Sulfate – AMS vs SAGA-MC

AMS measurements include organic sulfate. SAGA measurements only include the inorganic ionic forms.

All Data Points
\[ y = a + bx \]
\[ a = -0.57 \pm 0.04 \]
\[ b = 1.006 \pm 0.007 \]
\[ R^2 = 0.771 \]

Data Points Above DL
\[ a = -0.57 \pm 0.04 \]
\[ b = 1.006 \pm 0.007 \]
\[ R^2 = 0.771 \]

• Uncertainty envelopes based on SAGA-AERO time base combined data uncertainty
  ○ AMS 60s calculated from data file
  ○ SAGA = ± (0.021 ug std m\(^{-3}\) + 10%)
Sulfate – KAMS vs SAGA-MC

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

Data Points Above Precision Level
\[ a = -0.15 \pm 0.03 \]
\[ b = 0.791 \pm 0.006 \]
\[ R^2 = 0.723 \]

All Data Points
\[ y = a + bx \]
\[ a = -0.16 \pm 0.03 \]
\[ b = 0.792 \pm 0.006 \]
\[ R^2 = 0.723 \]
Sulfate – 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.

\[
\begin{align*}
Y &= a + bx \\
a &= -0.01 \pm 0.008 \\
b &= 0.951 \pm 0.002 \\
R^2 &= 0.906
\end{align*}
\]

All Data Points

\[
\begin{align*}
y &= a + bx \\
a &= -0.019 \pm 0.008 \\
b &= 0.954 \pm 0.002 \\
R^2 &= 0.901
\end{align*}
\]

Data Points Above DL

\[
\begin{align*}
Y &= a + bx \\
a &= -0.011 \pm 0.008 \\
b &= 0.951 \pm 0.002 \\
R^2 &= 0.906
\end{align*}
\]

Average All Data Points = -0.12 ± 0.91

Average Data Points above DL = -0.12 ± 0.91
All Data Points

\[ y = a + bx \]

\[
\begin{align*}
a &= 0.24 \pm 0.02 \\
b &= 0.784 \pm 0.002 \\
R^2 &= 0.889
\end{align*}
\]

Data Points Above DL

\[ Y = a + bx \]

\[
\begin{align*}
a &= 0.26 \pm 0.02 \\
b &= 0.783 \pm 0.002 \\
R^2 &= 0.889
\end{align*}
\]

KAMS LLOD values not provided, assume values under precision level are less than the detection limit.
Assessment of SAGA Time Response Issue – May 24

AMS 60s Data below DL
SAGA MC = 5.093
AMS 60s = -0.06875
Assessment of SAGA Time Response Issue – May 29

AMS 60s Data below DL
SAGA MC = 1.694
AMS 60s = 0.00109409

AMS 60s Data below DL
SAGA MC = 2.82
AMS 60s = -0.16045

AMS 60s Data below DL
SAGA MC = 4.26
AMS 60s = -0.11258
## Summary: AMS 60s vs SAGA-MC

<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>4694</td>
<td>2212 (47%)</td>
<td>3322 (71%)</td>
</tr>
</tbody>
</table>

## Summary: AMS vs KAMS (Research Flights)

<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>15244</td>
<td>13949 (91%)</td>
<td>14955 (98%)</td>
</tr>
</tbody>
</table>

## Summary: AMS vs KAMS (Research Flights)

<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>10366</td>
<td>8598 (83%)</td>
<td>10135 (98%)</td>
</tr>
</tbody>
</table>
Data:
• KORUSAQ-AMS-60s_DC8_########_R1.ict (######## = daily files from 20160501 – 20160609)
• KORUSAQ-AMS_DC8_########_R1.ict (######## = daily files from 20160501 – 20160609)
• korusaq-SAGA-MC_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.
• R² values are calculated independently, not from orthogonal distance regression.
  • **AMS/KAMS Comparison:**
    • Merged AMS to KAMS time interval.
    • AMS data points removed when flagged for potential inlet artifacts (IceFlag).
    • AMS 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:**
    • Merged AMS 60s and KAMS data to SAGA time base. Propagated AMS 60s DL and KAMS precision to SAGA time base.
    • AMS data filtered to only include merge intervals with at least 70% data within each merge interval. Data points removed when flagged for potential inlet artifacts (IceFlag).
    • 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-MC time interval: calculated using quadrature average.
• SAGA-MC: ± [0.021 ug std m^{-3} + 10%].

Difference dependence on NO₃ value:
• **AMS/KAMS Comparison:**
  • Difference calculated by AMS - KAMS.
  • Median, 25ᵗʰ, and 75ᵗʰ percentiles based on 1500 data point bins (Early Flights) and 1000 data point bins (Late Flights) after data sorted by AMS values.
• **SAGA Comparison:**
  • Difference calculated by SAGA-MC – AMS 60s and SAGA-MC – KAMS.
  • Median, 25ᵗʰ, and 75ᵗʰ percentiles based on 500 data point bins after data is sorted by SAGA-MC values.
  • Uncertainty envelopes for SAGA/AMS comparison based on reported SAGA-MC uncertainty and calculated AMS 1s total uncertainty.