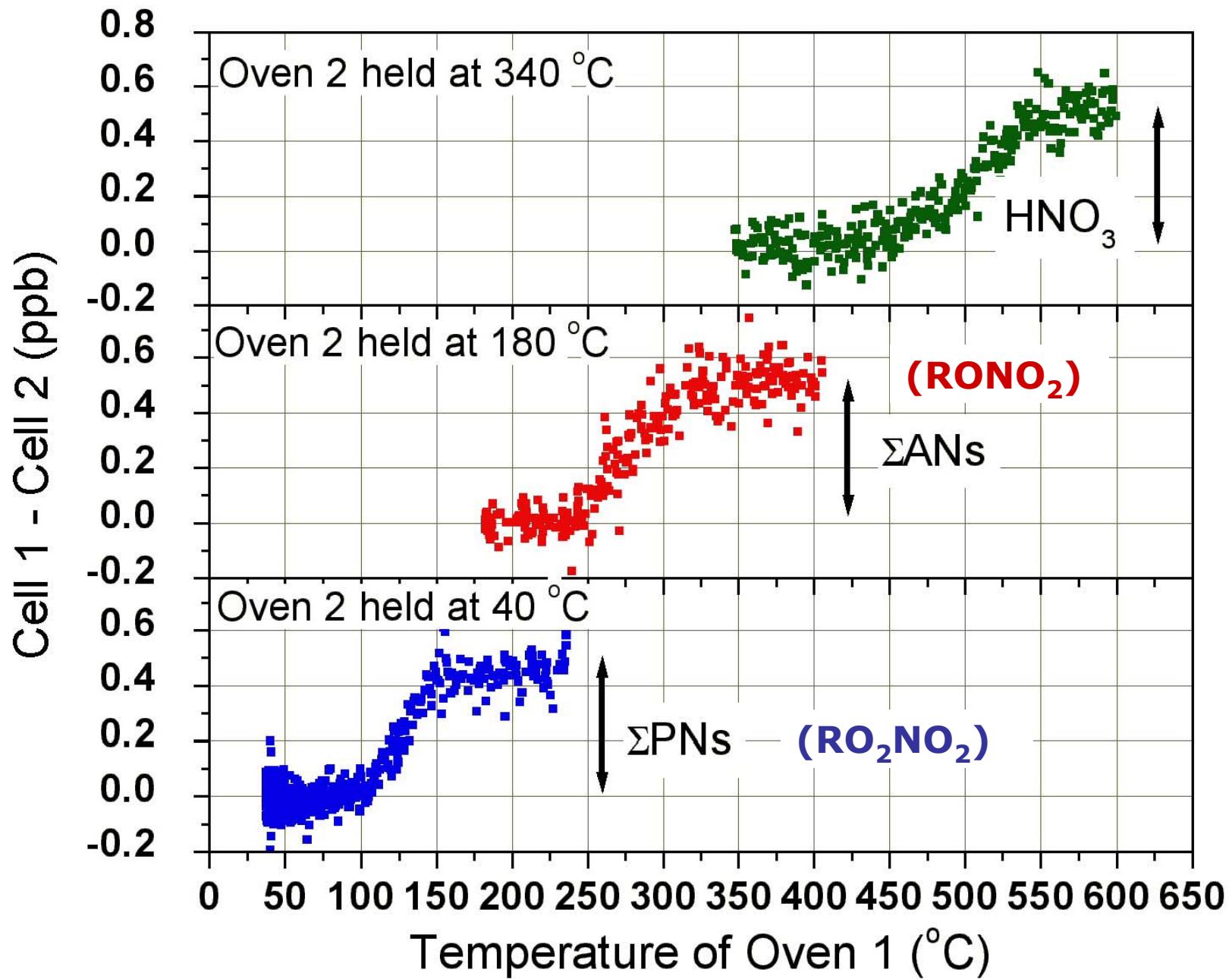


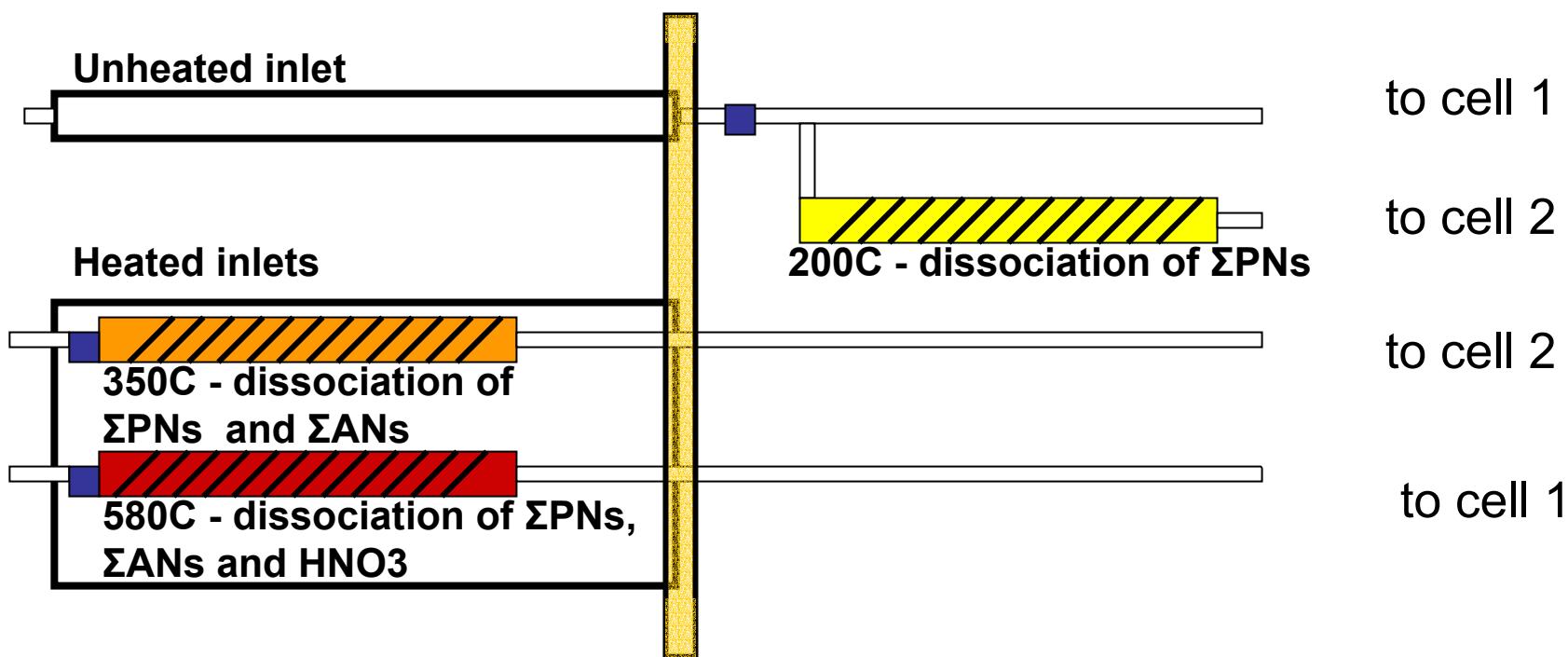


Thermal Dissociation-LIF

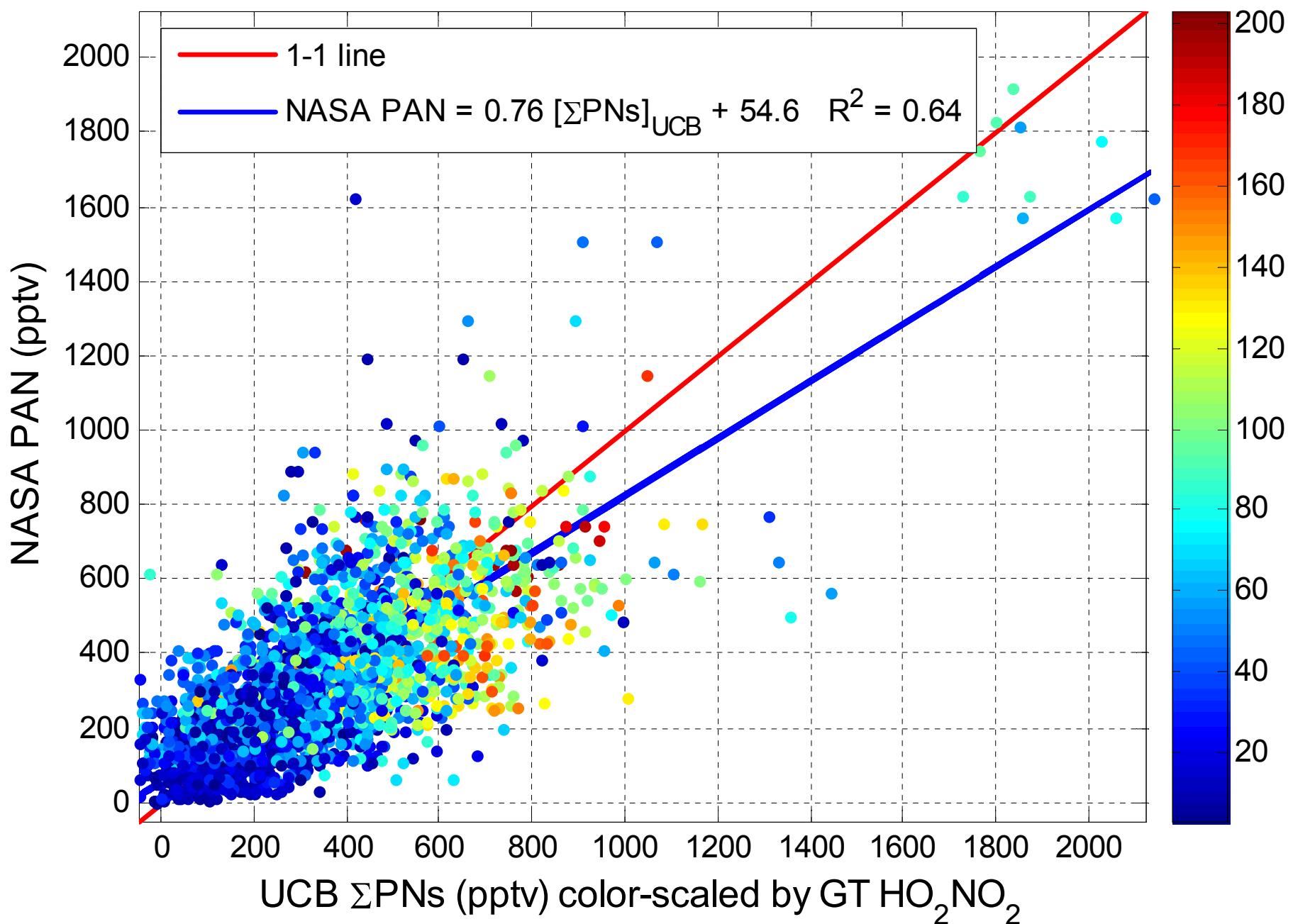
Doug A. Day, et al,
JGR., 107(D6), '02.

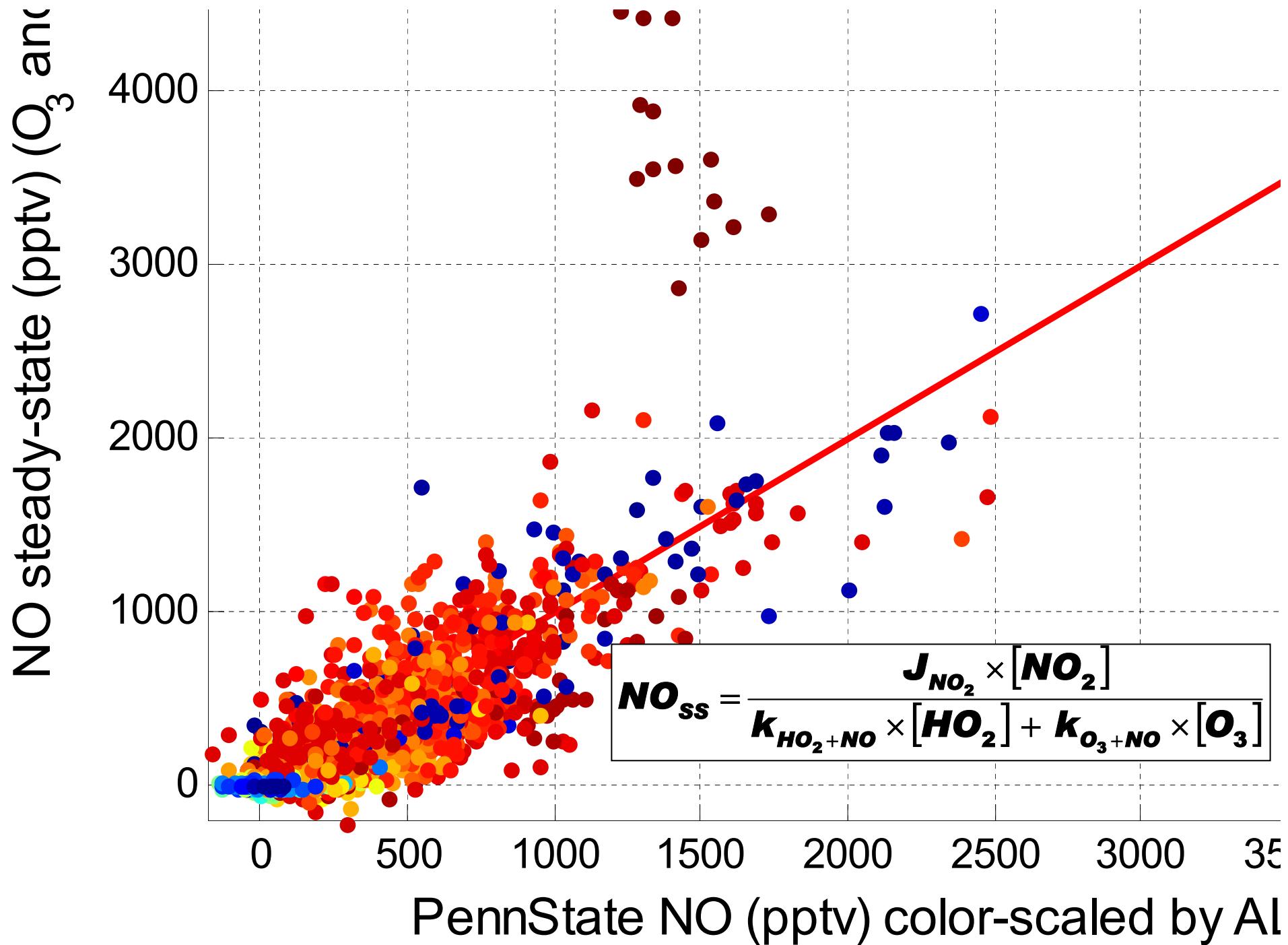




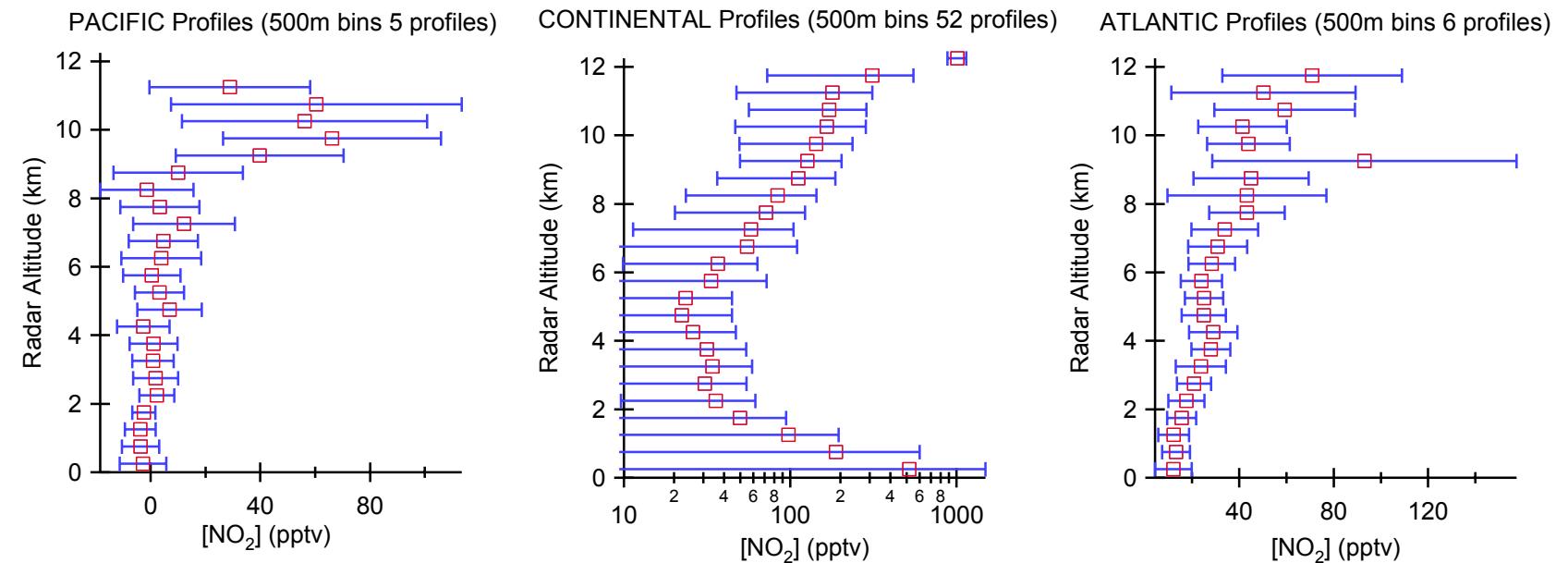
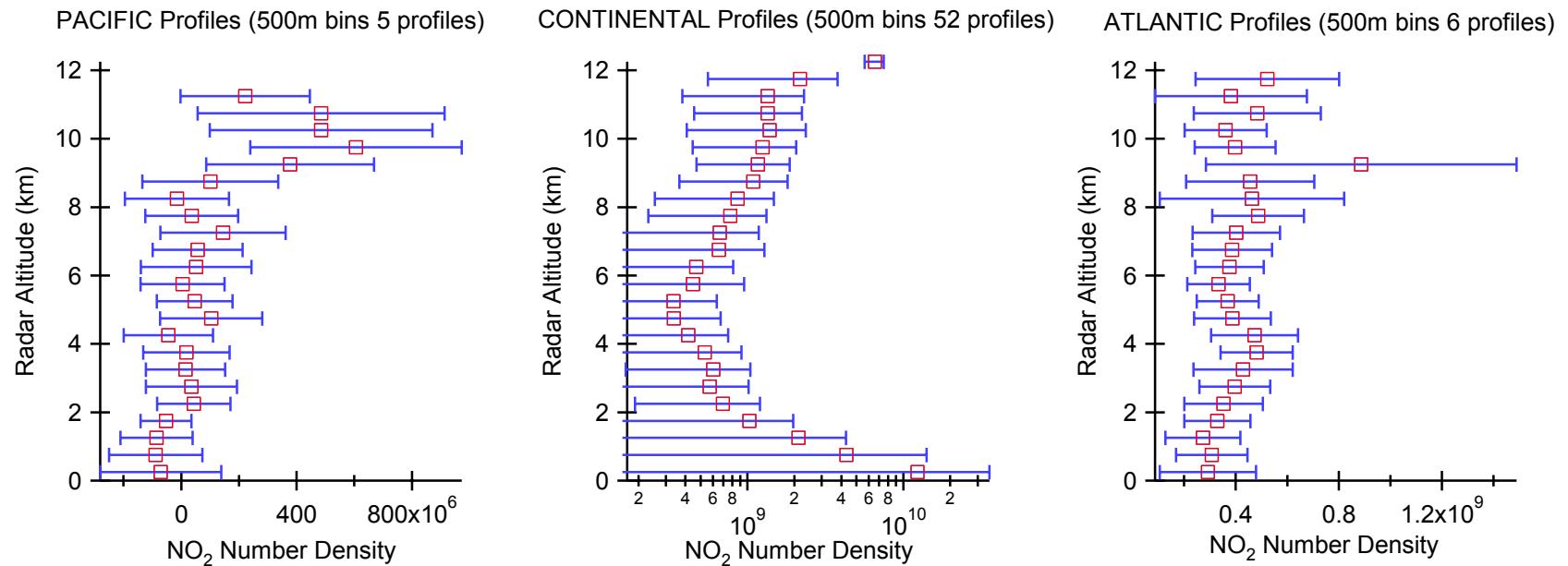


DC-8 Σ PNs PAN Comparison

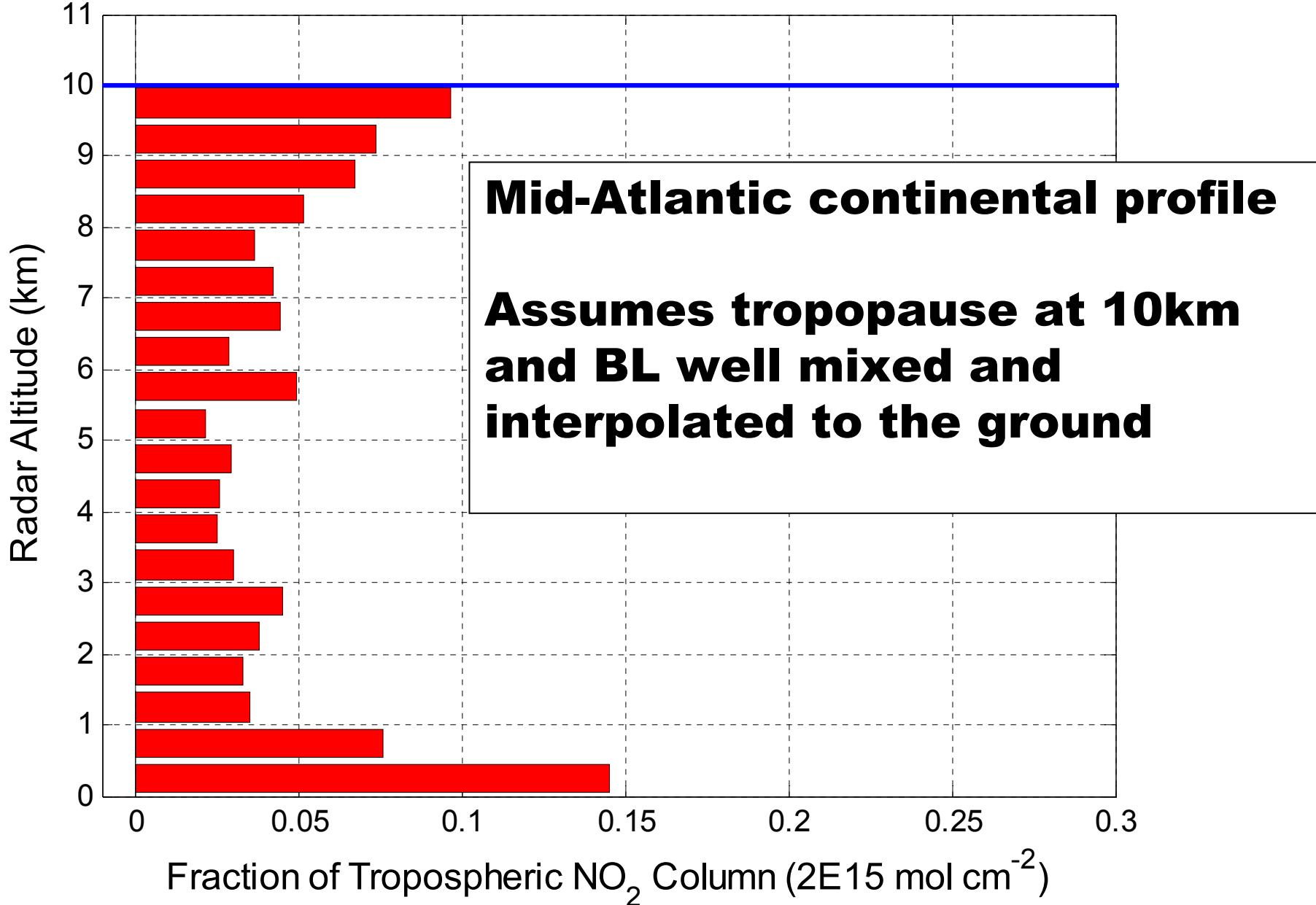




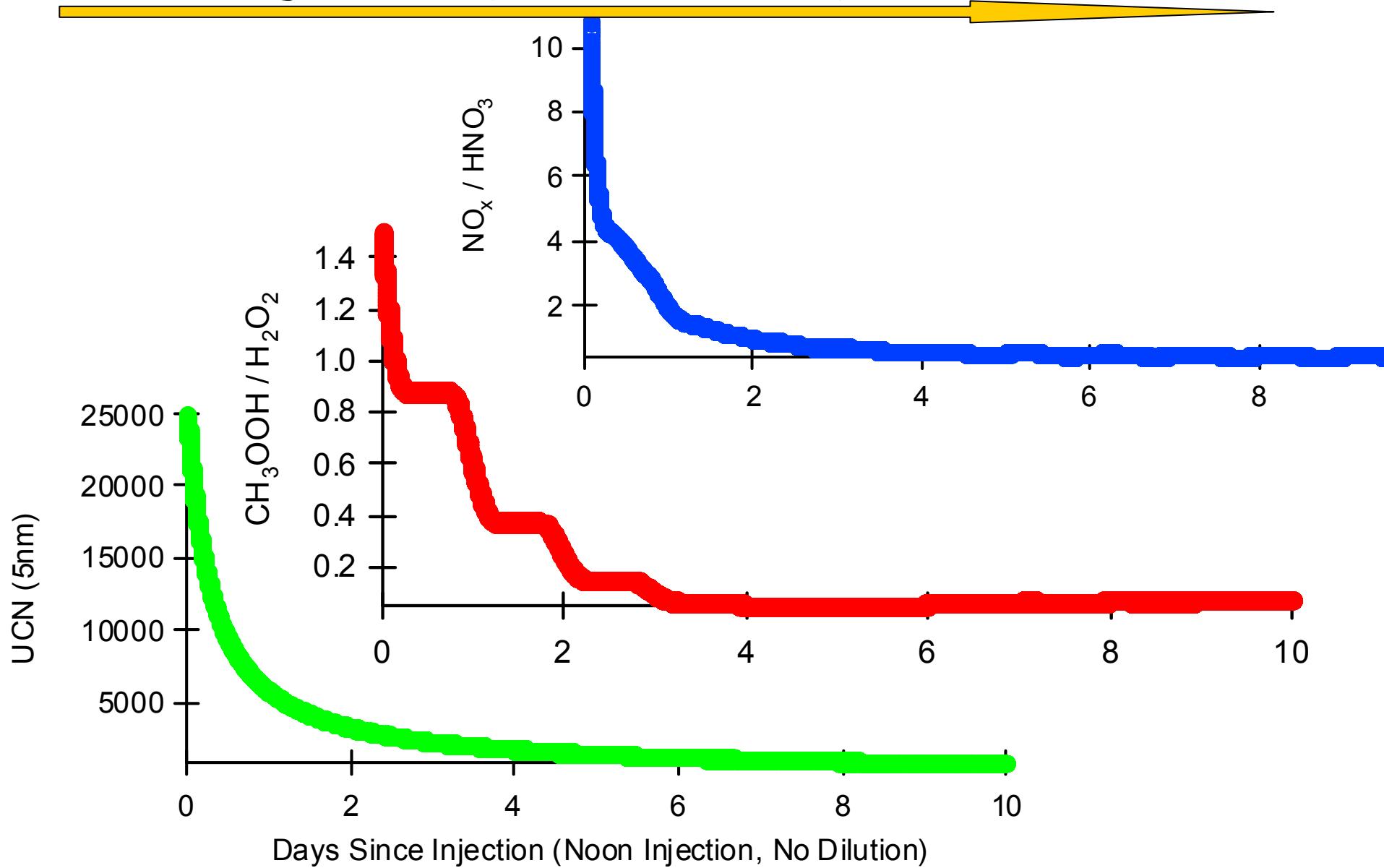
Convection/Age of Air

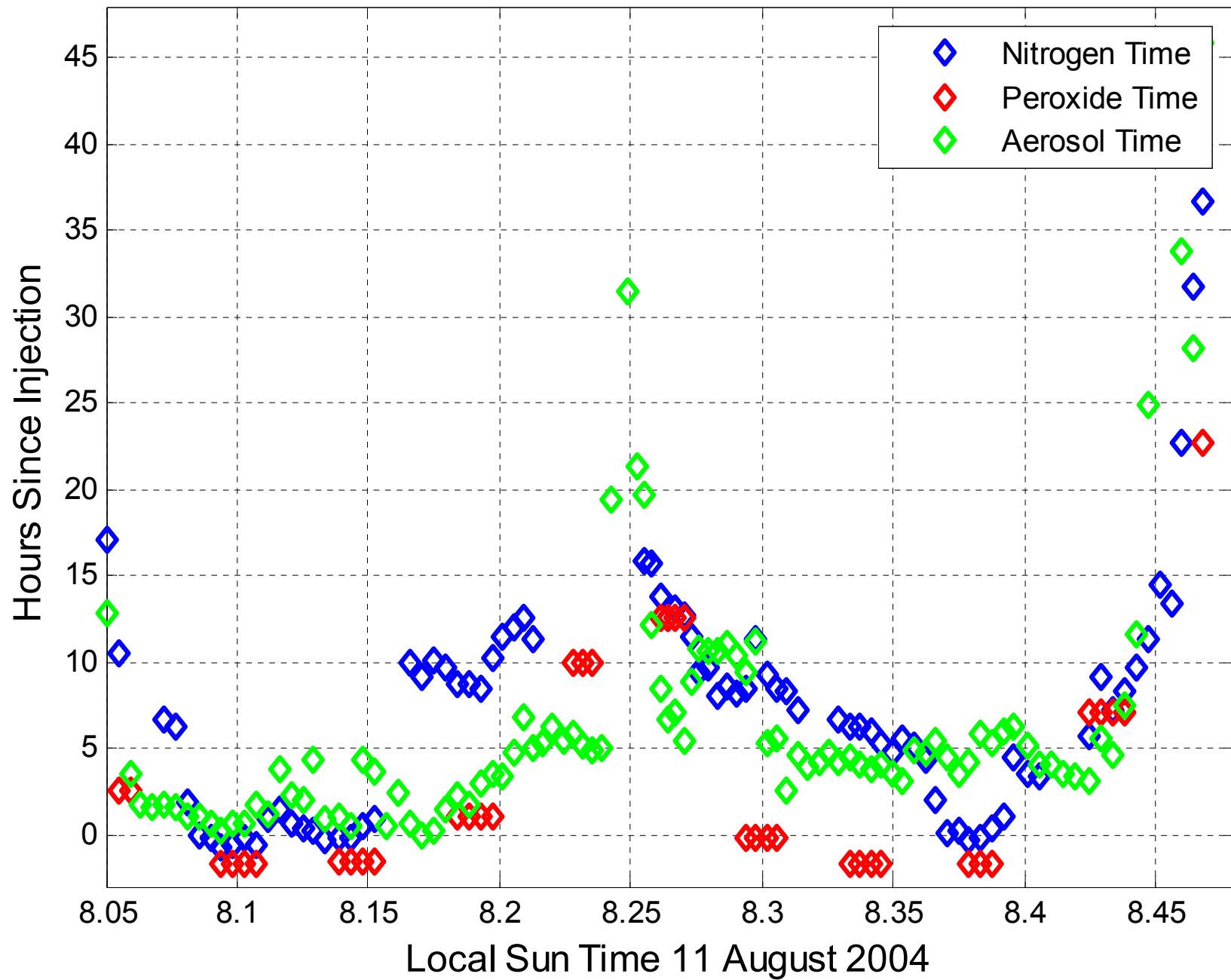


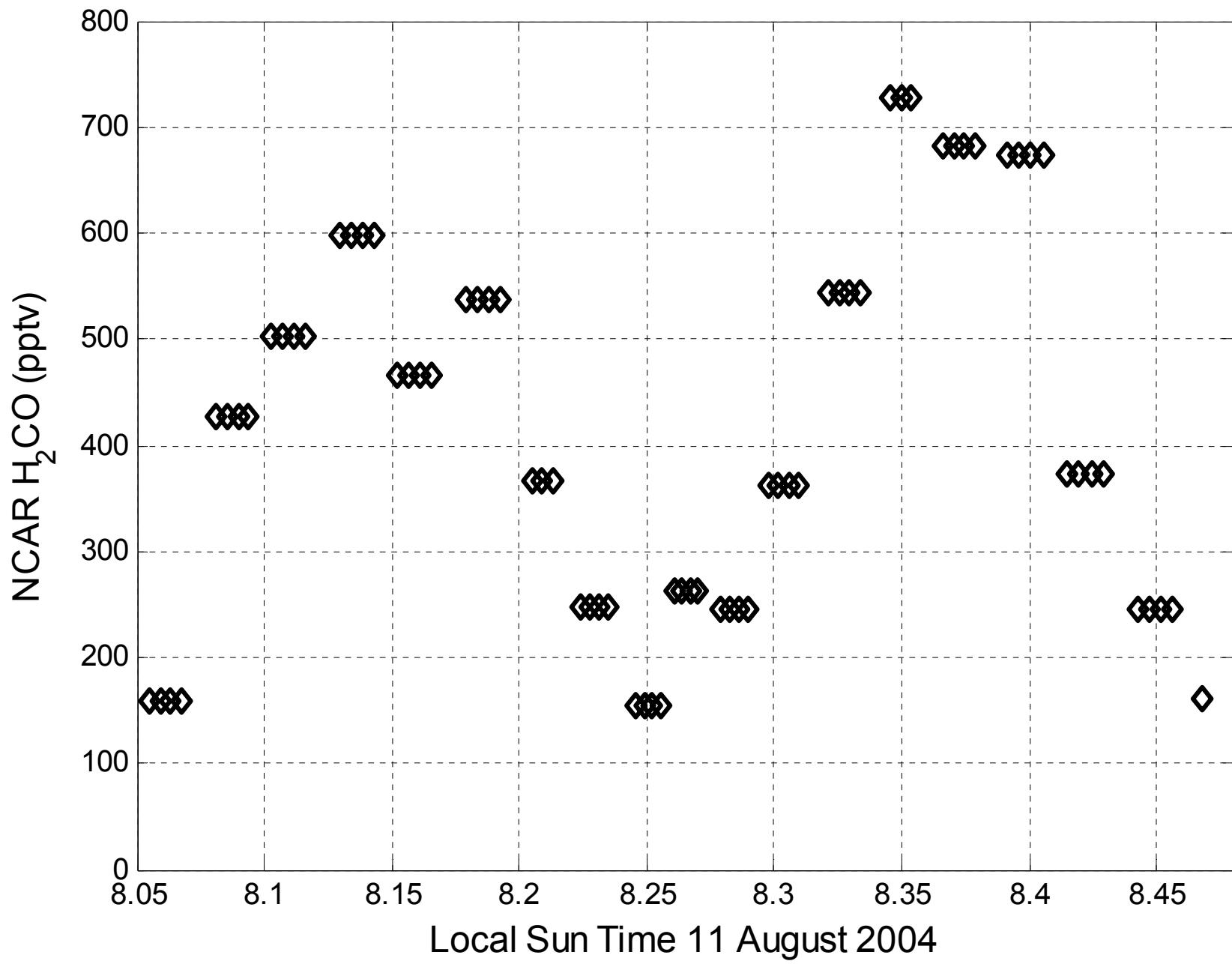
Fraction of Total Tropospheric Column at LAT = 33.66 LONG = 276.83



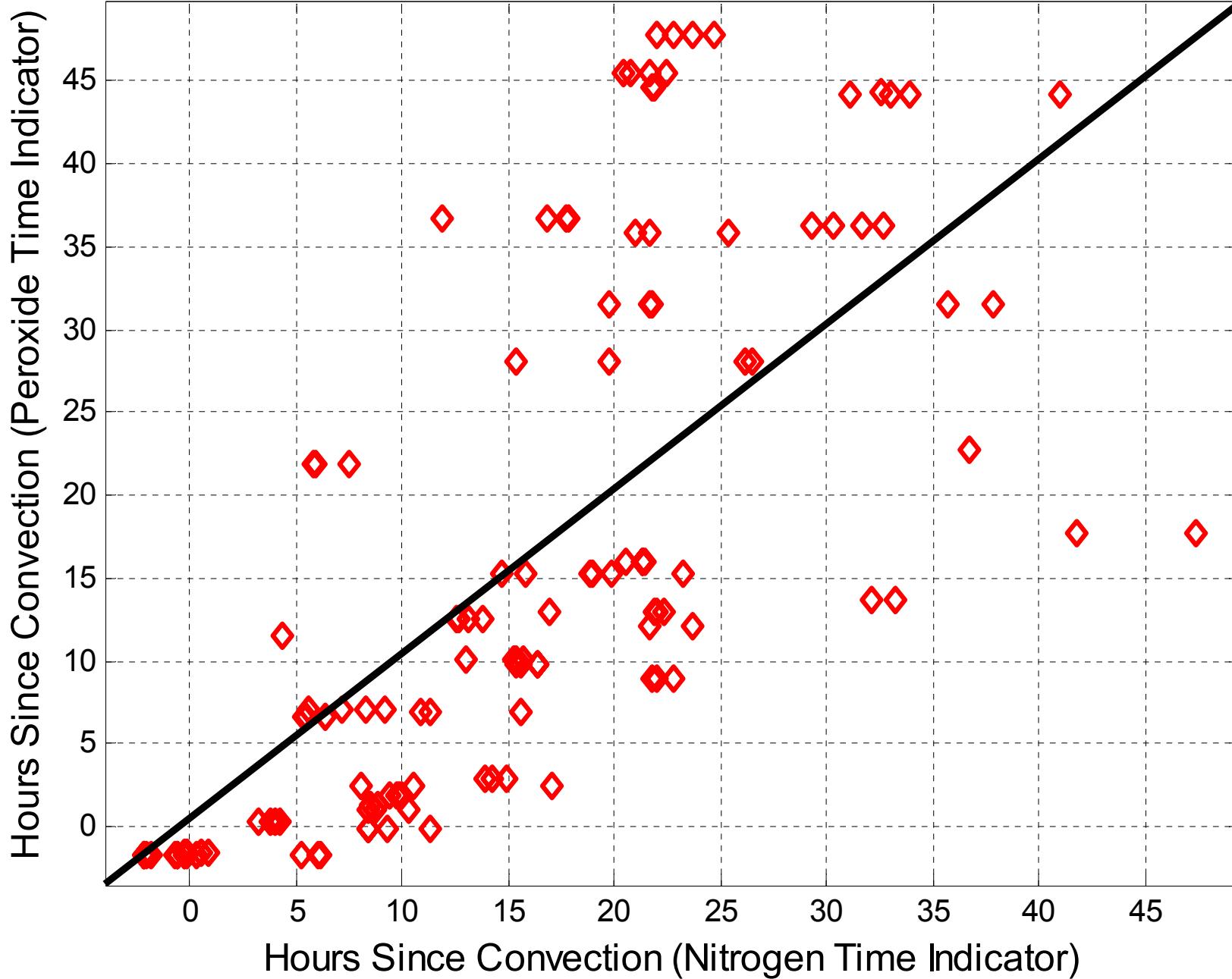
0-D time dependent model: Noon injection, no dilution, 10km





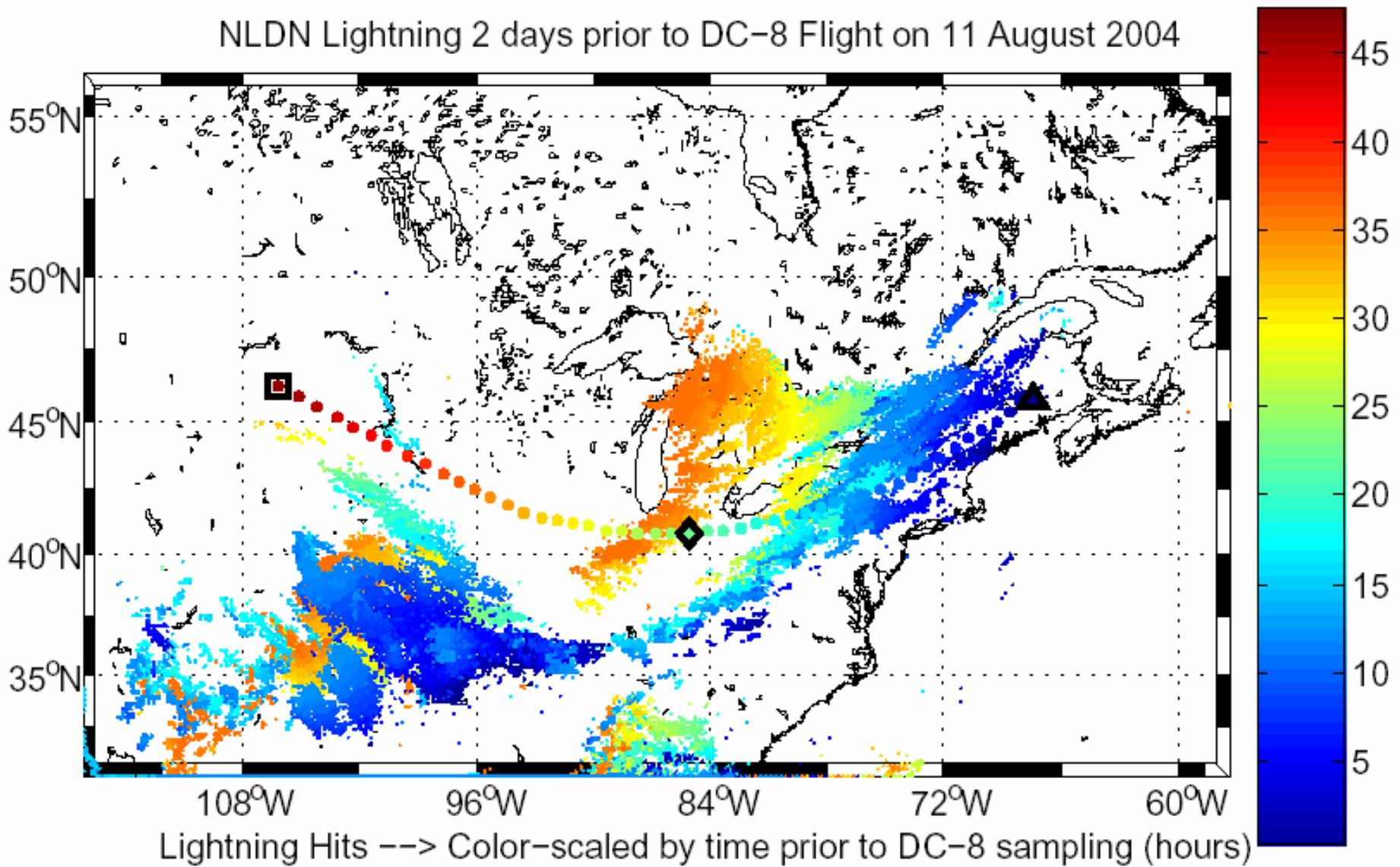


11 August 2004 ALT>8km

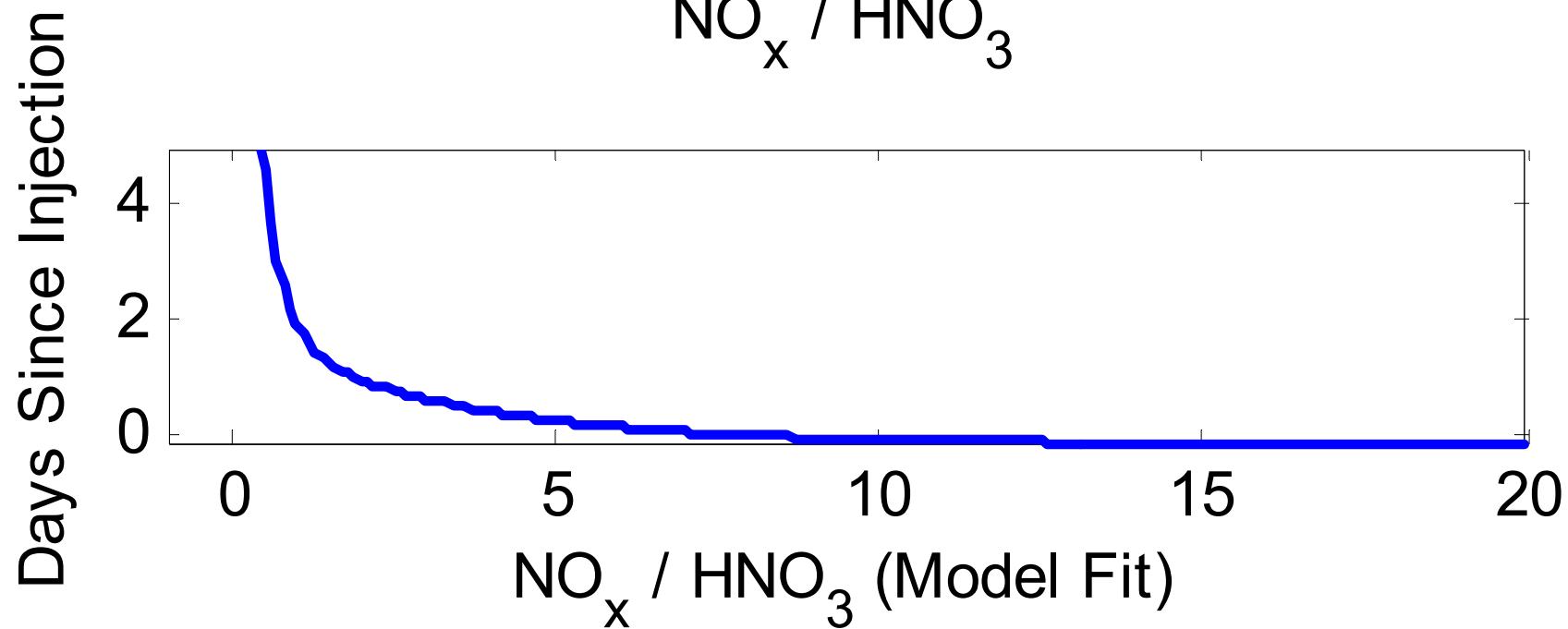
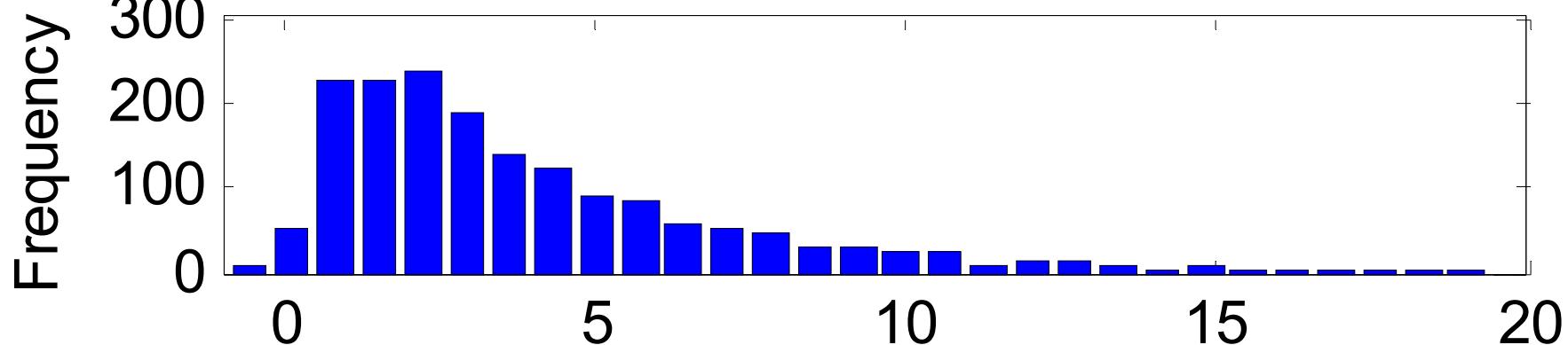


Lightning hits 10/11 August 2004 2day back trajectory

NLDN Lightning 2 days prior to DC-8 Flight on 11 August 2004

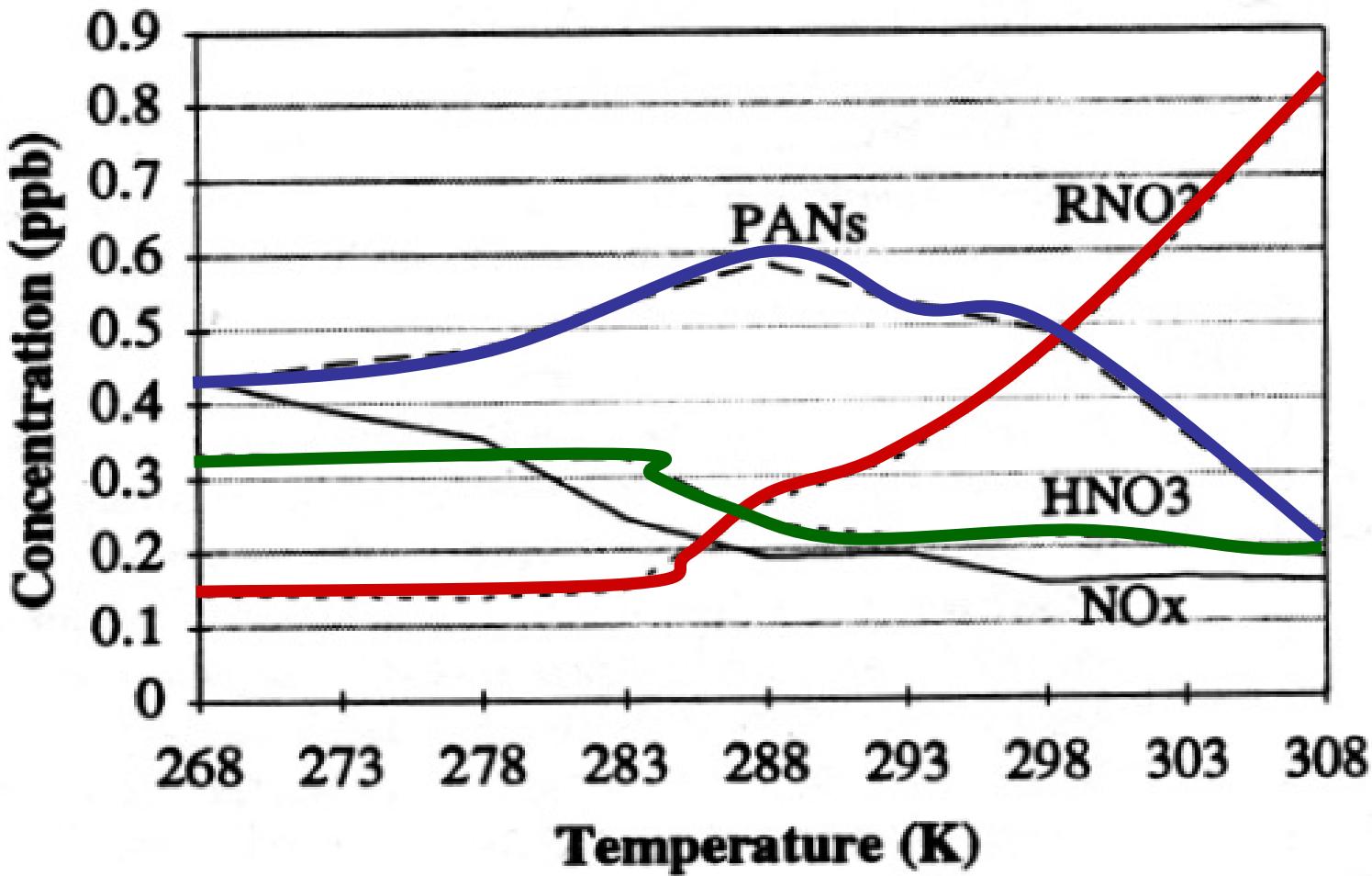


1-min merge data; Model fit to exponential



Isoprene Nitrates

Sillman and Sampson JGR 1995

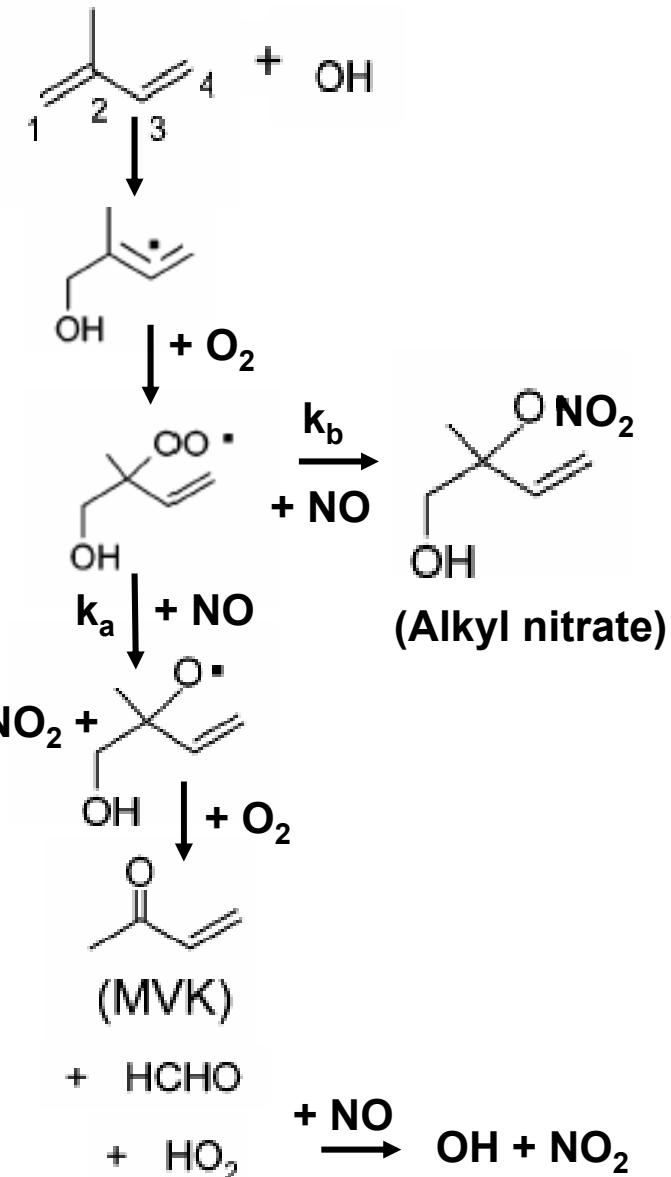


Hydrocarbons (RO_2) —————→
←———— OH

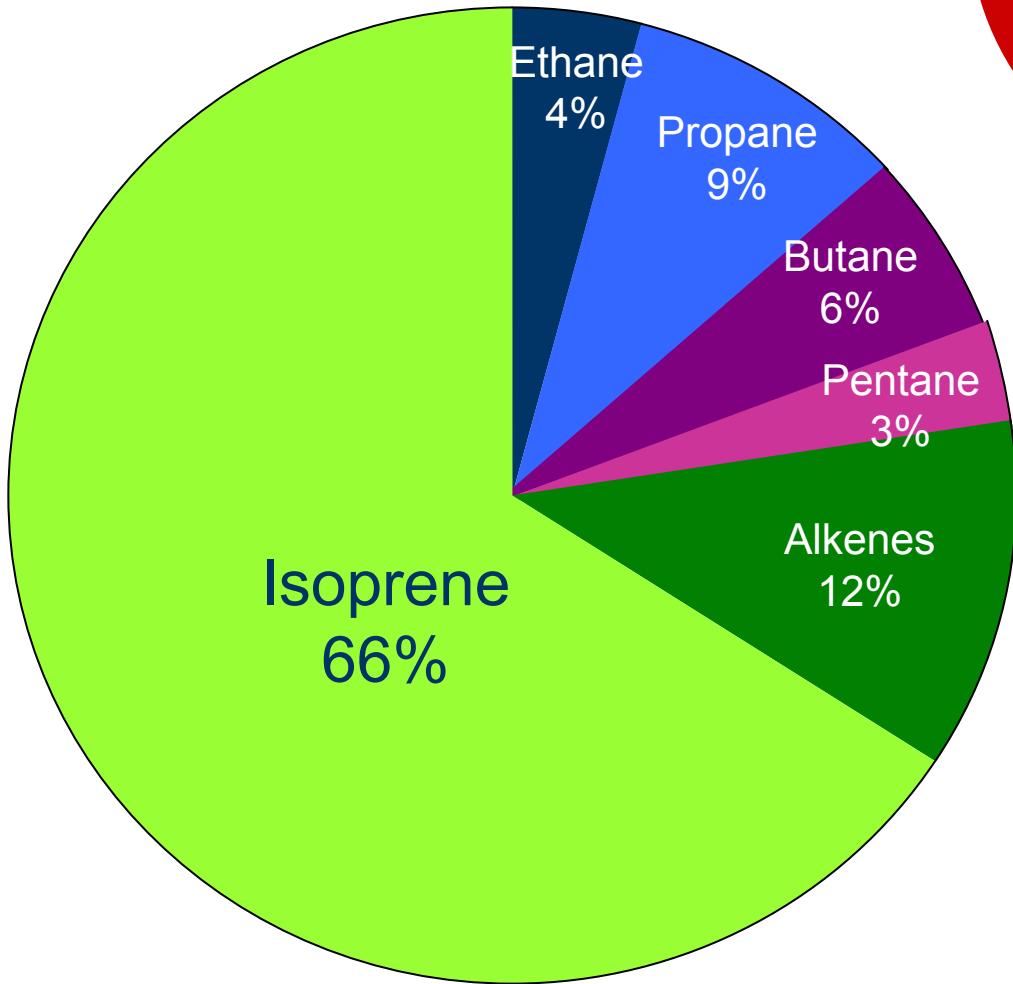
Isoprene Oxidation

H₂CO yield is 0.6

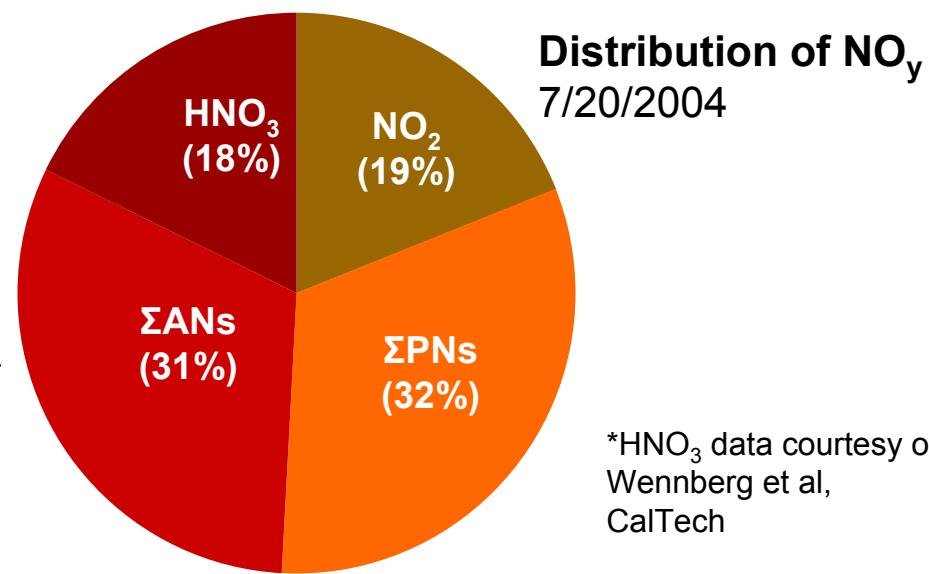
**O₃ yield is 2(1- α) where
 α is $k_b/(k_a+k_b)$**



Observed contributions to RO₂[·] production

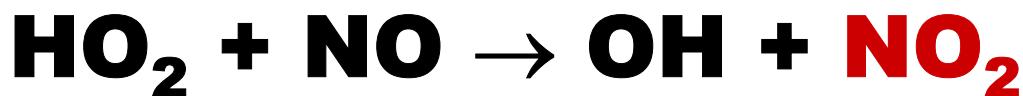
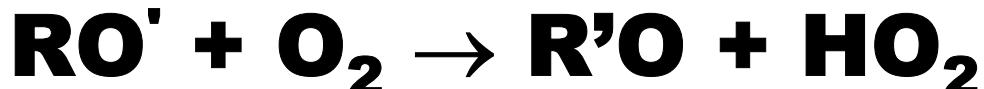


Hydrocarbon data provided by Blake et al, UC Irvine



*HNO₃ data courtesy of
Wennberg et al,
CalTech

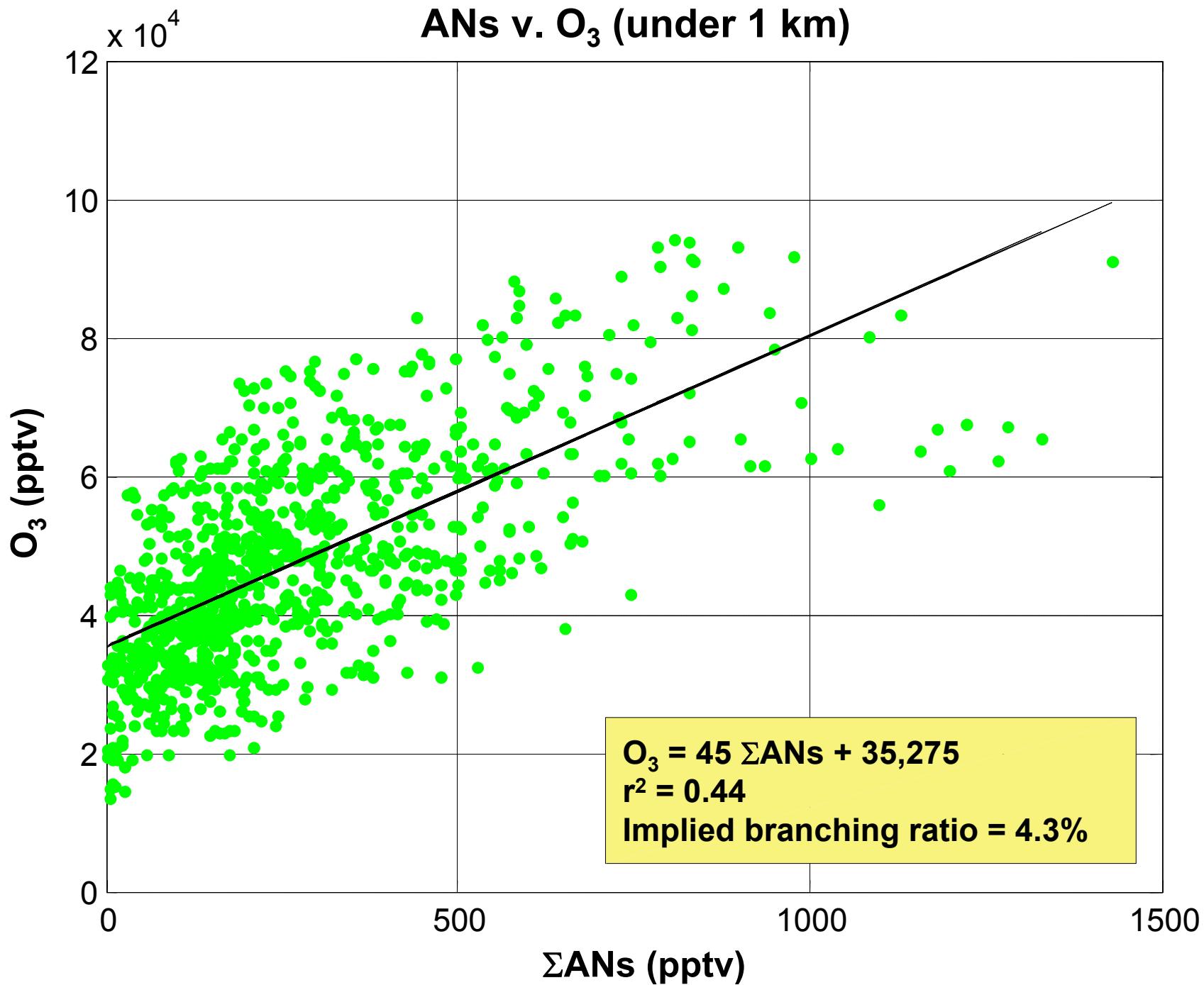
Σ ANs and O_3



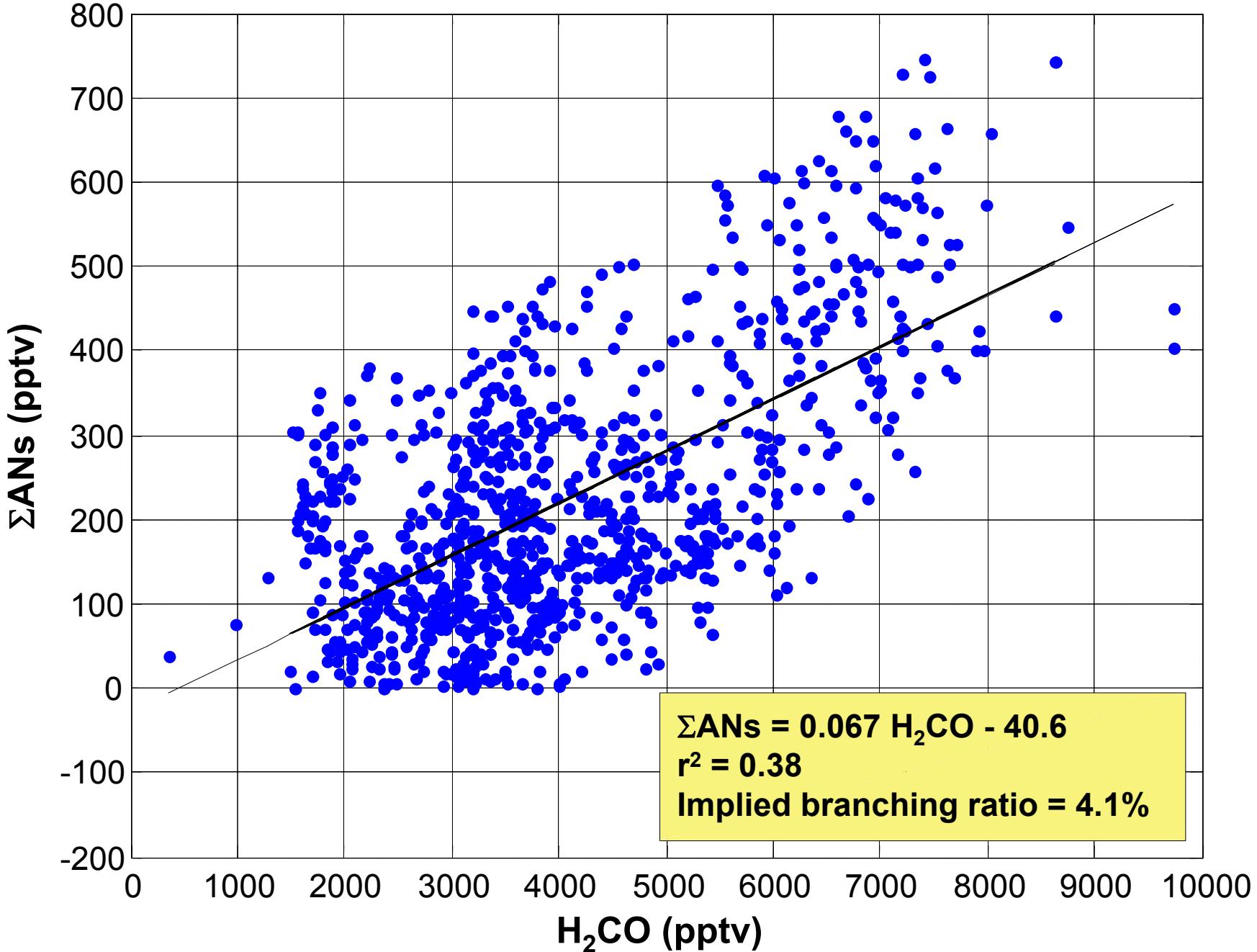
2 x 97 O_3 : 3 Σ ANs

65 O_3 : Σ AN

ANs v. O₃ (under 1 km)



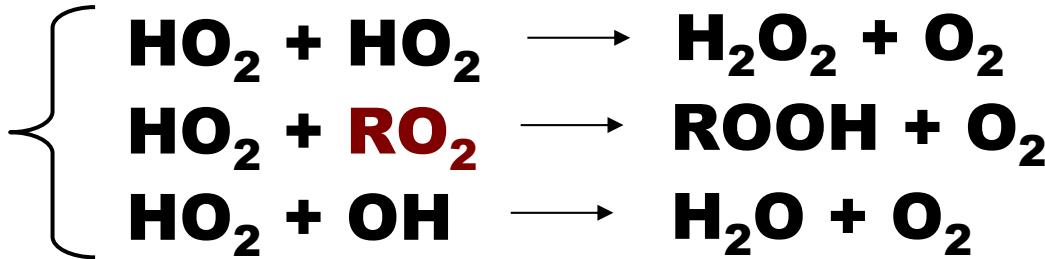
H_2CO v. ANs (under 1 km)



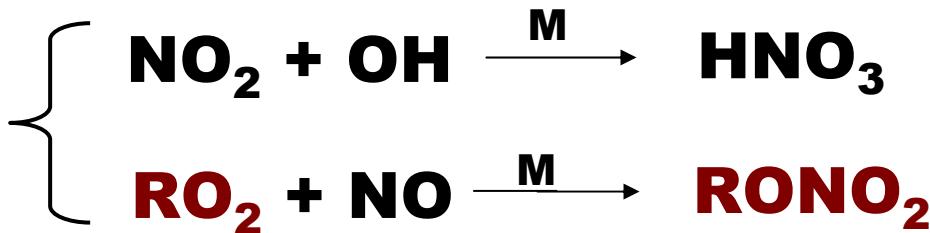
HO_x Chain Termination

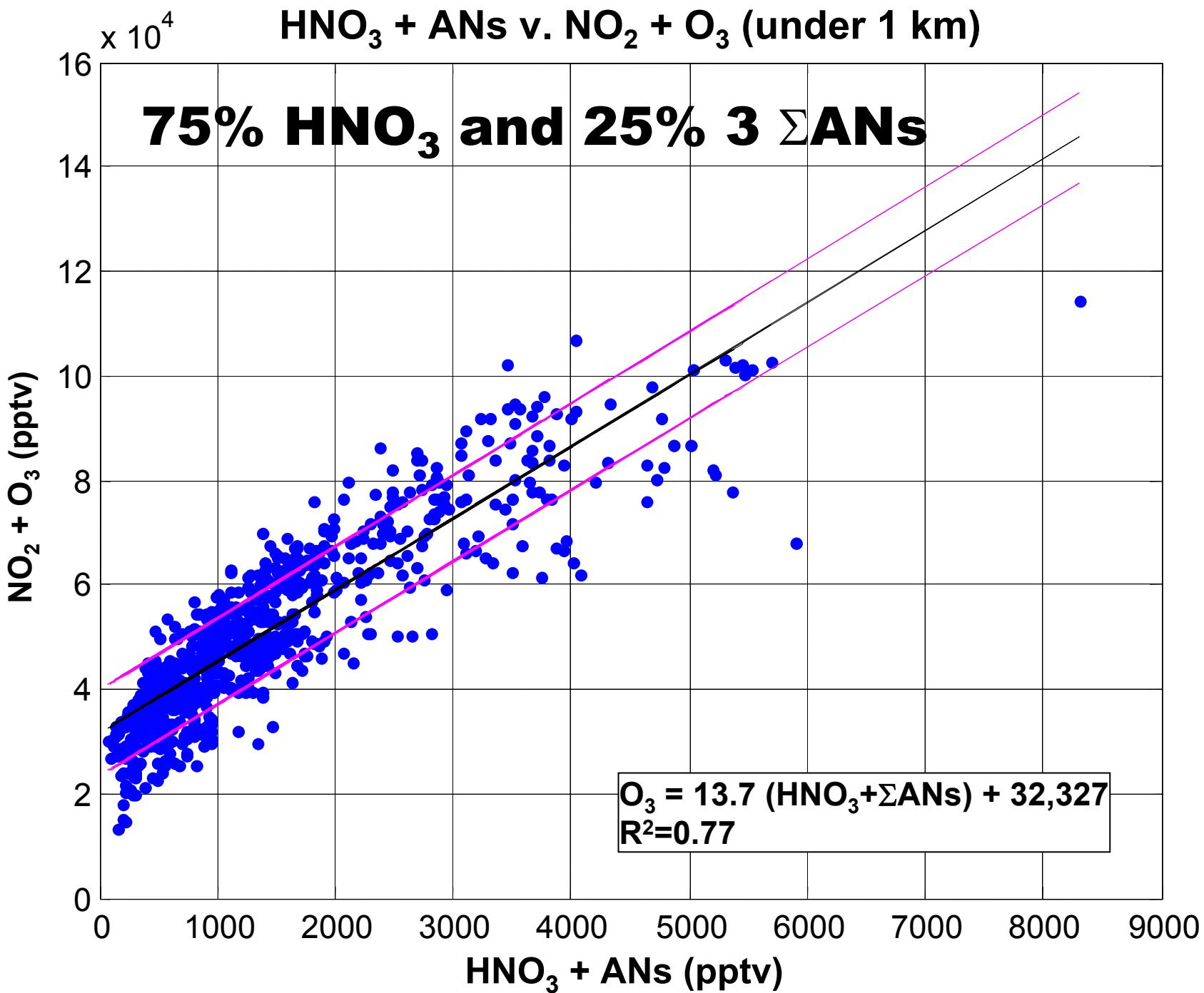
Chain Termination

HO_x- HO_x



NO_x- HO_x





Plans & Questions



Describe distribution of age of air between 8 and 12 km. Understand how age affects other photochemical processes. What other short lived species (e.g. H₂CO are lofted by convection)? How well can we connect observations of atmospheric composition in the PBL to the observations at 8-12km? Will that provide a way to measure lightning NO_x?



Assess whether data does cleanly constrain isoprene nitrate yield. Characterize ΣAN/HNO₃ roles in HO_x chain termination. Where do the ΣANs go?