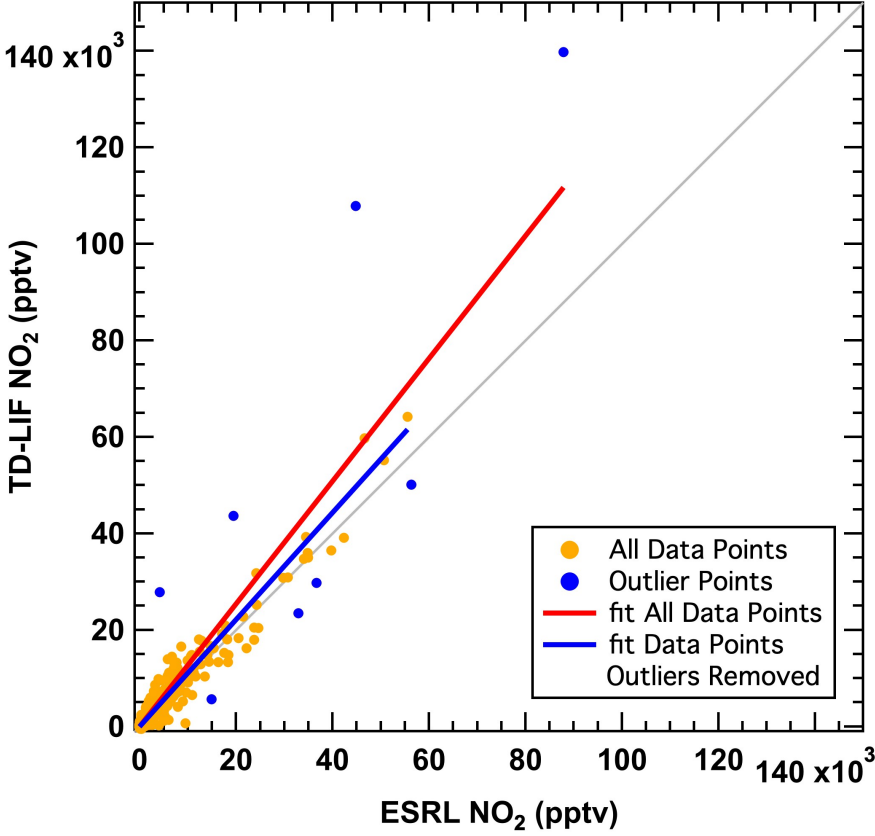


NO₂ – U.C. Berkeley TD-LIF vs NOAA ESRL CL

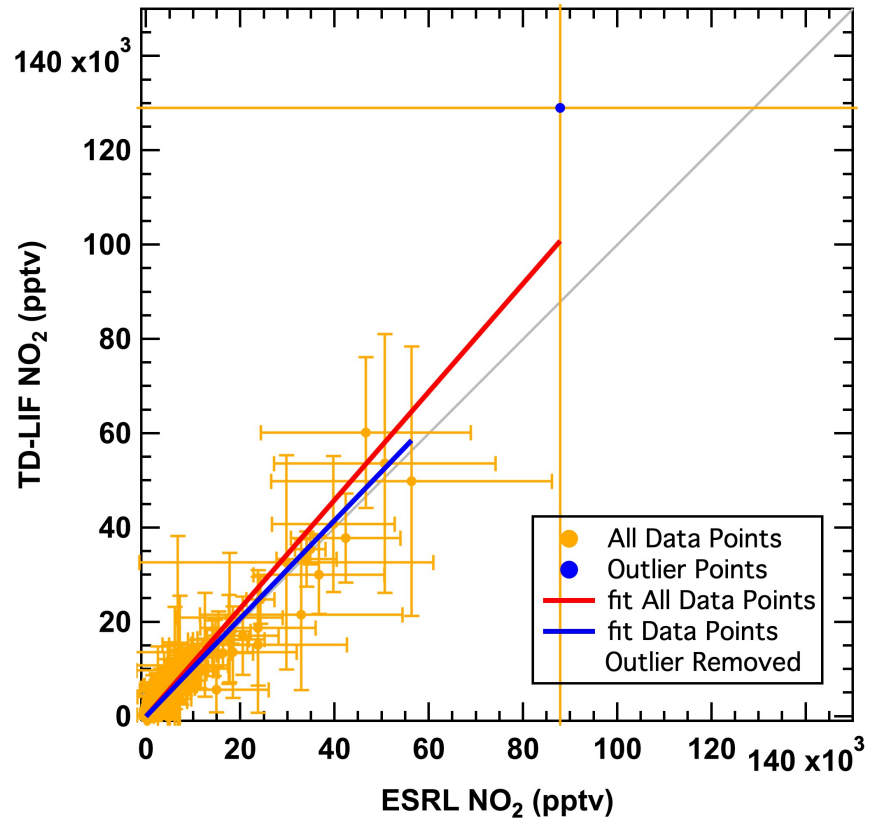
Archive 10s Merge



All Data Points (32642 pts)
 $y = a + bx$
 $a = -27.1 \pm 3.0$
 $b = 1.272 \pm 0.002$
 $R^2 = 0.892$

Data Points Outliers Removed (32634 pts)
 $y = a + bx$
 $a = 7.6 \pm 1.5$
 $b = 1.108 \pm 0.001$
 $R^2 = 0.948$

10s Merge with 70% Data

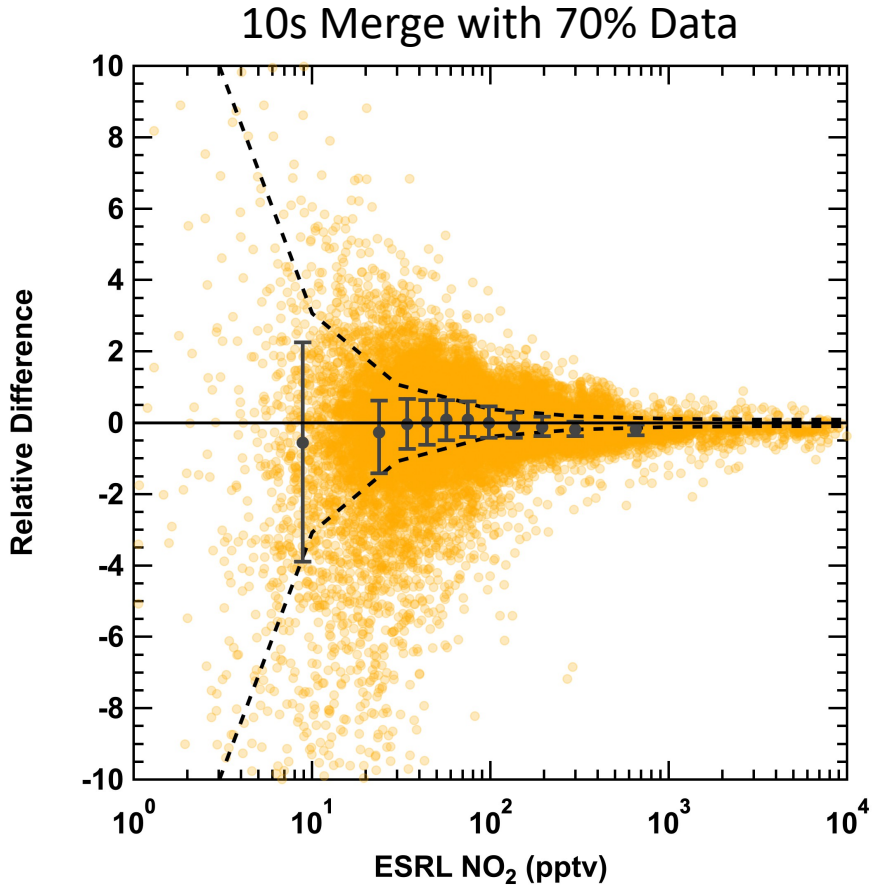
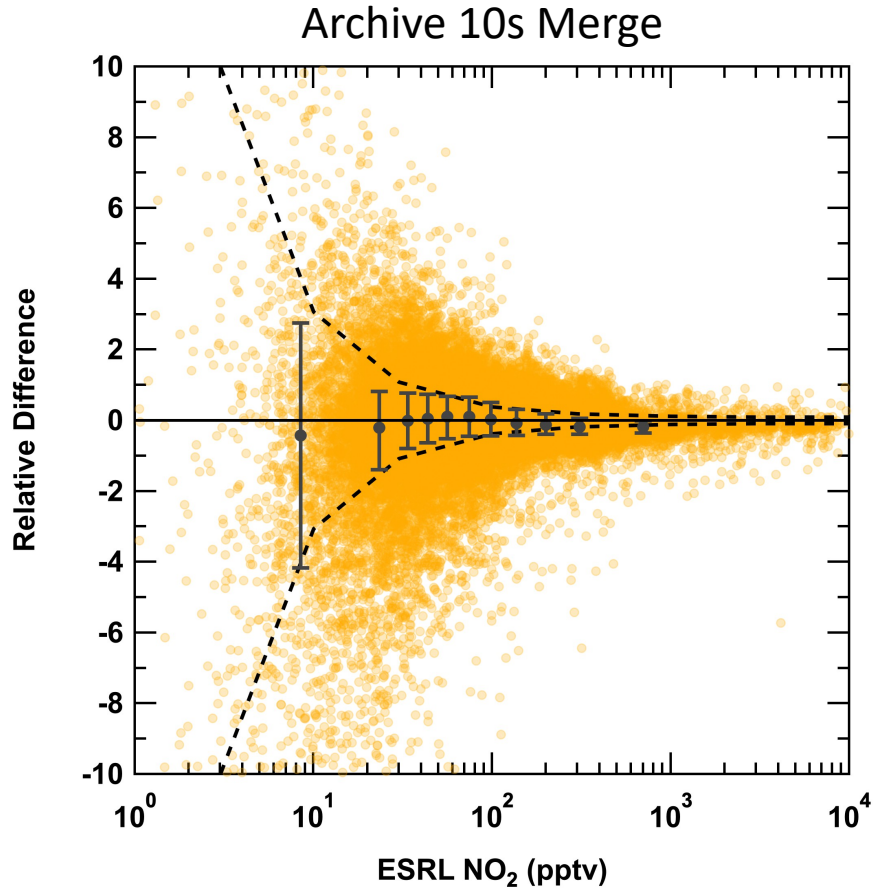


All Data Points (21955 pts)
 $y = a + bx$
 $a = -2.3 \pm 2.4$
 $b = 1.147 \pm 0.002$
 $R^2 = 0.942$

Data Points Outliers Removed (21954 pts)
 $y = a + bx$
 $a = 21.2 \pm 1.8$
 $b = 1.039 \pm 0.002$
 $R^2 = 0.952$

Difference dependence on NO₂ value

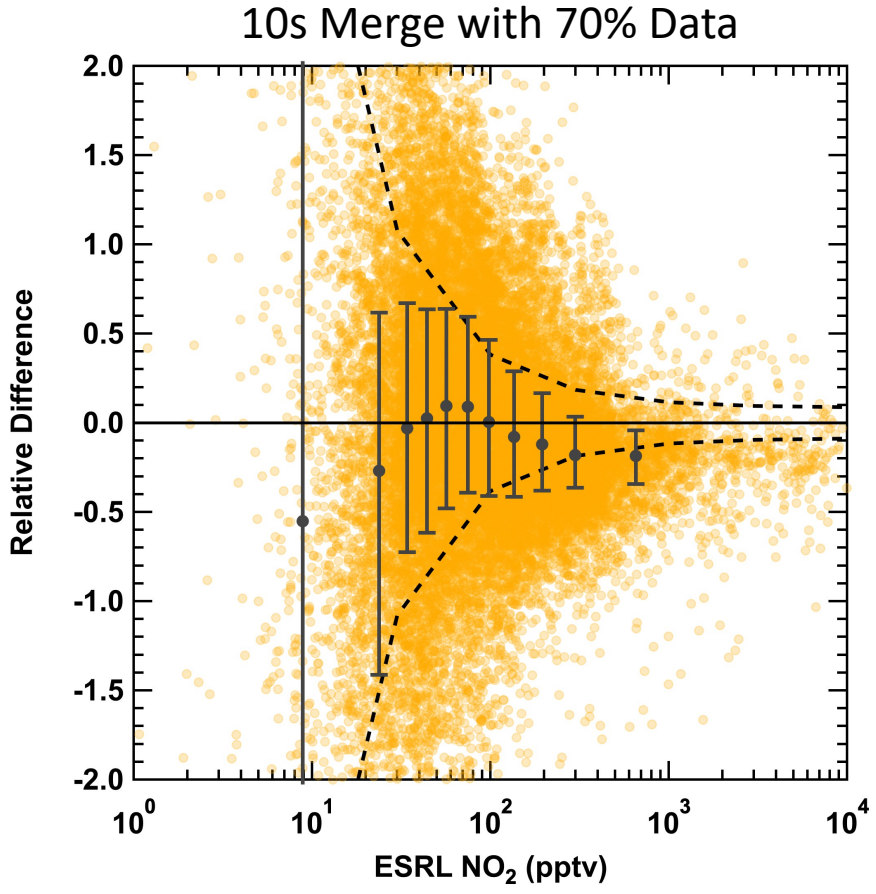
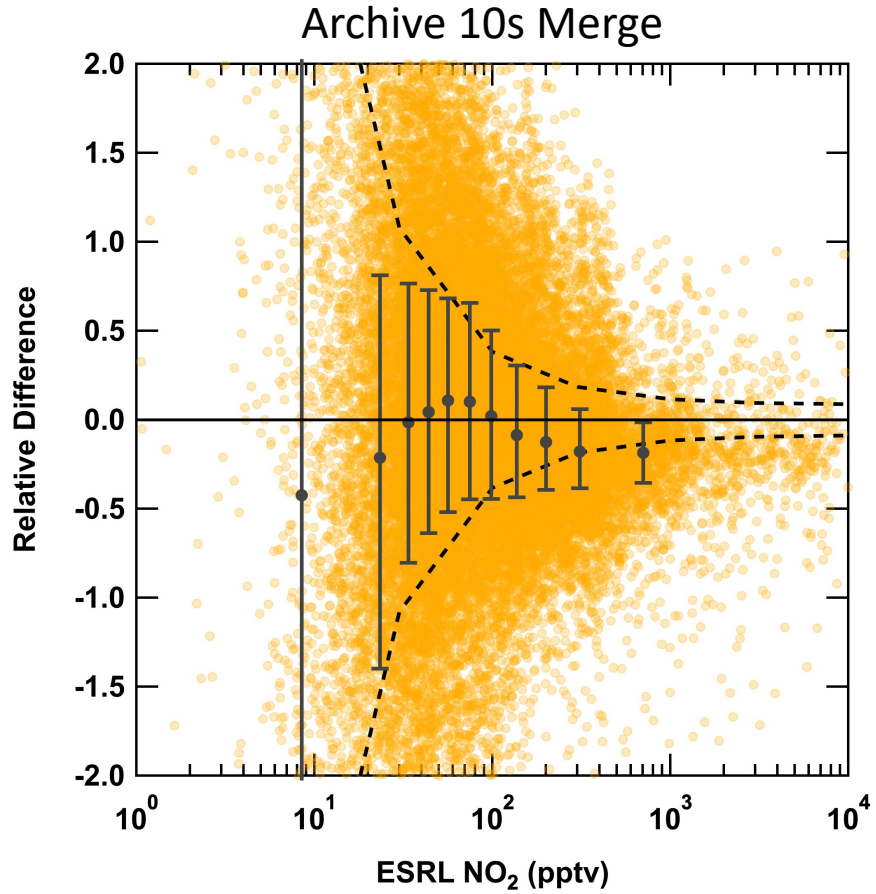
Uncertainty envelopes based on 10s data uncertainty (NOAA ESRL = $\pm (20 \text{ pptv} + 7\%)$, TD-LIF = $\pm (22.1 \text{ pptv} + 5\%)$)



┌─── 75th Percentile
● Median
└─── 25th Percentile

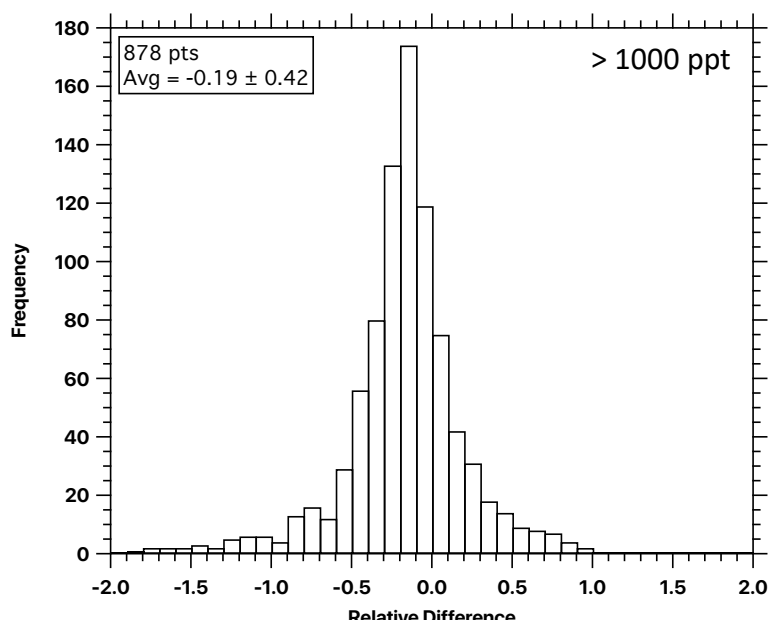
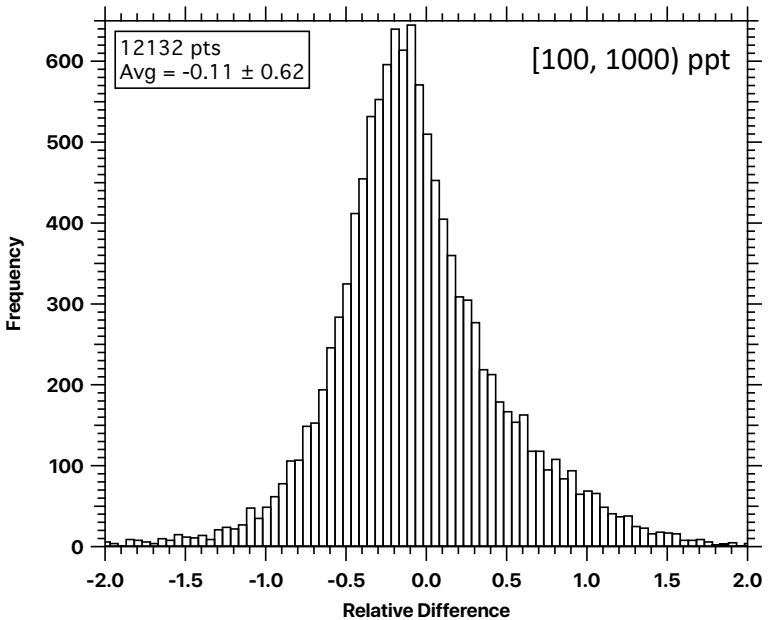
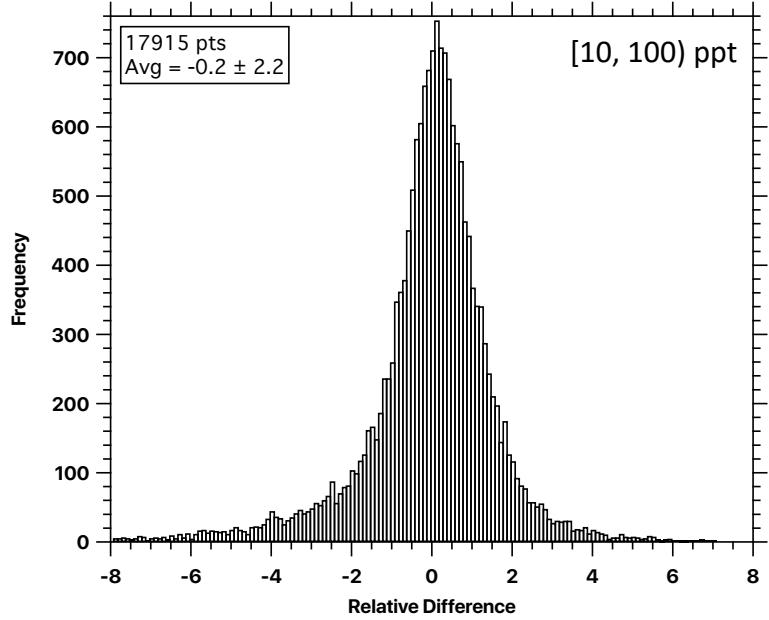
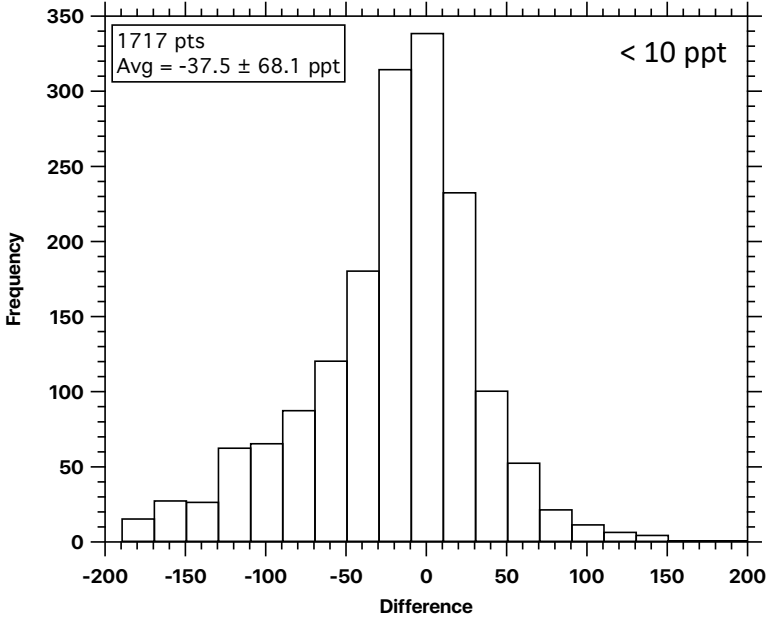
Difference dependence on NO₂ value

Uncertainty envelopes based on 10s data uncertainty (NOAA ESRL = \pm (20 pptv + 7%), TD-LIF = \pm (22.1 pptv + 5%))

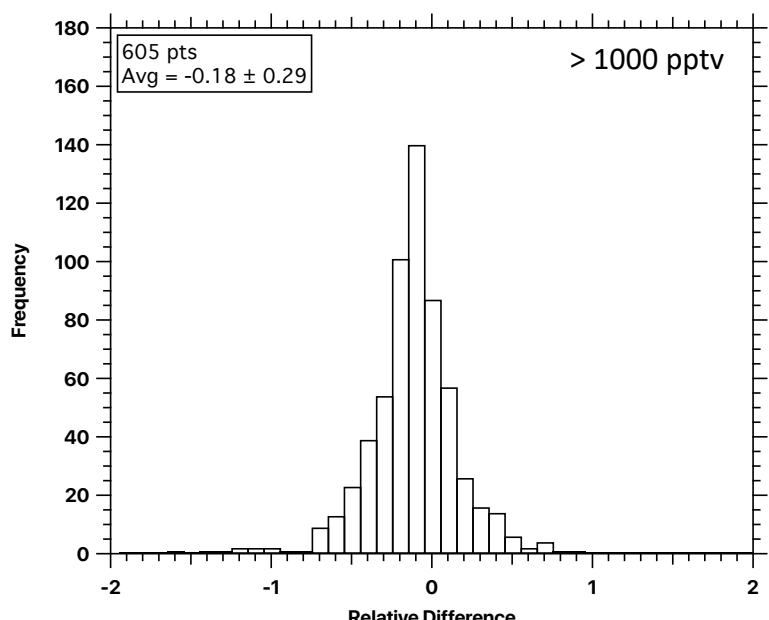
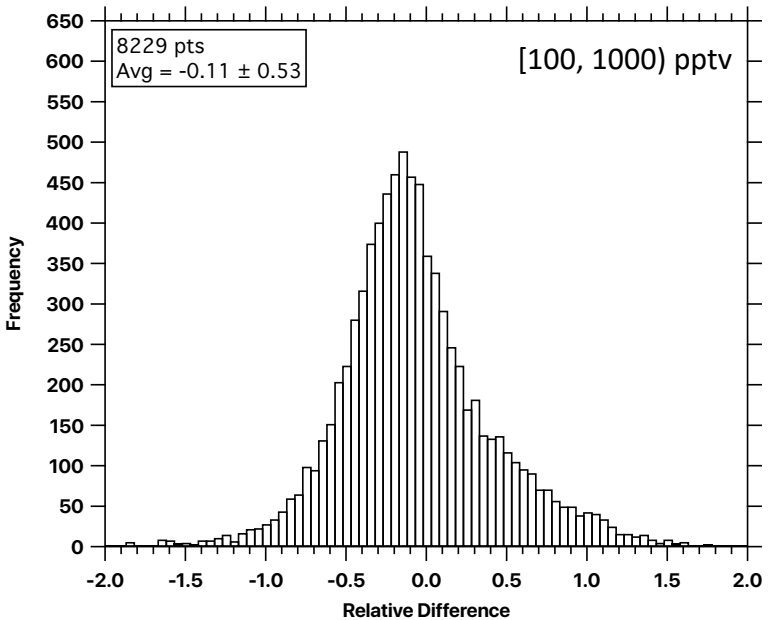
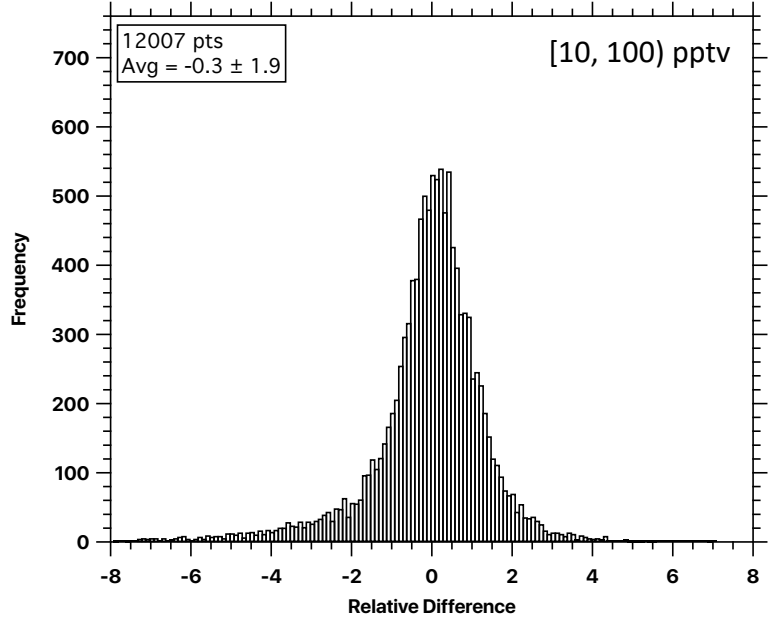
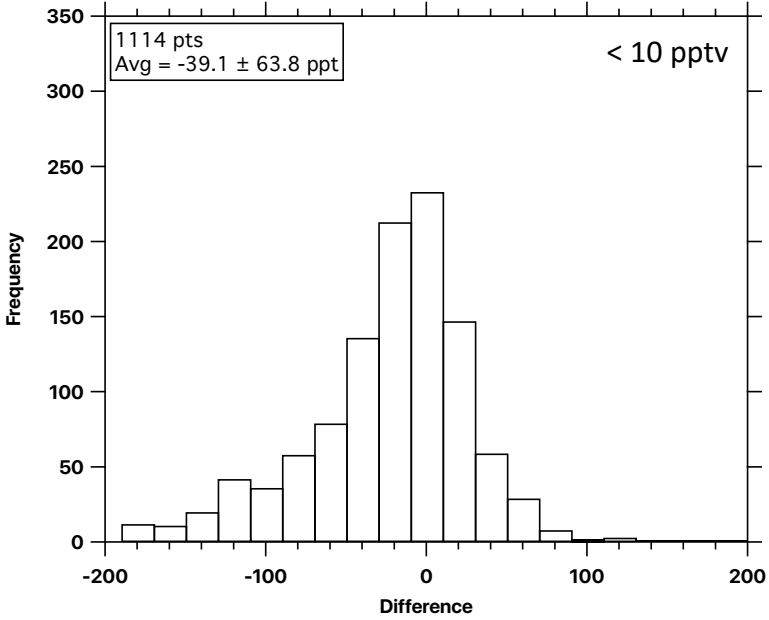


75th Percentile
Median
25th Percentile

Frequency distribution – 10s Archive Merge



Frequency distribution – 10s Merge 70% Data



Data:

- 10 second merge: SEAC4RS-mrg10-dc8_merge_20130806_R5_thru20130923.ict
- 1 second TD-LIF: SEAC4RS-TDLIF-NO2_DC8_#####_R0.ict (##### = daily files from 20130806 – 20130923).
- 1 second ESRL: SEAC4RS-NO2_DC8_#####_R1.ict (##### = daily files from 20130806 – 20130923).

Correlation:

- 10s merge with 70% data are calculated using 1s PI data files. Each 10s interval must contain at least 70% of data for analysis.
- 10s archive merge outliers removed iteratively when Cook's Distance > 1 (https://en.wikipedia.org/wiki/Cook%27s_distance).
- 10s merge with 70% data outliers removed based on standard deviation.
- Fit lines are derived from orthogonal distance regressions.
- R² values are calculated independently, not from orthogonal distance regression.

Uncertainty propagation (Uncertainties provided by PIs).

- TD-LIF 1s uncertainty: +/- (70 pptv + 5%); 10s uncertainty: +/- (22.1 pptv + 5%), calculated using quadrature average.
- NOAA ESRL 1s uncertainty: +/- (30 pptv + 7%); 10s uncertainty from PI: +/- (20 pptv + 7%).

Difference dependence on NO₂ value:

- Relative difference calculated by (ESRL – TD-LIF)/ESRL.
- Median, 25th, and 75th percentiles based on 3000 data point bins (archive merge) and 2000 data point bins (70% data merge) after data is sorted by ESRL values.
- Uncertainty envelopes based on 10s data uncertainty.

Frequency Distributions:

- NOAA ESRL data divided into 4 regions (< 10 ppt, 10-100 ppt, 100-1000 ppt, and > 1000 ppt).
- Frequency distribution bin width[<10 ppt] = 20
- Frequency distribution bin width[10-100 ppt] = 0.1
- Frequency distribution bin width[100-1000 ppt] = 0.05
- Frequency distribution bin width[>1000 ppt] = 0.1

Summary: Archived 10s merge

Data Range	# Points	# Pts within Combined Unc.	# Pts within 2*Combined Unc.
All	32634	14923 (46%)	23935 (73%)
<10 ppt	1717	824 (48%)	1262 (73%)
[10,100) ppt	17915	9454 (53%)	14152 (79%)
[100,1000) ppt	12132	4442 (37%)	8091 (67%)
>1000 ppt	870	203 (23%)	430 (49%)

Summary: 10s merge with 70% data

Data Range	# Points	# Pts within Combined Unc.	# Pts within 2*Combined Unc.
All	21954	10661 (48%)	16831 (77%)
<10 ppt	1114	562 (50%)	841 (75%)
[10,100) ppt	12007	6749 (56%)	9854 (82%)
[100,1000) ppt	8229	3196 (39%)	5815 (71%)
>1000 ppt	604	154 (25%)	321 (53%)