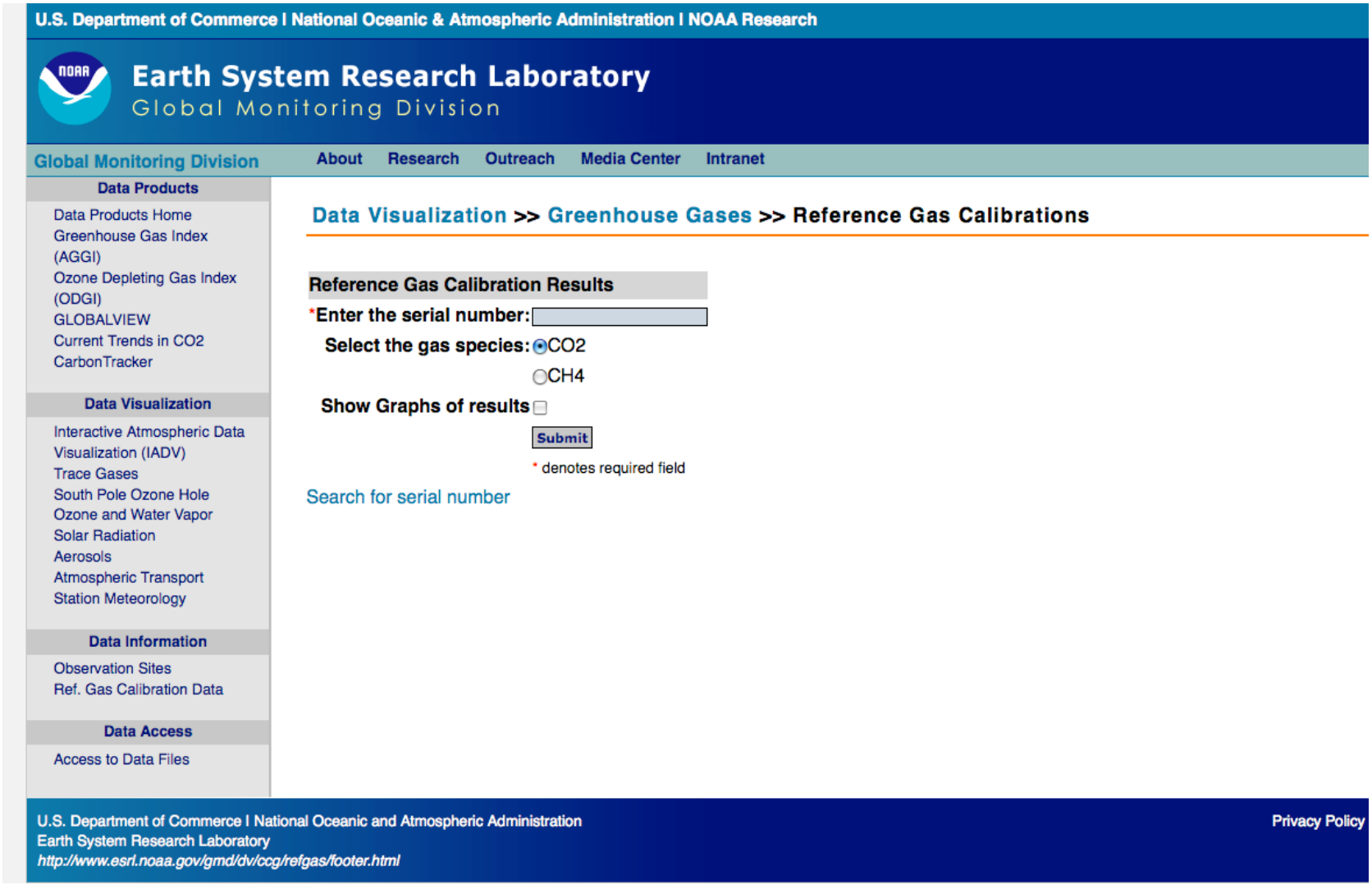
Nitrous Oxide: Are We Making Progress?

Brad Hall, Geoff Dutton, Ed Dlugokencky

NOAA Earth System Research Lab., Boulder, Colorado

- New Data Features from the CCL
- Comparisons
- Background on N_2O Calibrations
- Scale Stability

N_2O Calibration Results: coming soon ….



Comparisons

- Cylinders (RR): Assess differences among scales, scale transfer issues
- Common sites: scale differences, instrumental or sampling bias
- Special Studies: sampling bias

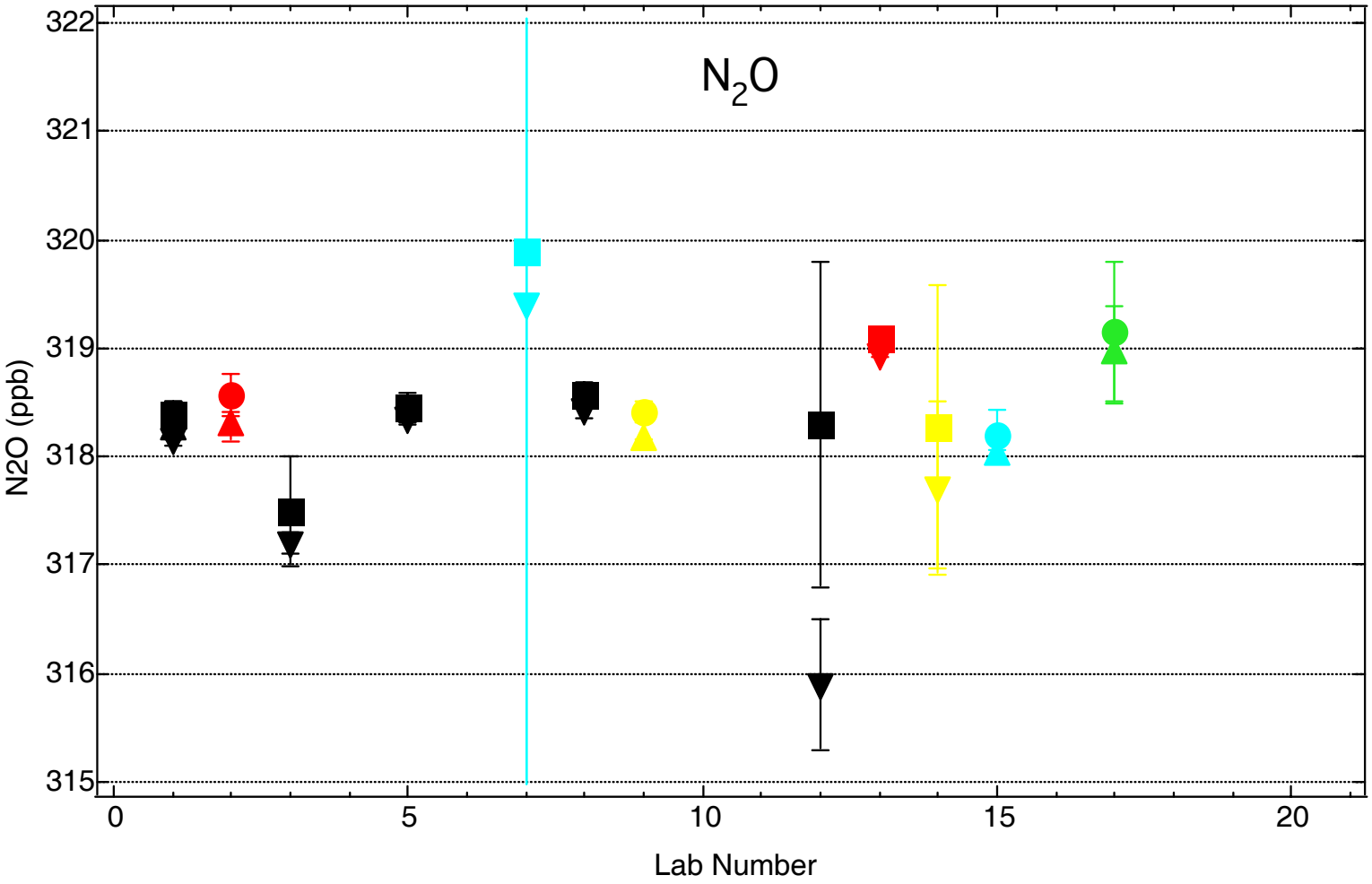
CCL / WCC Comparison

- Blind cylinder exchange (2007)

Cylinder	NOAA Result	WCC-CCL
6061	295.89	**0.29**
4616	305.89	**0.01**
4586	318.90	**0.05**
4563	332.77	**0.01**
4594	347.35	**0.20**

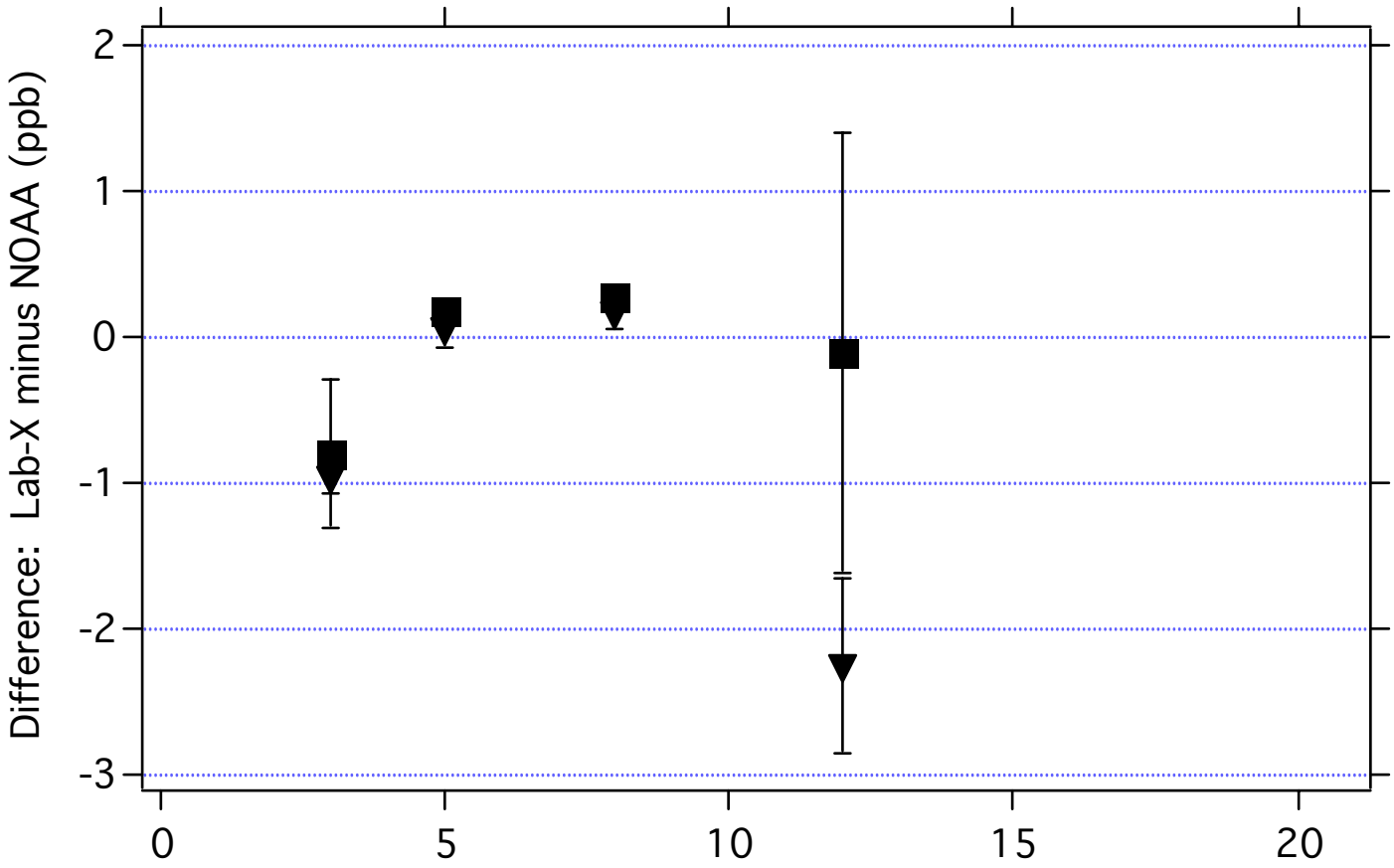
WCC data from H.E. Scheel

Scale Differences (IHALACE)



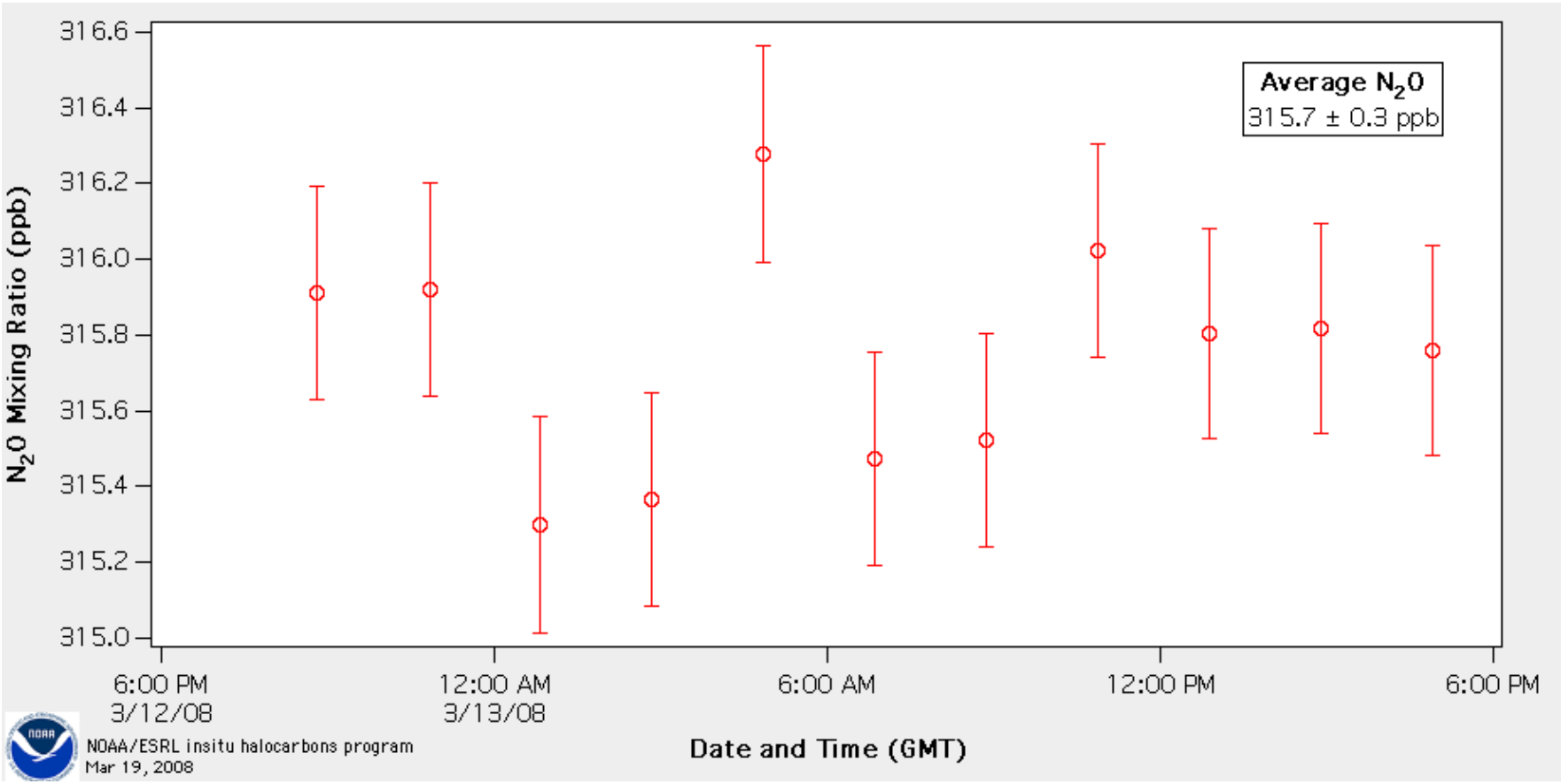
Adapted from Hall et al., Fall AGU Meeting, 2008

Scale Transfer (IHALACE)



WCC Cylinder: NOAA Barrow, AK

WCC N_2O: 315.73 ± 0.3 ppb *(Christoph Zellweger)*
NOAA result: 315.74 ± 0.3 ppb



Comparisons with SIO

- 3 Cylinders, 2006 (lab)
  - Avg Diff. 0.03 ppb
  - Std Dev. 0.19 ppb

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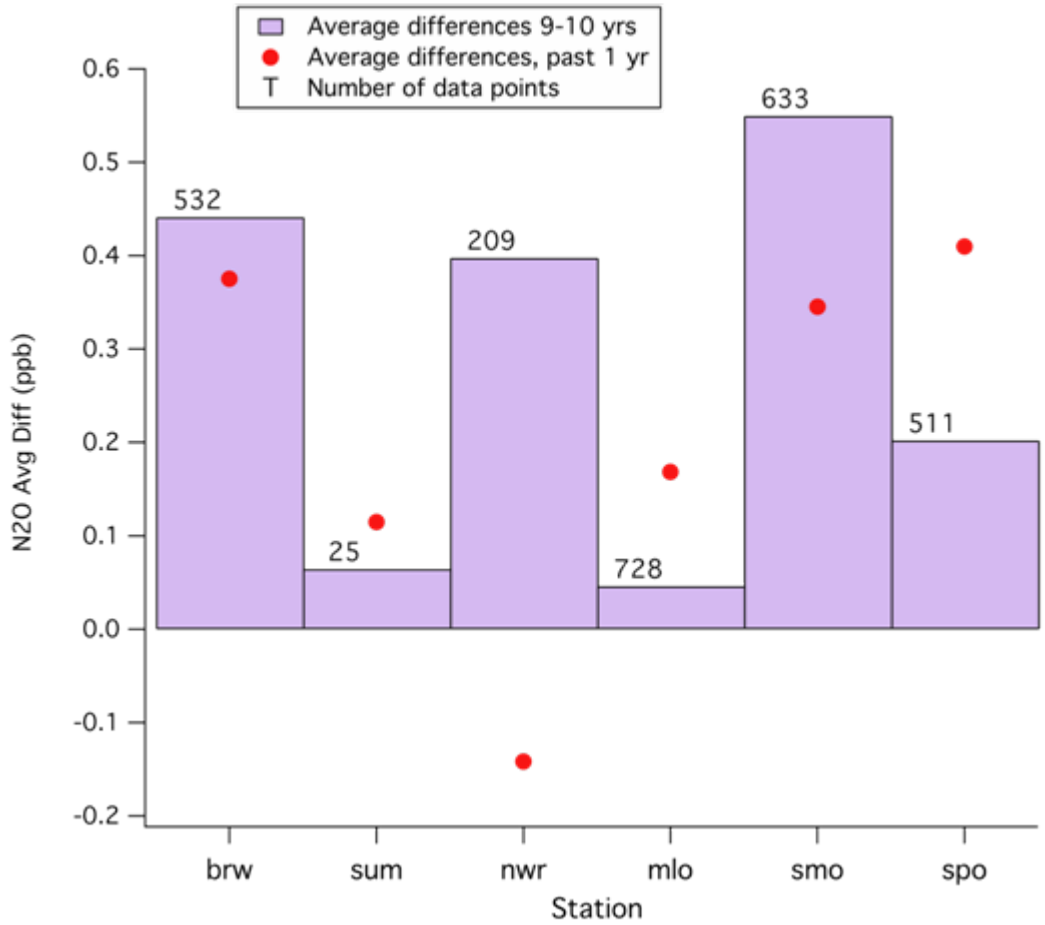
- American Samoa (1999-2009)
  - 0.3 ppb (NOAA *in situ)*
  - -0.3 ppb (NOAA flask)
  - (differences trending toward zero)

(Comparison results courtesy of Paul Krummel)

Comparisons at Common Sites

NOAA *in situ* vs NOAA flask at six sites



Cylinder air measured on field instrument

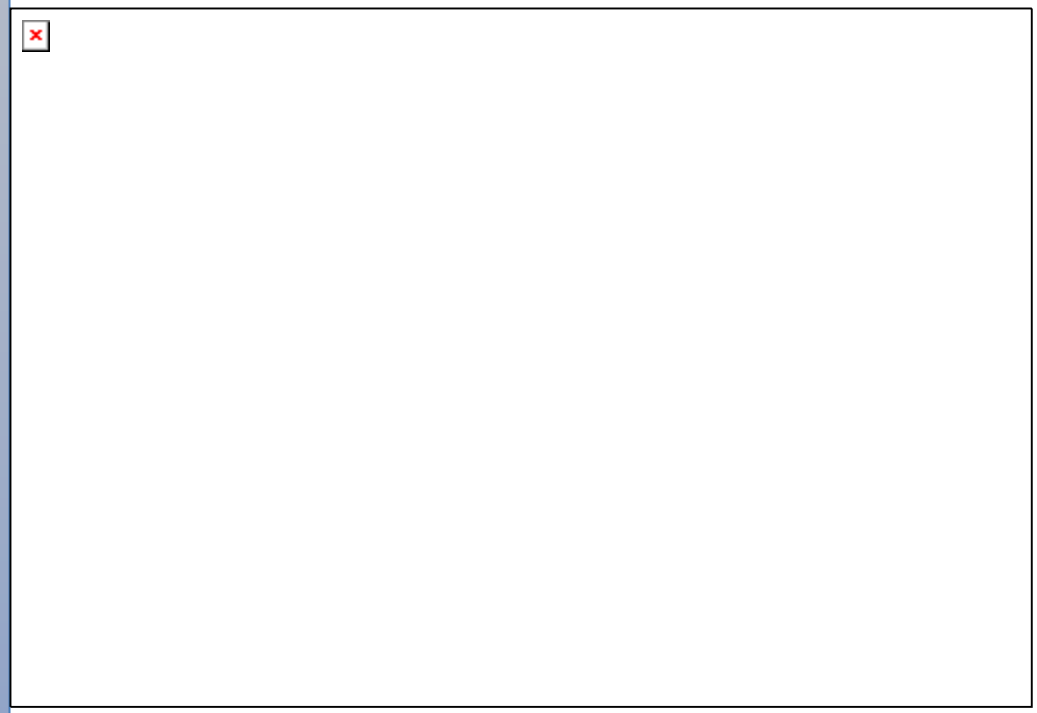
NOAA *in situ* GC at American Samoa

Cylinder air run through intake lines (322.20 ppb)

Measured

inlet #1: 322.12 (0.37)

inlet #2: 323.16 (0.67)

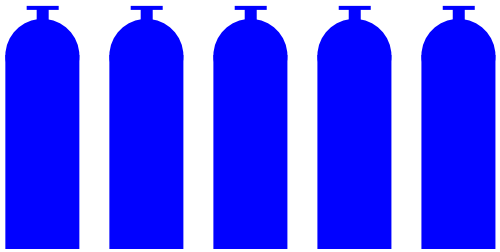


N_2O Analysis

- Single Working Standard (natural air)
  - Feb. 09 – Feb 04: 313.67 ppb
  - Feb 04 – Jun 07: 318.10 ppb
  - Jun 07 – Aug 09: 319.76 ppb
  - Aug 09 – present: 322.65 ppb

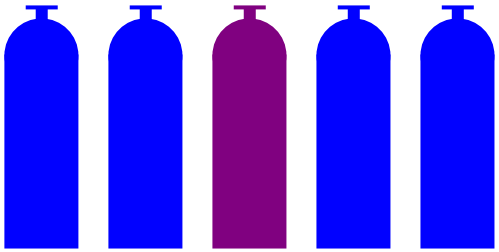
127 192 256 283 314 ppb

2003



262 289 313 332 347 ppb

2004-2008



262 289 318 332 347 ppb

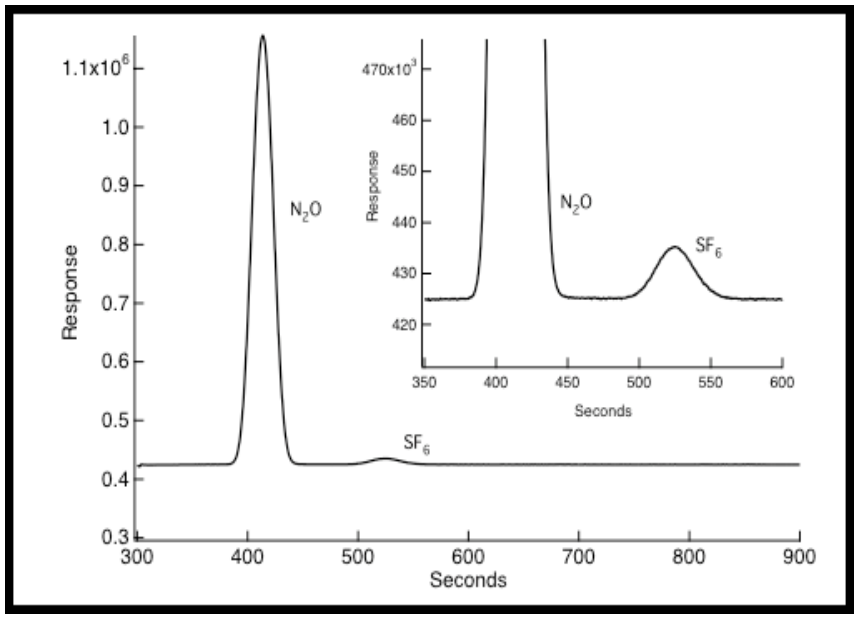
2009

Routine Calibration:

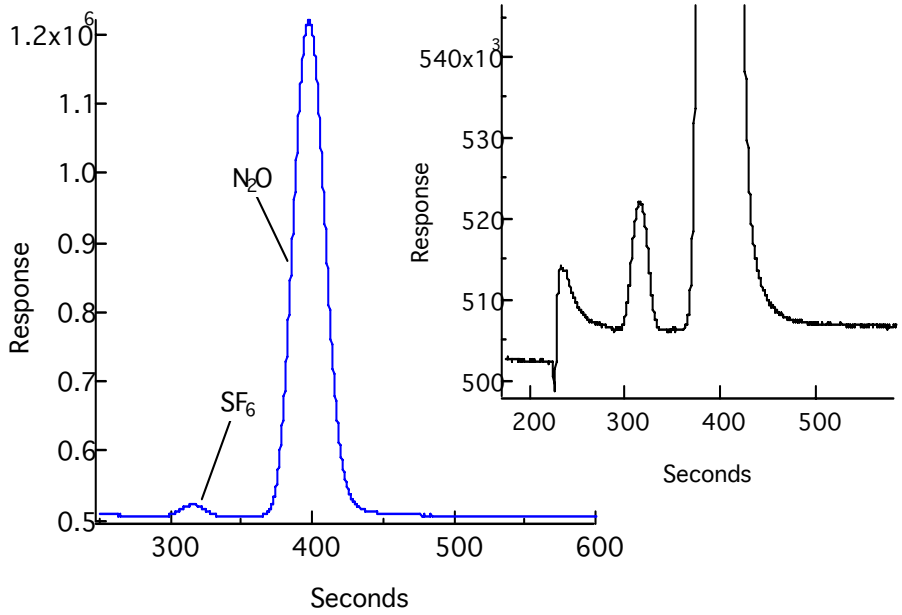
5 secondary standards
2 target tanks
one aluminum,
one stainless steel

N_2O Analysis

2003-2006: Poropak Q column

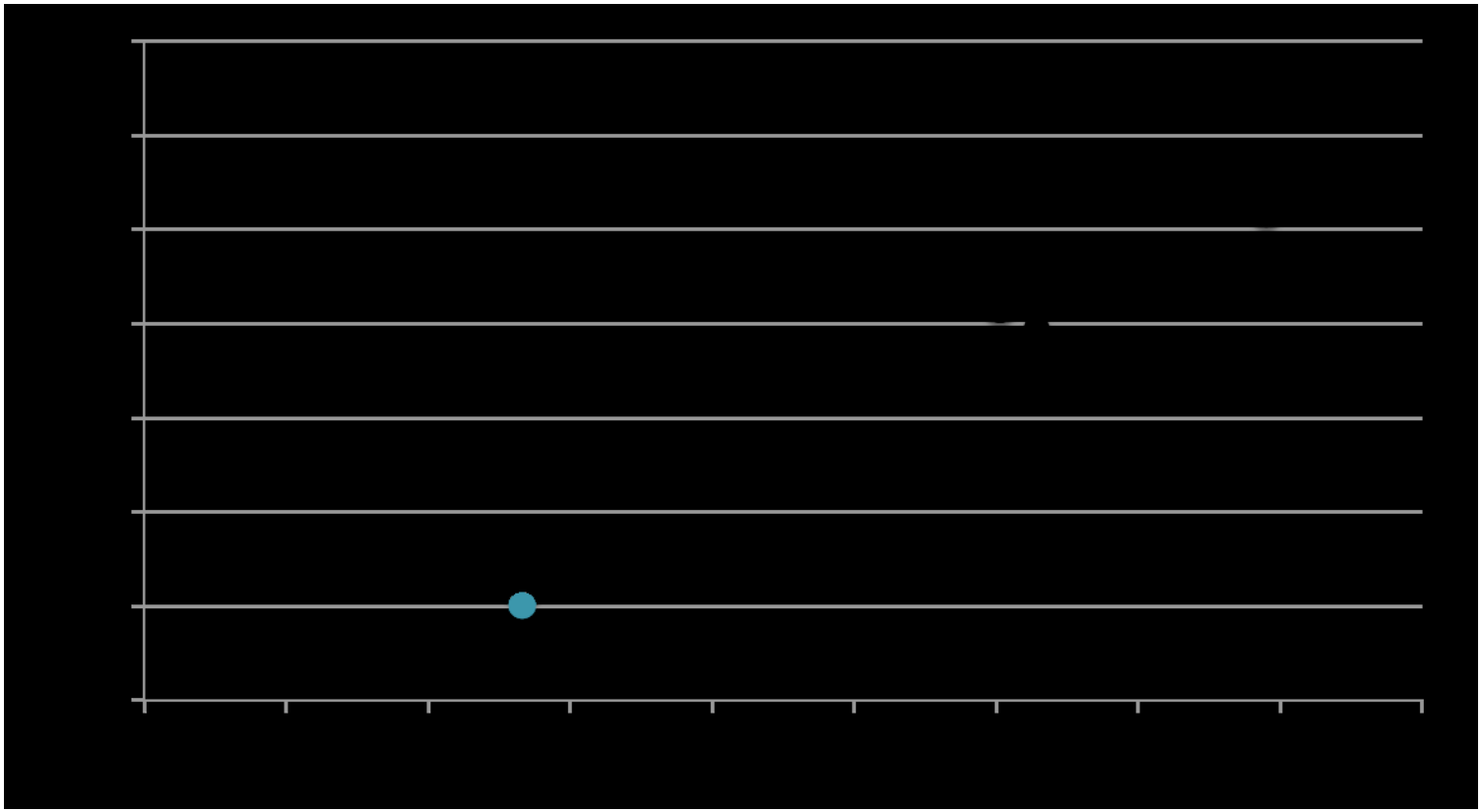


2006-present: Poropak Q / Molecular Sieve



Are CCL Results Consistent Over Time?

WCC Tertiary Standards Analyzed in 2005 and 2009
(2009 result minus 2005 result)



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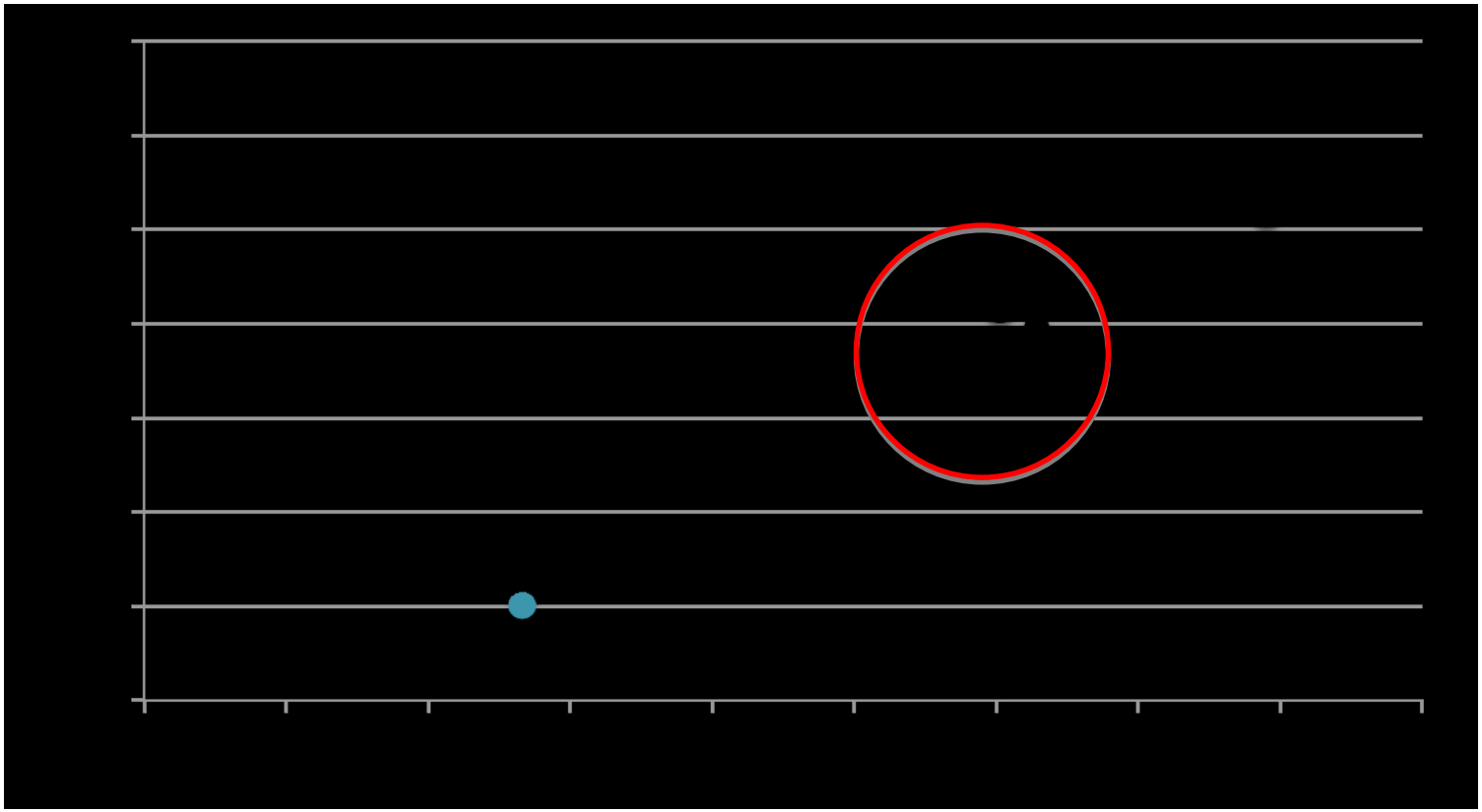

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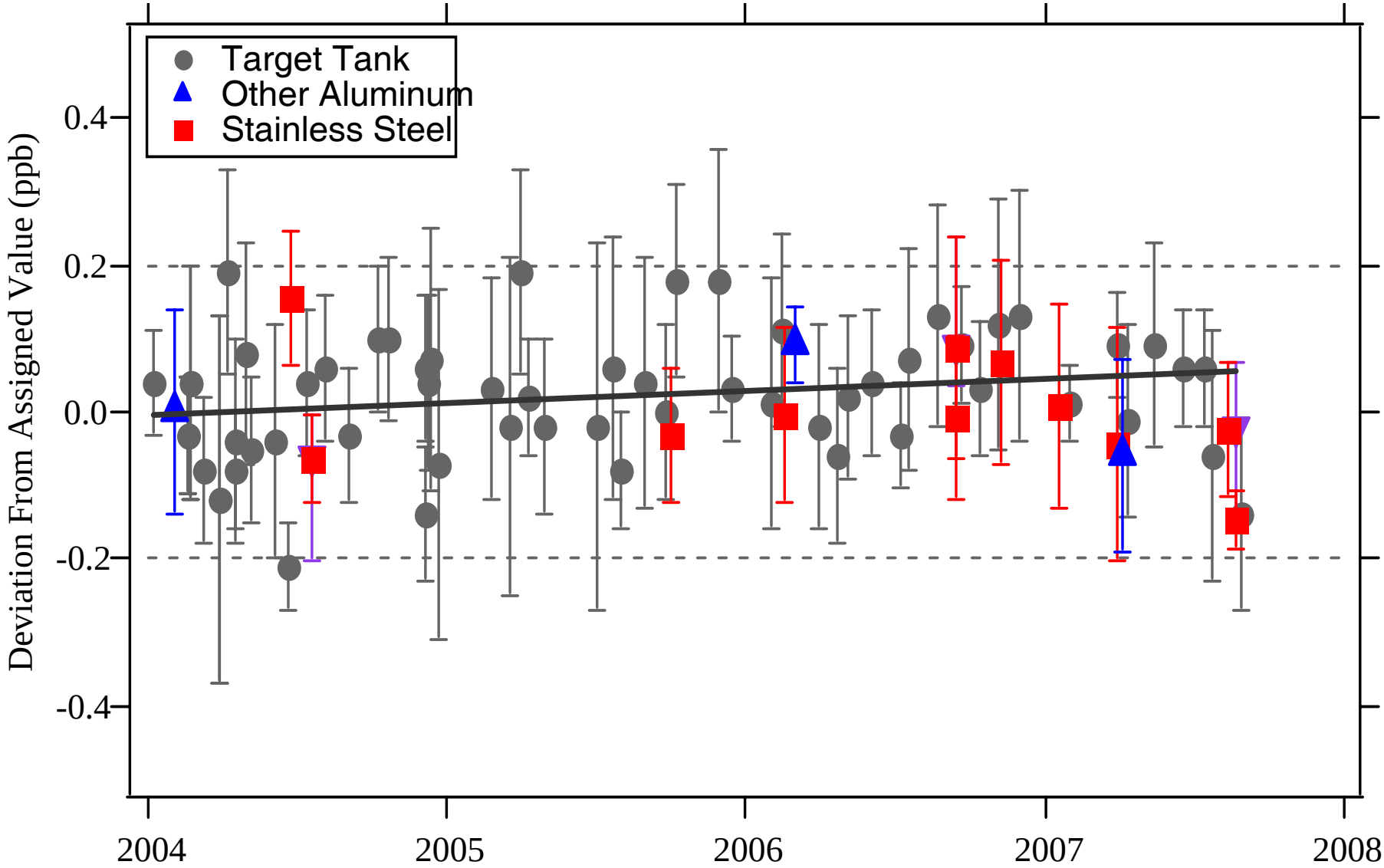

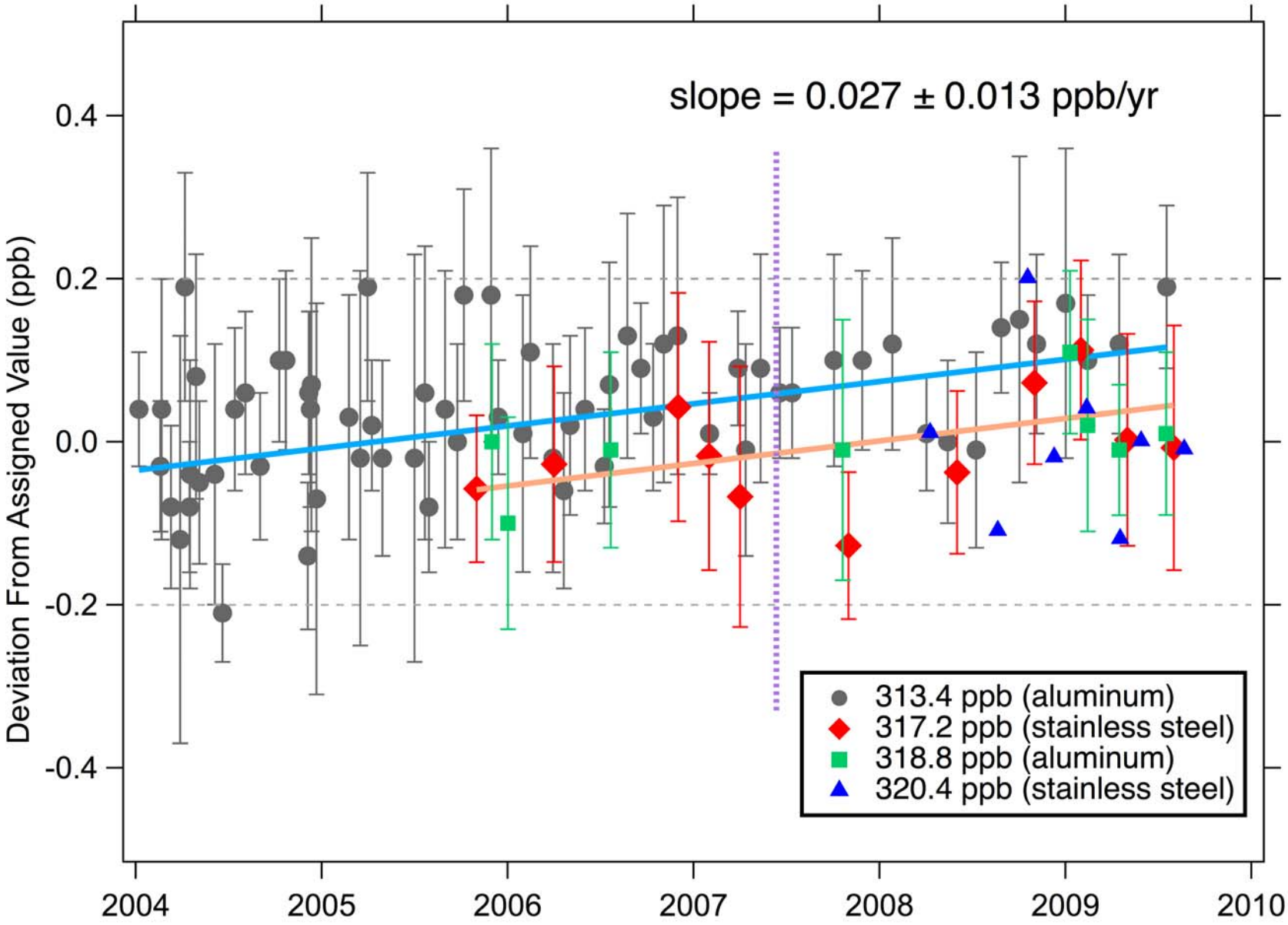
slope = 0.027 ± 0.013 ppb/yr
Deviation From Assigned Value (ppb)
0.4
0.2
0.0
-0.2
-0.4
2004
2005
2006
2007
2008
2009
2010
313.4 ppb (aluminum)
317.2 ppb (stainless steel)
318.8 ppb (aluminum)
320.4 ppb (stainless steel)

Summary

1. N_2O Calibration results soon to be available on-line
2. Comparisons: mixed results
   - Very good scale transfer in some cases, not so good in others
   - Sampling bias: detection important
3. The NOAA scale appears to be drifting at 0.03 ppb/yr