NO₂ - U.C. Berkeley TD-LIF vs NCAR CL

U.C. Berkeley TD-LIF vs NCAR CL

GIST K-ACES vs NCAR CL

\[ y = a + bx \]
\[ a = -0.034 \pm 0.003 \]
\[ b = 1.1798 \pm 0.0007 \]
\[ R^2 = 0.984 \]

\[ y = a + bx \]
\[ a = 0.002 \pm 0.005 \]
\[ b = 1.096 \pm 0.001 \]
\[ R^2 = 0.965 \]
Difference dependence on $\text{NO}_2$ - U.C. Berkeley TD-LIF vs NCAR CL

Uncertainty envelopes based on 10s data uncertainty (NCAR = $\pm$ (15.8 pptv + 30%), TD-LIF = $\pm$ (22.1 pptv + 5%))

Absolute Difference

Relative Difference

Average = -0.24 ± 0.95

Average = 0.02 ± 0.48

75th Percentile

Median

25th Percentile
Difference dependence on NO$_2$ - GIST K-ACES vs NCAR CL

Absolute Difference

Relative Difference

Average = -0.15 ± 0.92

Average = 0.01 ± 1.1
Frequency distribution based on NCAR CL data value

**CL Data < 0.1 ppbv**
- Frequency distribution for CL Data < 0.1 ppbv with 12225 pts, Avg = 0.1 ± 2.3

**0.1 < CL Data < 0.4 ppbv**
- Frequency distribution for 0.1 < CL Data < 0.4 ppbv with 14797 pts, Avg = 0.06 ± 0.33

**CL Data > 0.4 ppbv**
- Frequency distribution for CL Data > 0.4 ppbv with 17335 pts, Avg = -0.16 ± 0.25
<table>
<thead>
<tr>
<th>Data Range</th>
<th># Points</th>
<th># Pts within Combined Unc.</th>
<th># Pts within 2*Combined Unc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>41576</td>
<td>37460 (90%)</td>
<td>41075 (99%)</td>
</tr>
<tr>
<td>CL &lt; 0.1 ppbv</td>
<td>11286</td>
<td>10104 (89%)</td>
<td>11253 (99%)</td>
</tr>
<tr>
<td>CL [0.1,0.4) ppbv</td>
<td>14260</td>
<td>12426 (87%)</td>
<td>14043 (98%)</td>
</tr>
<tr>
<td>CL &gt; 0.4 ppbv</td>
<td>16030</td>
<td>14930 (93%)</td>
<td>15779 (98%)</td>
</tr>
</tbody>
</table>

Summary: CL vs TD-LIF
Data:
• 10 Second Merge: korusaq-mrg10-dc8_merge_20160426_R6_thru20160618.ict (only data from flights 20160501-20160609 used in analysis – non-transit flights).

Correlation:
• Fit lines are derived from orthogonal distance regressions.
• $R^2$ 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 using quadrature average.
• NCAR 1s uncertainty: +/- (50 pptv + 30%); 10s uncertainty: +/- (15.8 pptv + 30%).

Difference dependence on NO$_2$ value:
• U.C. Berkeley TD-LIF vs NCAR CL
  • Absolute difference calculated by (CL - TD-LIF).
  • Relative difference calculated by (CL – TD-LIF)/CL.
  • Median, 25$^{th}$, and 75$^{th}$ percentiles based on 3000 data point after data is sorted by NCAR values.
  • Uncertainty envelopes based on 10s data uncertainty.
• GIST K-ACES vs NCAR CL
  • Absolute difference calculated by (CL – K-ACES).
  • Relative difference calculated by (CL – K-ACES)/CL.
  • Median, 25$^{th}$, and 75$^{th}$ percentiles based on 2000 data point after data is sorted by NCAR values.

Frequency Distributions:
• NCAR data divided into 3 regions (< 0.1 ppbv, 0.1-0.4 ppbv, and > 0.4 ppbv).
• Frequency distribution bin width = 0.1