Enhanced NO/NO_y System (Nitrotrain)

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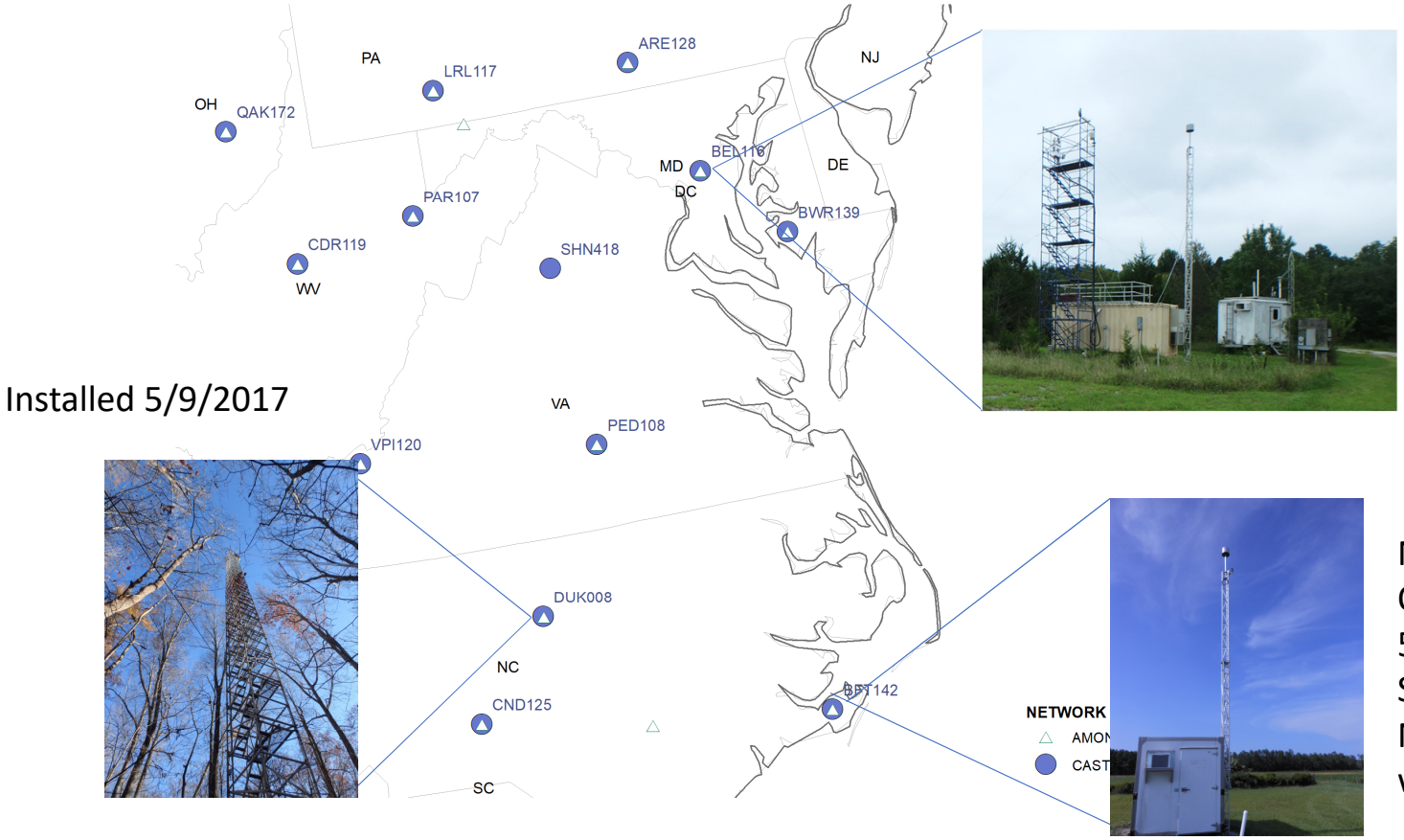
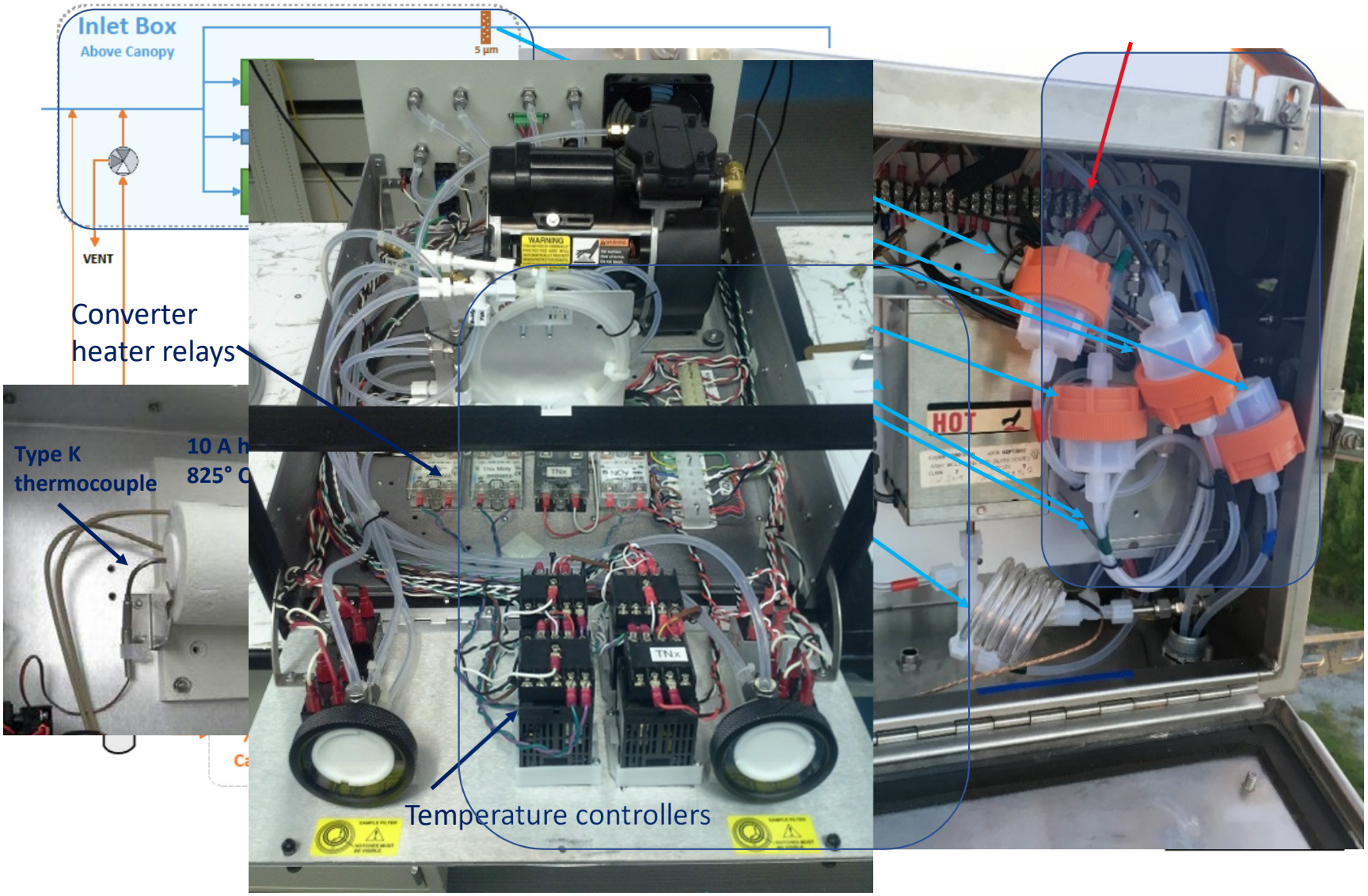
Nitrotrain Locations



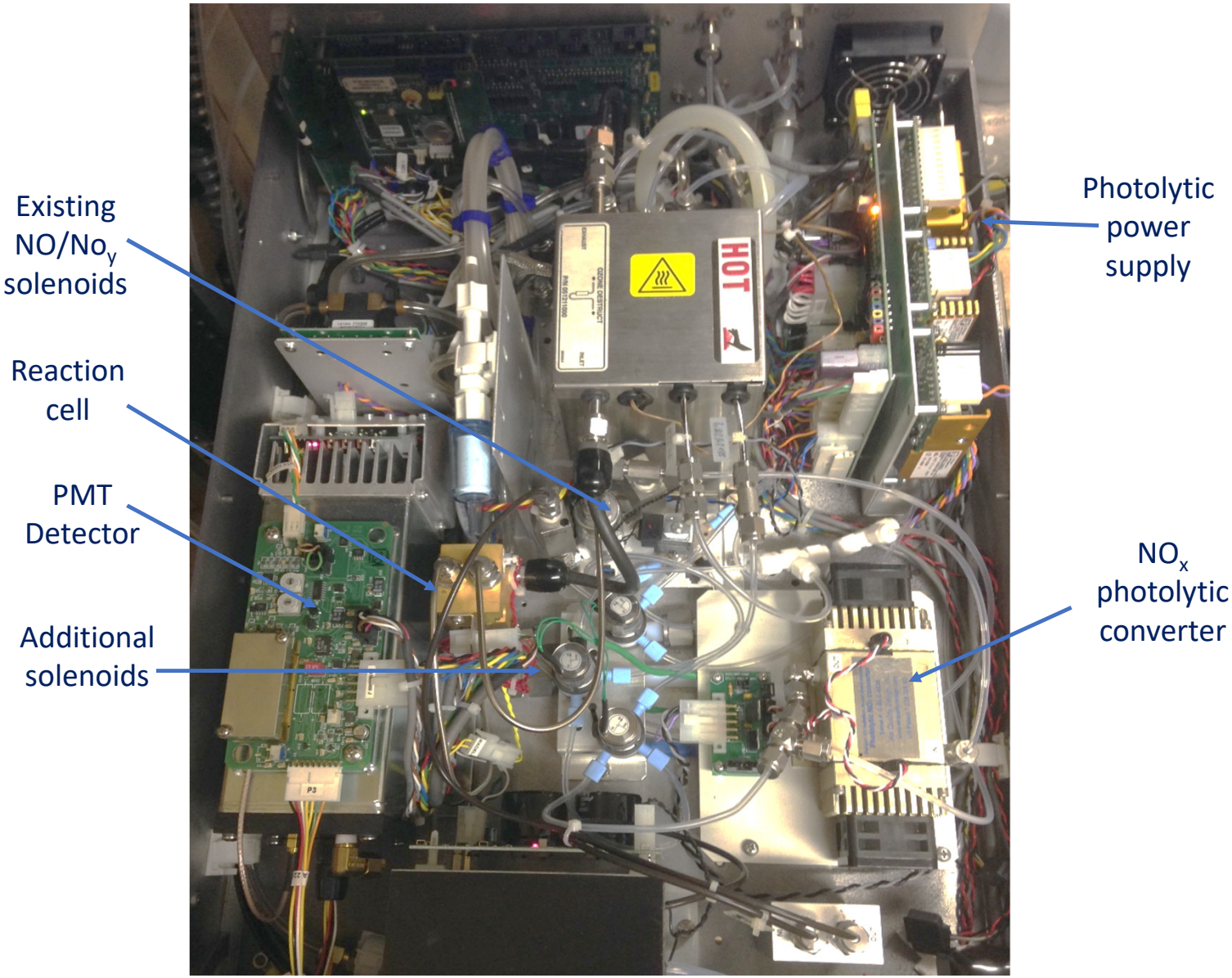
Installed 11/14/2014
HNO_3 installed 8/22/2016
NO_x moly converter removed 9/14/2016

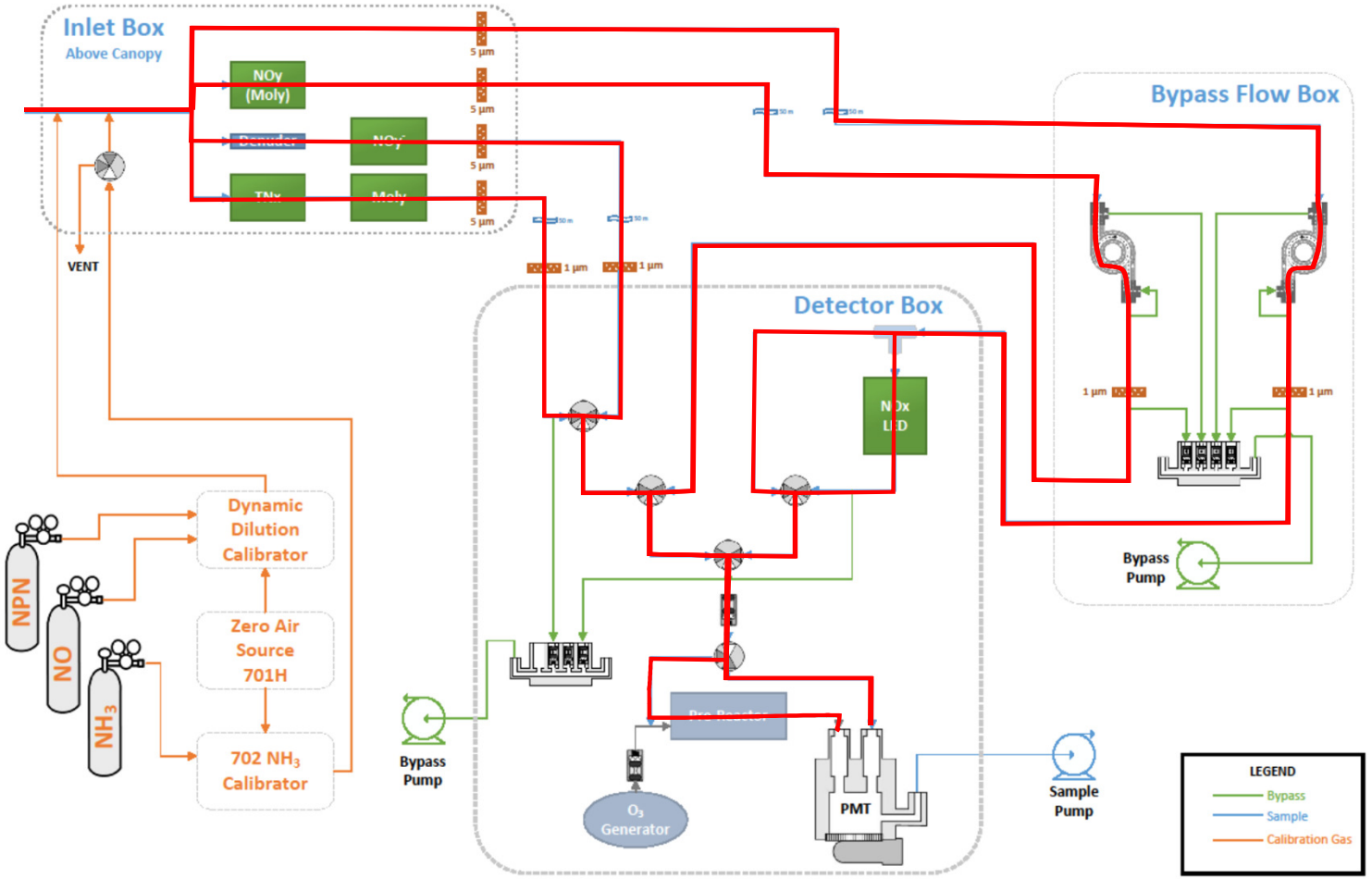
Installed 5/9/2017

Nitrotrain 1.0
Operated 2/10/2012 – 5/15/2013
Switching between NO_x, NO_y, NO and comparison to weekly and daily denuders



- Directly measured:
  - NO_y
  - NO_x True
  - NO
  - TN_x
  - NO_y Minus
- Calculated:
  - HNO_3
  - NO_y Diff
  - NO_2 True
  - NH_3


Existing NO/No$_y$ solenoids
Reaction cell
PMT Detector
Additional solenoids
Photolytic power supply
NO$_x$ photolytic converter
HOT

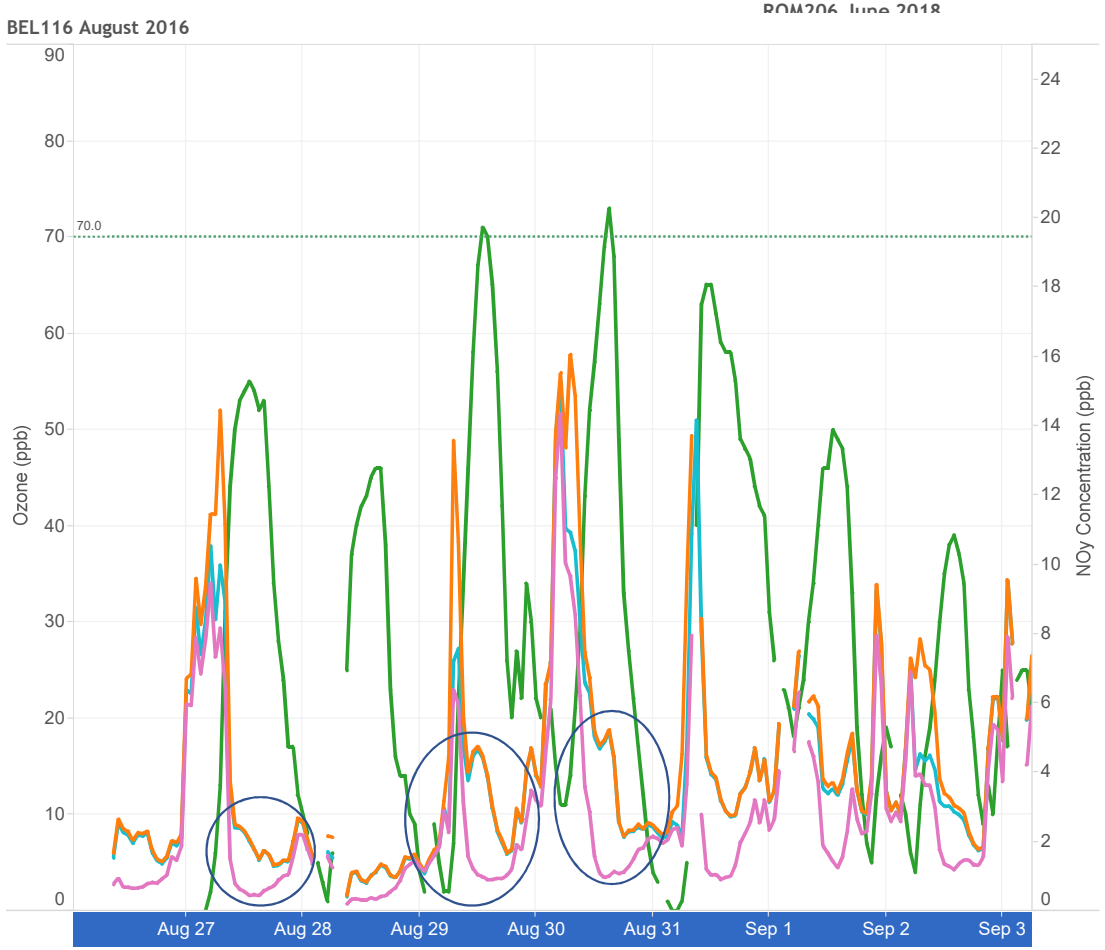


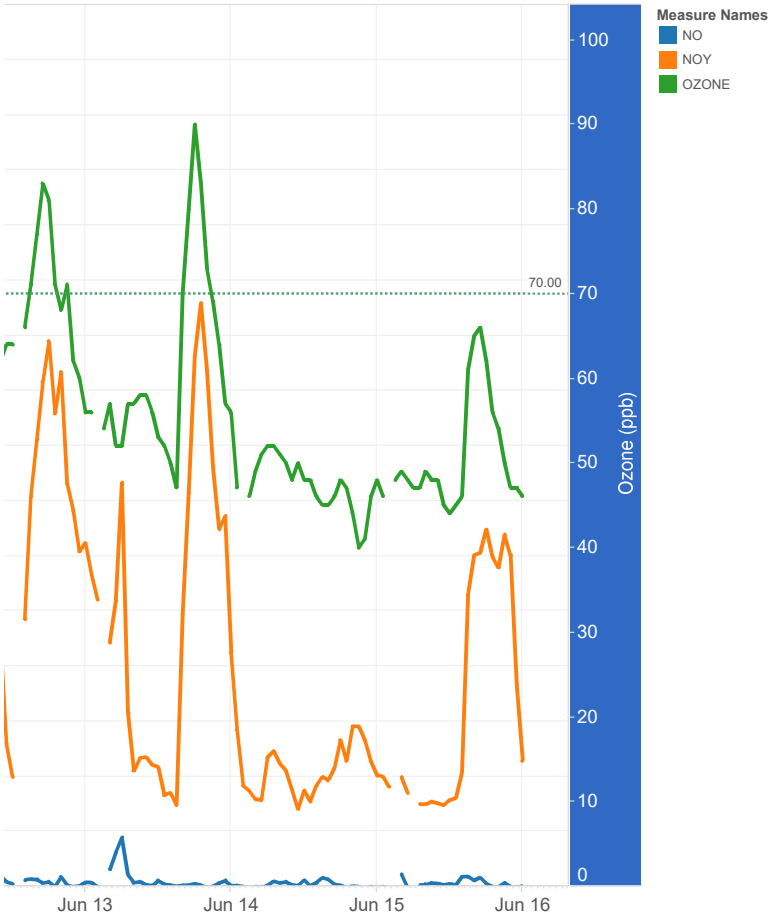
NO	10 s	5 samples
NOy	10 s	5 samples
NOx	10 s	5 samples
HNO_3	10 s	5 samples
NO	10 s	5 samples
TNx	10 s	5 samples
Pre-Reactor	12 s	5 samples

Hourly Average

NO	20%	375 samples
NOy	14%	250 samples
NOx	20%	375 samples
HNO_3	14%	250 samples
TNx	14%	250 samples
Pre-Reactor	17%	250 samples

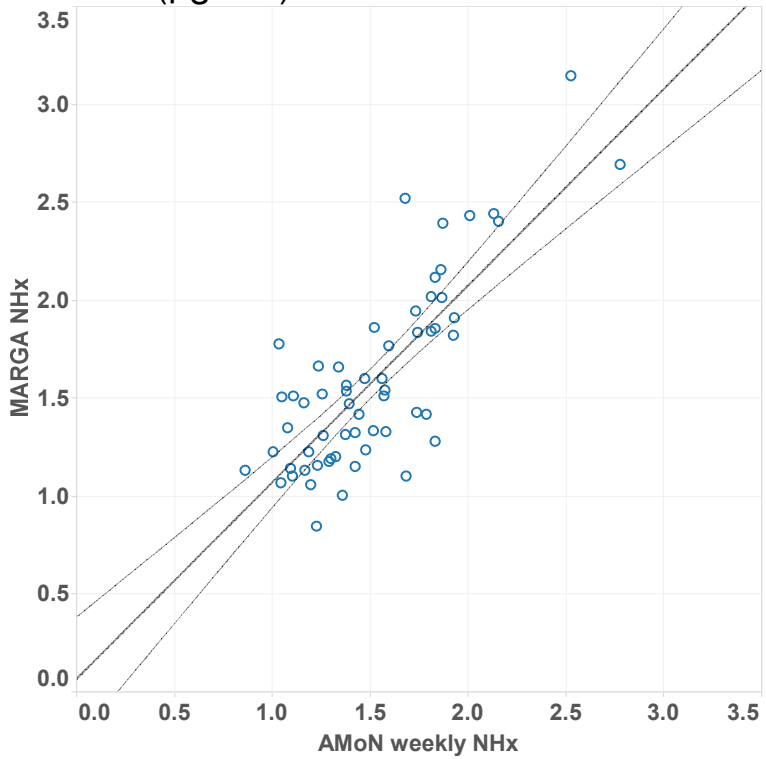
Ozone exceedances





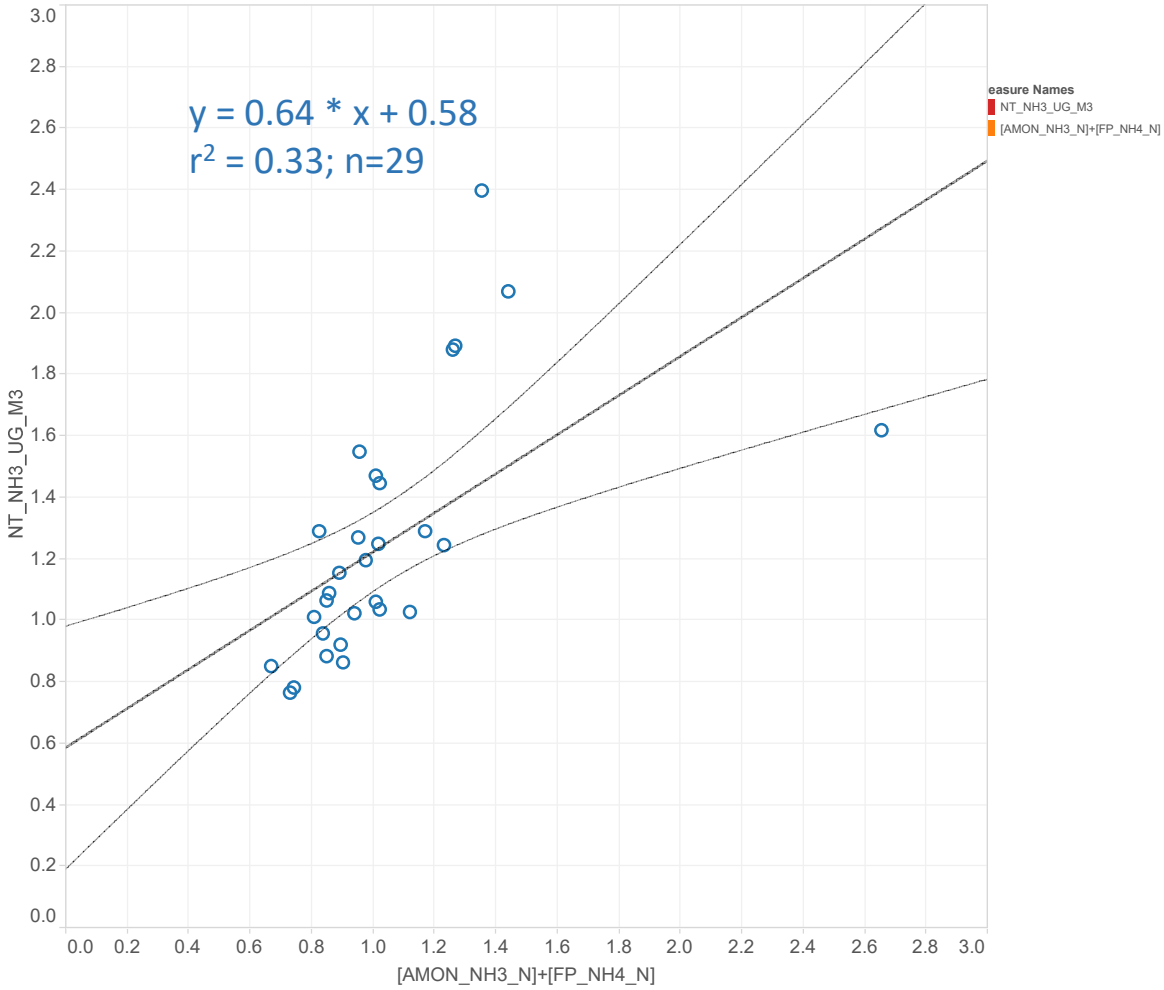
Beltsville Comparison: Regressions of weekly integrated NH_x data

NHx (µg m^{-3}) at Beltsville 2014 -2015

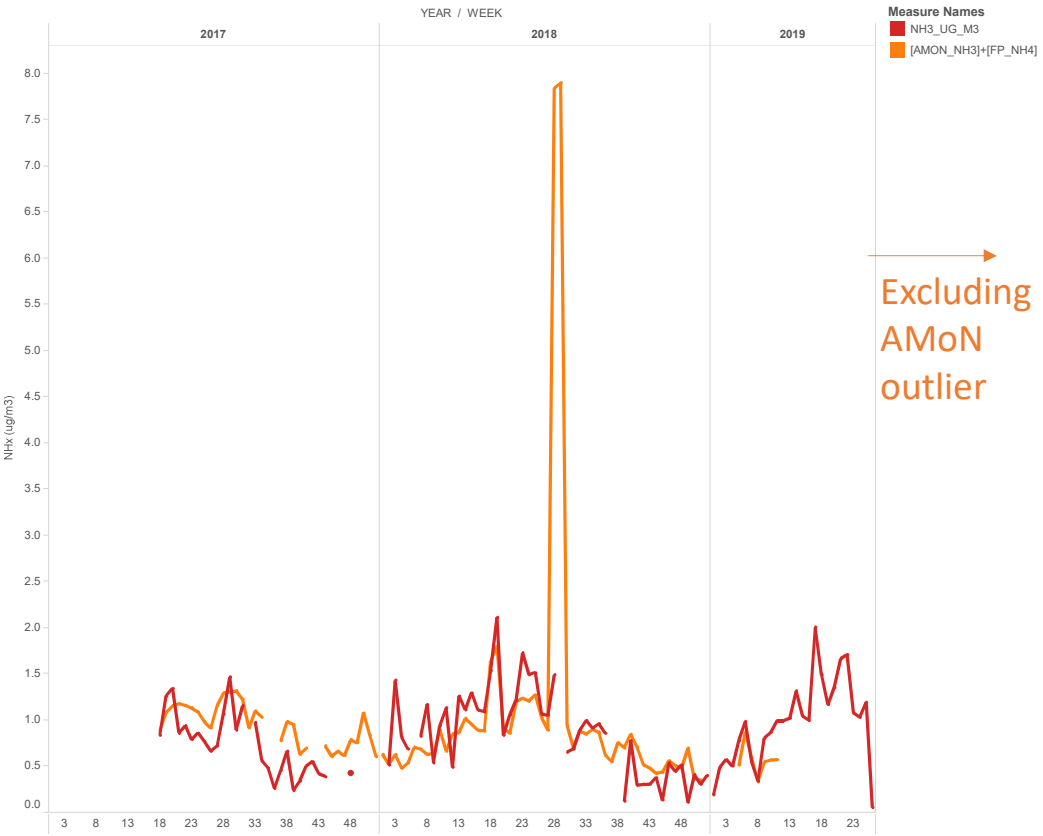


$NH_{x\ MARGA} = 1.004\ NH_{x\ AMON} + 0.066$

$R^2 = 0.630;\ N=60$

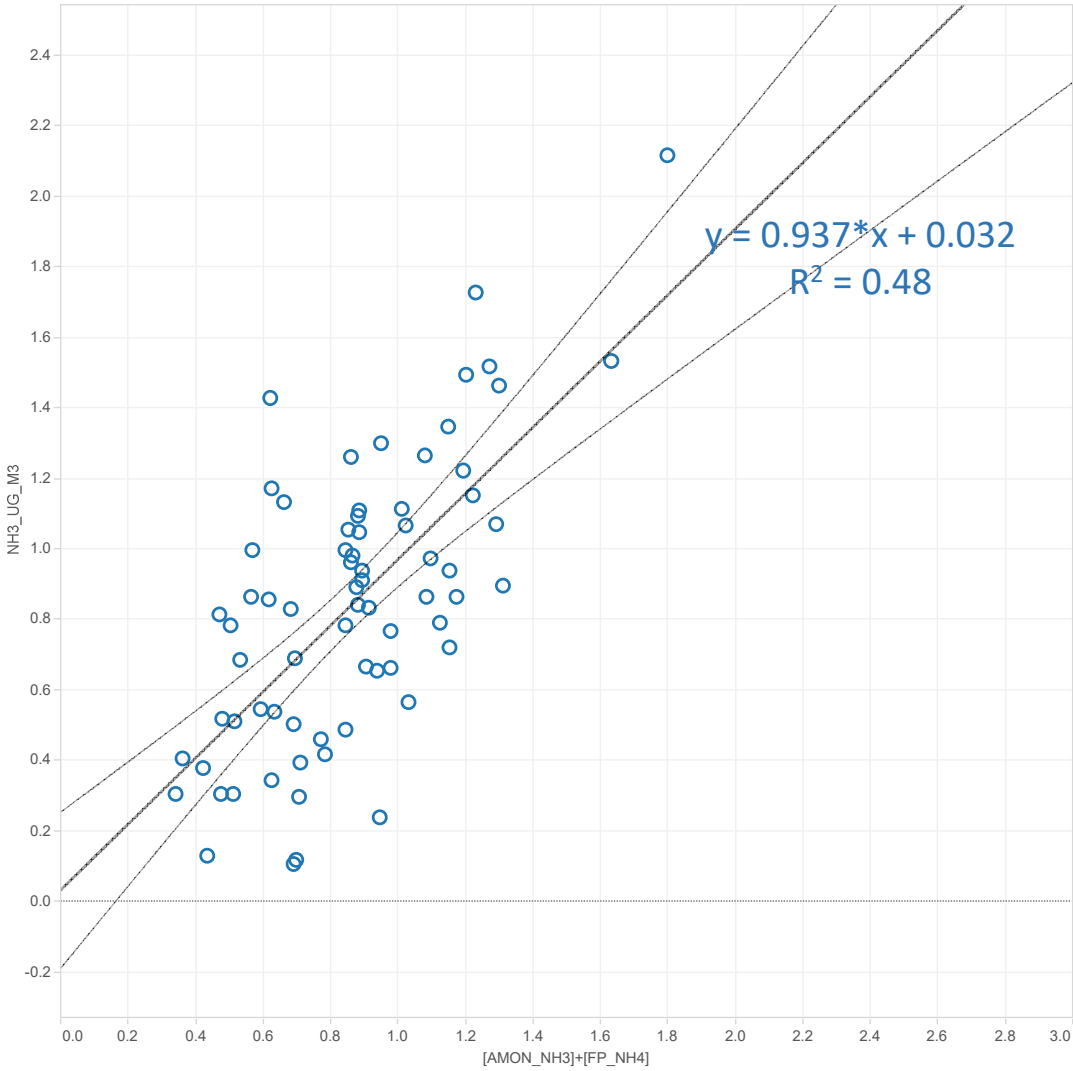


Duke Forest NH_x

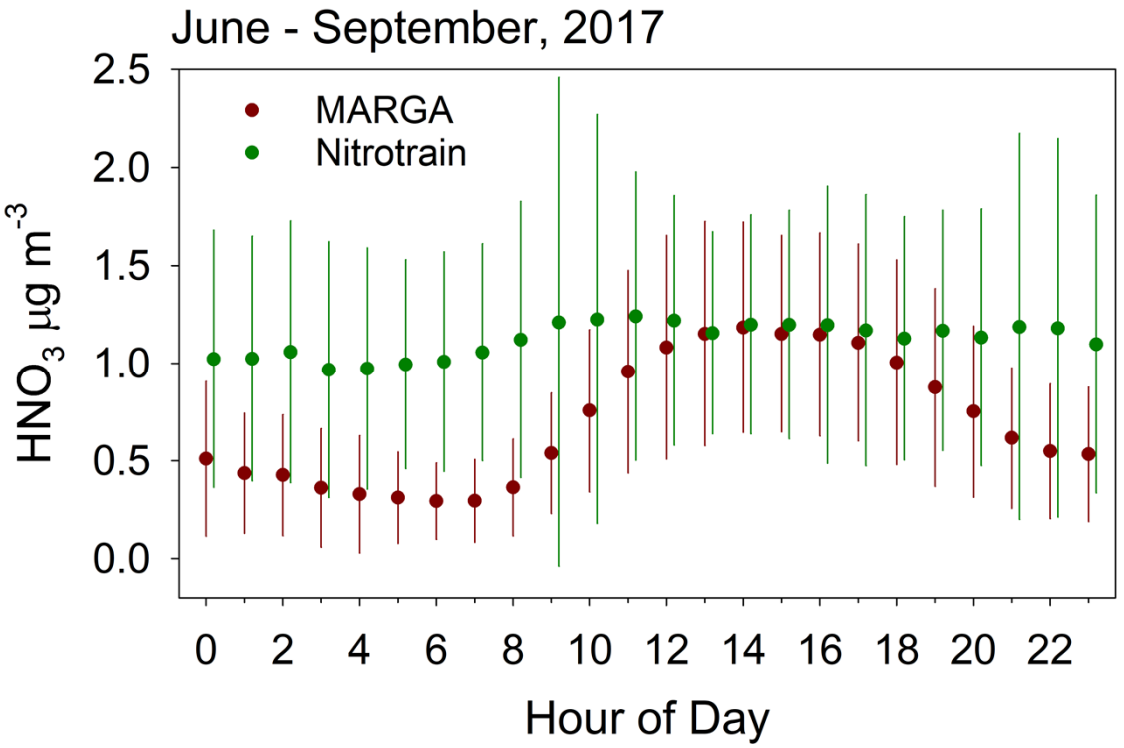


Using NC30 (Grassfield)

Excluding AMoN outlier



Duke Forest MARGA-Nitrotrain Comparison



Discussion

- Propose replacing NO with TNx especially at sites with NO_2
- Additional QA/QC and potential next steps
  - Precision check running co-located sites?
  - Or comparison to Ecophysics at Duke Forest (NOy, NO_2, TNx, NO)?
- Paper describing methods and QA/QC procedures, results from comparisons studies
- CASTNET will continue to evaluate HNO_3
- Determine sites where nitrotrain deployment would be most useful