Ammonium – AMS vs SAGA-AERO

**Graphs:**
- **All Data Points**
  - Data Points below DL:
  - Fit All Data Points:
  - Fit Data Points above DL:

**Equations:**
- **All Data Points**
  - $y = a + bx$
  - $a = -0.471 \pm 0.065$
  - $b = 1.095 \pm 0.018$
  - $R^2 = 0.767$
- **Data Points Above DL**
  - $y = a + bx$
  - $a = -0.475 \pm 0.065$
  - $b = 1.096 \pm 0.019$
  - $R^2 = 0.766$

**Uncertainty Envelopes:**
- Uncertainty envelopes based on SAGA-AERO time base combined data uncertainty
  - AMS 60s calculated from data file
  - SAGA $= \pm (0.02 \text{ ug std m}^{-3} + 11\%)$
Ammonium – KAMS vs SAGA-AERO

**All Data Points**

\[ y = a + bx \]

- \( a = -0.188 \pm 0.053 \)
- \( b = 0.911 \pm 0.015 \)
- \( R^2 = 0.763 \)

**Data Points Above DL**

\[ y = a + bx \]

- \( a = -0.189 \pm 0.053 \)
- \( b = 0.912 \pm 0.015 \)
- \( R^2 = 0.762 \)

Average All Data Points = 0.4 ± 1.2
Average Data Points above DL = 0.4 ± 1.2
Ammonium – KAMS vs AMS (Research Flights 1-9, 11, 15, 19)
KAMS LLOD values not provided, assume values under precision level are less than the detection limit.

\[ y = a + bx \]

**All Data Points**
- \( a = 0.021 \pm 0.004 \)
- \( b = 0.992 \pm 0.002 \)
- \( R^2 = 0.923 \)

**Data Points Above DL**
- \( a = 0.023 \pm 0.004 \)
- \( b = 0.991 \pm 0.002 \)
- \( R^2 = 0.926 \)
Ammonium – KAMS vs AMS (Research Flights 10, 12-14, 16-18, 20)

KAMS LLOD values not provided, assume values under precision level are less than the detection limit.

<table>
<thead>
<tr>
<th>All Data Points</th>
<th>Data Points Above DL</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = a + bx )</td>
<td>( y = a + bx )</td>
</tr>
<tr>
<td>( a = 0.204 \pm 0.011 )</td>
<td>( a = 0.210 \pm 0.011 )</td>
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<tr>
<td>( b = 0.817 \pm 0.002 )</td>
<td>( b = 0.816 \pm 0.002 )</td>
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<tr>
<td>( R^2 = 0.891 )</td>
<td>( R^2 = 0.891 )</td>
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</tbody>
</table>
Data:
• SAGA-AERO Merge: korusaq-mrgSAGA-AERO-dc8_merge_20160426_R3_thru20160609.ict (only data from flights 20160501-20160609 used in analysis – non-transit flights).
• KORUSAQ-AMS-60s_DC8_########_R1.ict (######## = daily files from 20160501 – 20160609)
• korusaq-SAGA-AERO_DC8_########_R1.ict (######## = daily files from 20160501 – 20160609)
• KORUSAQ-KAMS_DC8_########_R3.ict (######## = daily files from 20160501 – 20160609)

Correlation:
• Data reported at STP (273 K & 1013 mb).
• Fit lines are derived from orthogonal distance regressions.
• $R^2$ values are calculated independently, not from orthogonal distance regression.
• Data points below the DL/precision are colored red.
• **AMS/KAMS Comparison:**
  • Merged AMS 60s to KAMS time interval.
  • AMS 60s DL: reported in data file, propagated to KAMS time interval.
  • KAMS DL: LLOD values not provided, assume values under precision level are less than the detection limit.
  • Research flights separated per the recommendation of PIs, Research flights (1-9, 11, 15, 19) and Research Flights (10, 12-14, 16-18, 20).
• **SAGA Comparison:**
  • AMS and KAMS reported DL and precision, respectively, propagated to SAGA time interval.
  • AMS/KAMS measurements include organic nitrate, whereas SAGA measurements only include the inorganic ionic forms.

Uncertainty propagation (Uncertainties provided by PIs).
• AMS 1s precision reported in data file with 34% accuracy; SAGA-AERO time interval: calculated using quadrature average.
• SAGA-AERO: ± [0.02 ug std m$^{-3}$ + 11%].

Difference dependence on NO$_3$ value:
• **AMS/KAMS Comparison:**
  • Difference calculated by AMS 60s - KAMS.
  • Median, 25$^{th}$, and 75$^{th}$ percentiles based on 1500 data point bins (Early Flights) and 1000 data point bins (Late Flights) after data is sorted by AMS 60s values.
• **SAGA Comparison:**
  • Difference calculated by SAGA-AERO – AMS 60s and SAGA-AERO – KAMS.
  • Median, 25$^{th}$, and 75$^{th}$ percentiles based on 75 data point bins after data is sorted by SAGA-AERO values.
  • Uncertainty envelopes for SAGA/AMS comparison based on reported SAGA-AERO uncertainty and calculated AMS 1s total uncertainty.