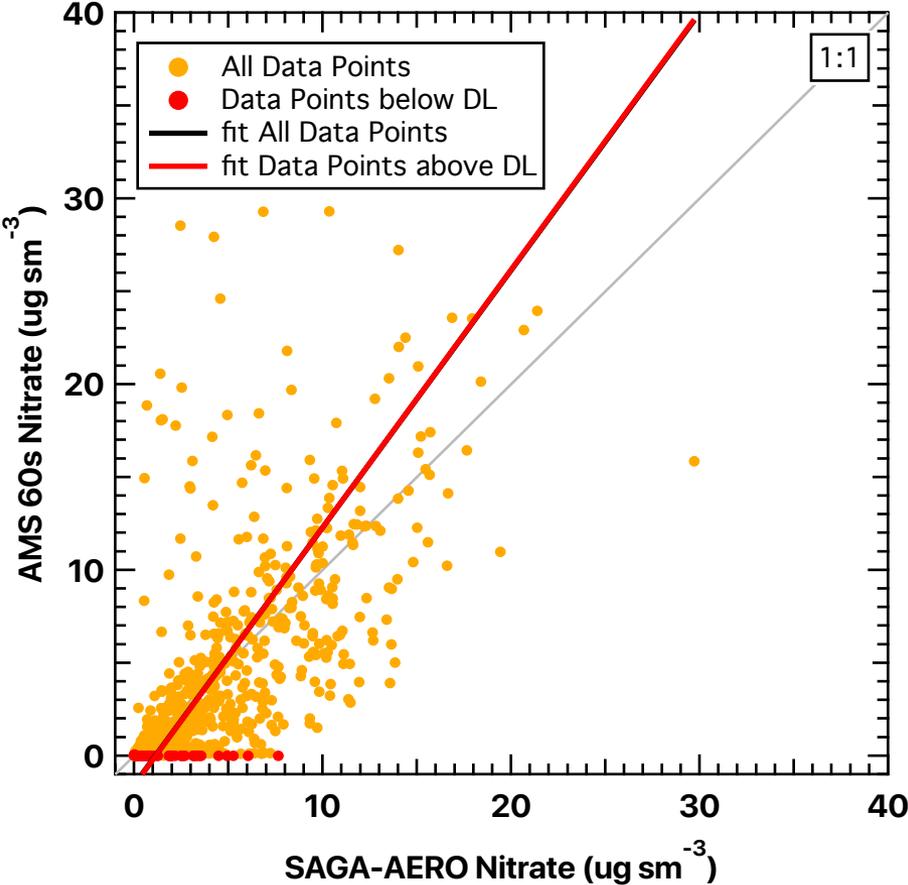# Nitrate – AMS vs SAGA-AERO
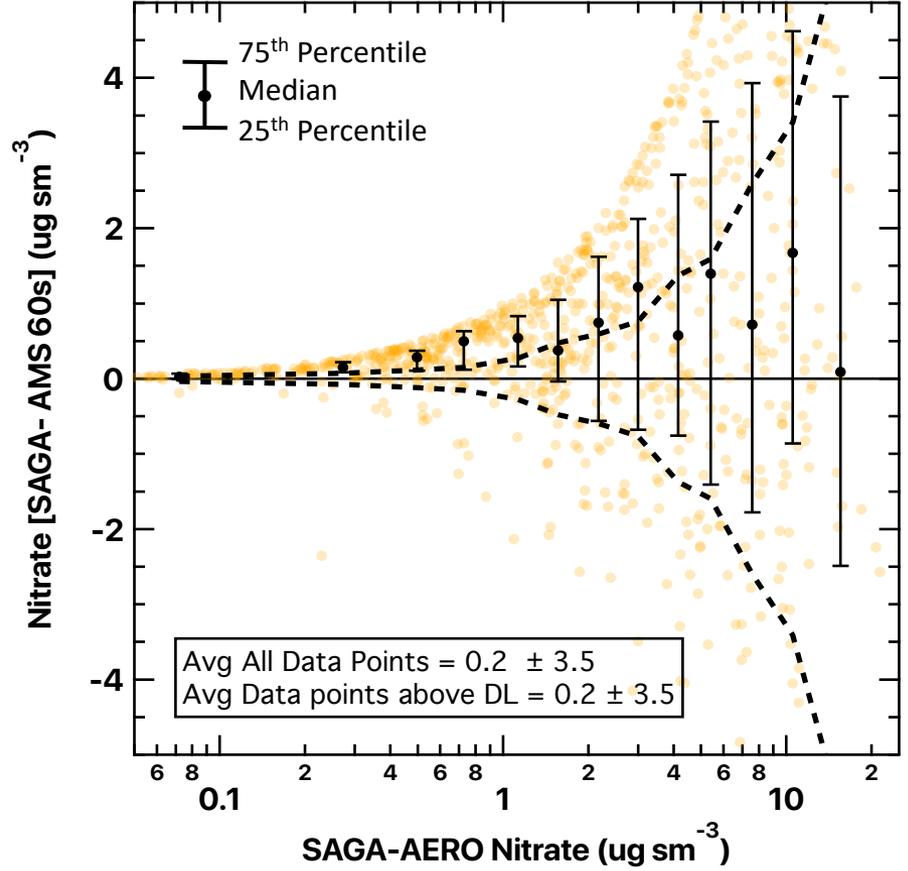
AMS measurements include organic nitrate. SAGA measurements only include the inorganic ionic forms.

All Data Points
y = a + bx
a = -1.56 ± 0.19
b = 1.385 ± 0.0374
R^2 = 0.517

Data Points Above DL
Y = a + bx
a = -1.58 ± 0.19
b = 1.388 ± 0.038
R^2 = 0.516

- Uncertainty envelopes based on SAGA-AERO time base combined data uncertainty
  - AMS 60s calculated from data file
  - SAGA = ± (0.02 ug std m-3 + 15%)

Nitrate – KAMS vs SAGA-AERO

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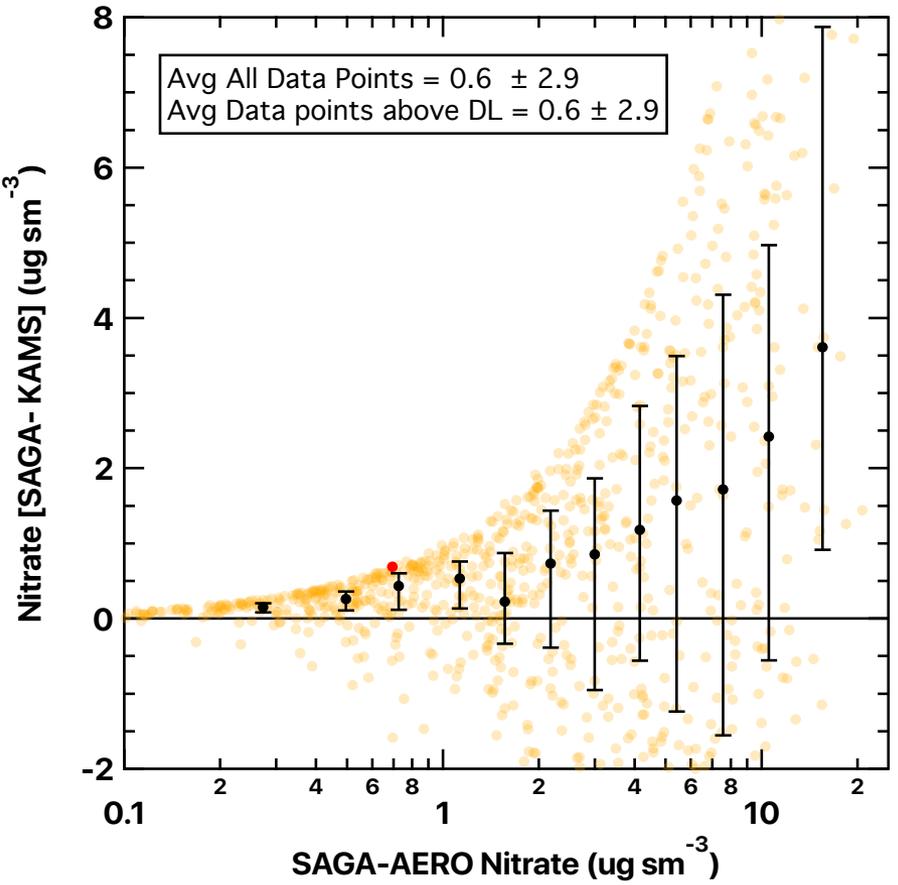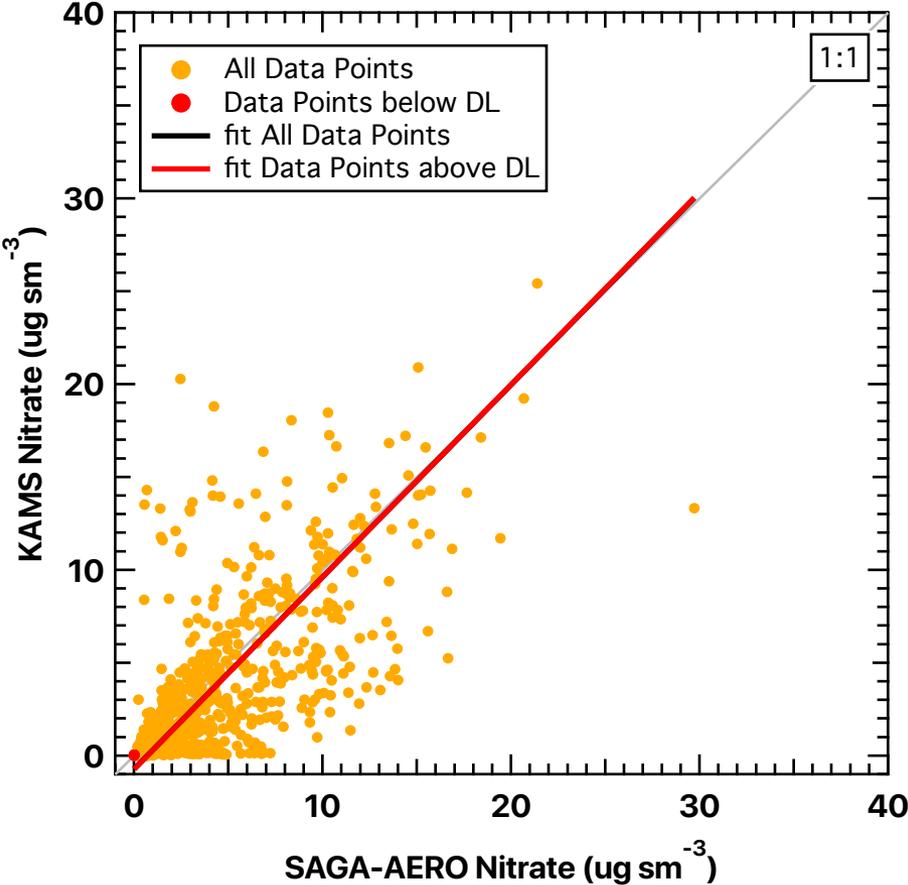

All Data Points

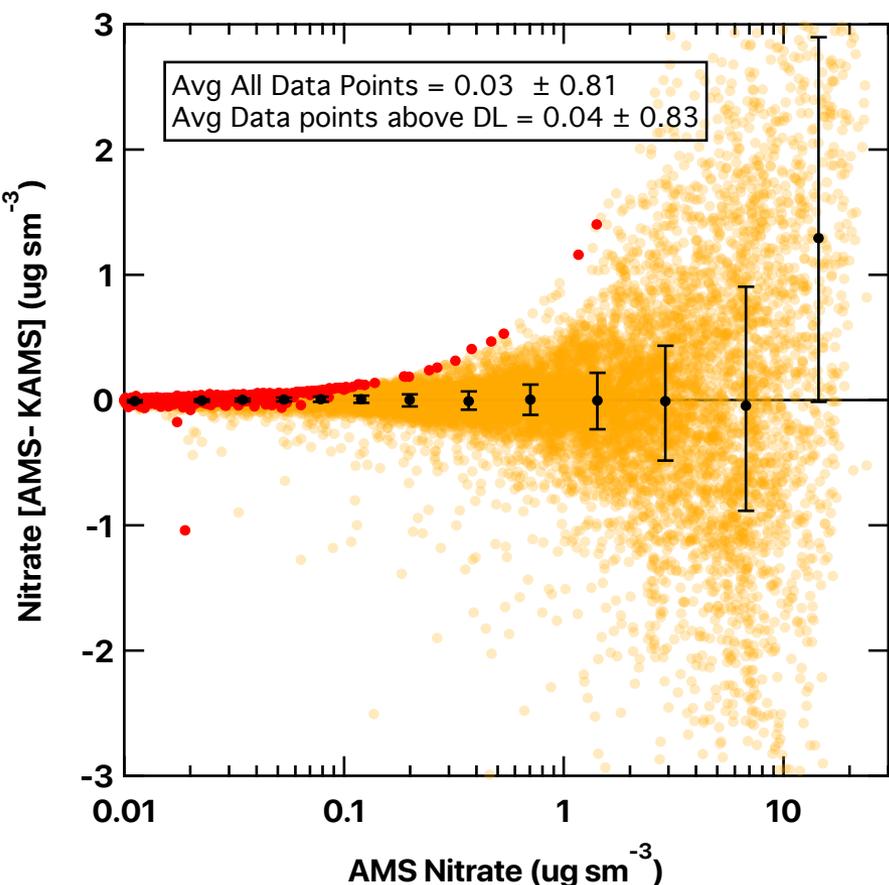y = a + bx
a = -0.71 ± 0.13
b = 1.034 ± 0.027
R^2 = 0.532

Data Points Above DL

Y = a + bx
a = -0.72 ± 0.13
b = 1.035 ± 0.027
R^2 = 0.530

Nitrate – 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.

All Data Points
y = a + bx
a = 0.0458 ± 0.0063
b = 0.9458 ± 0.0019
R^2= 0.931

Data Points Above DL
Y = a + bx
a = 0.0490 ± 0.0068
b = 0.9449 ± 0.0019
R^2 = 0.932

(🟠 All Data Points, 🔴 Data Points < DL)

75th Percentile
Median
25th Percentile

Nitrate – 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.

Left panel legend:
- All Data Points
- Data Points below DL
- fit All Data Points
- fit Data Points above DL

1:1

KAMS Nitrate (ug sm^{-3}) vs AMS Nitrate (ug sm^{-3})

Right panel:
Avg All Data Points = 0.6 ± 2.3
Avg Data Points above DL = 0.7 ± 2.3

Nitrate [AMS- KAMS] (ug sm^{-3}) vs AMS Nitrate (ug sm^{-3})

All Data Points
$y = a + bx$
$a = 0.308 \pm 0.017$
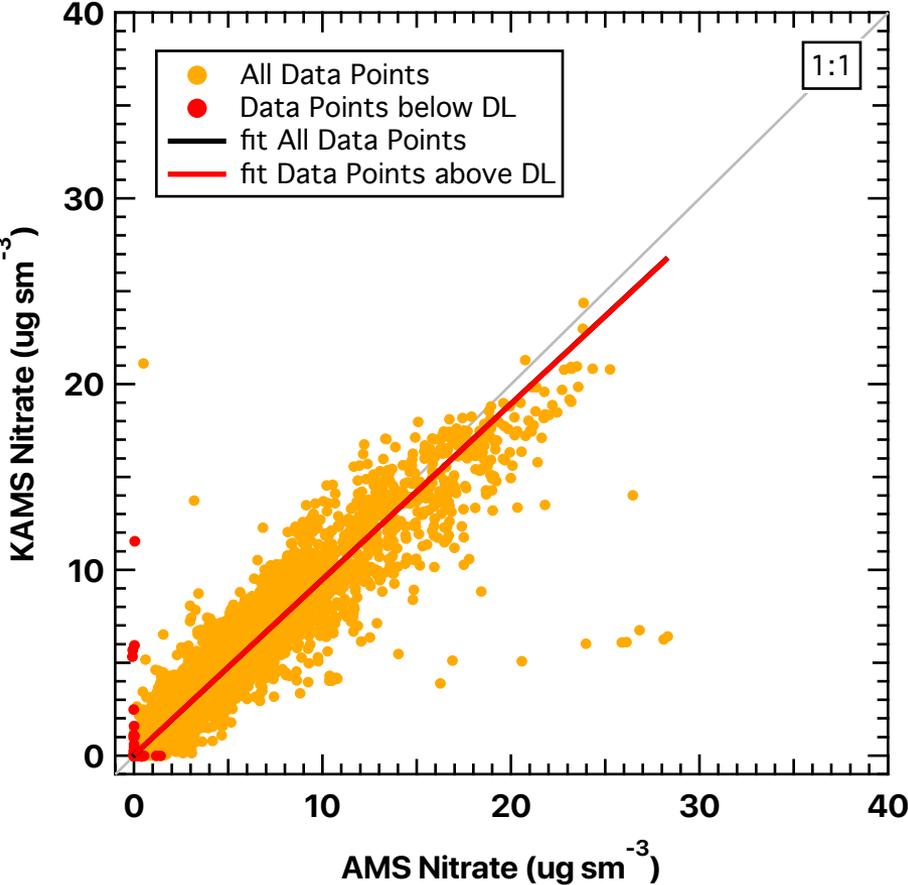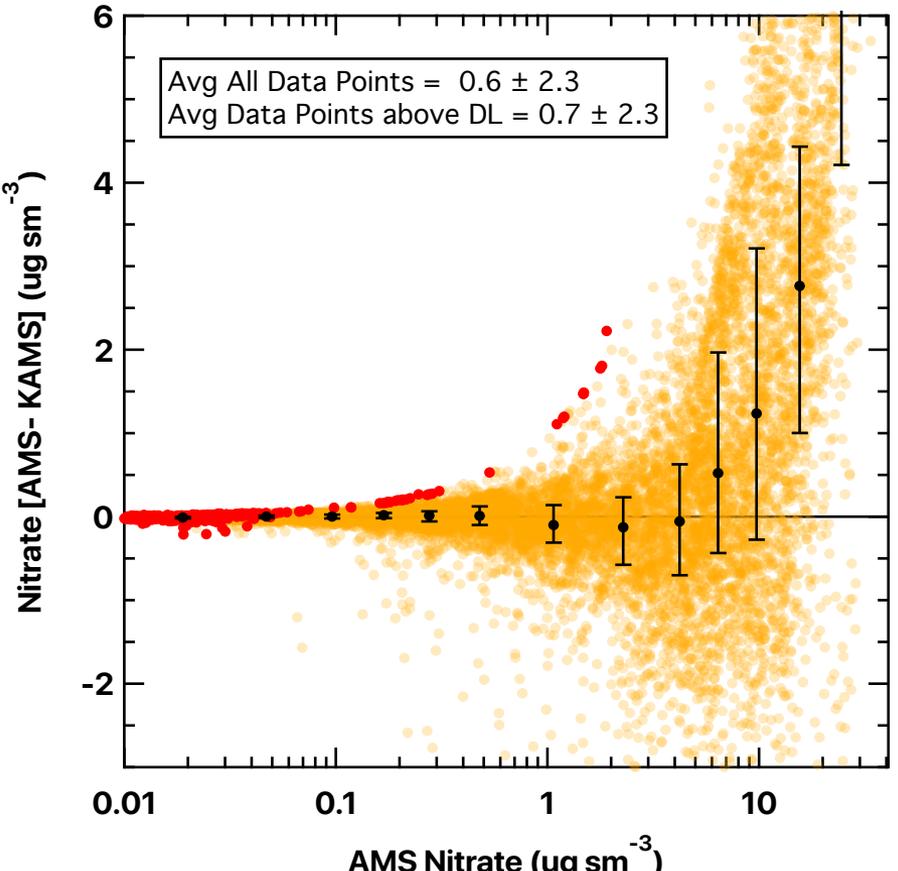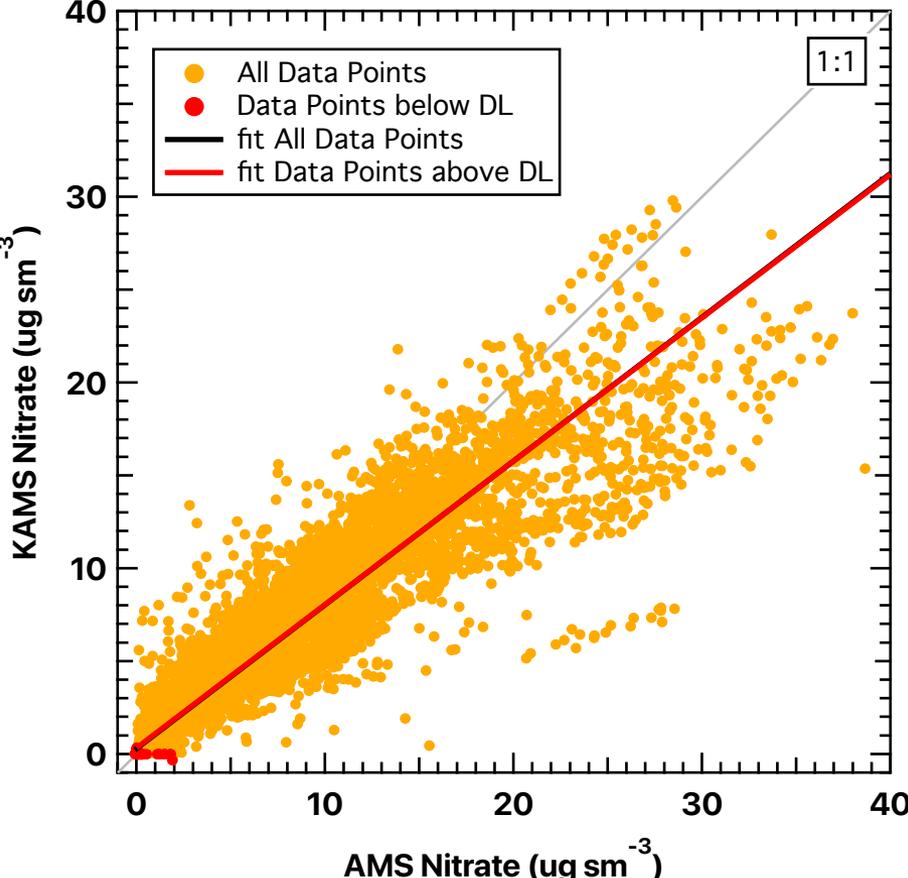$b = 0.7739 \pm 0.0023$
$R^2 = 0.897$

Data Points Above DL
$Y = a + bx$
$a = 0.3313 \pm 0.018$
$b = 0.7721 \pm 0.0023$
$R^2 = 0.895$

(● All Data Points, ● Data Points < DL)

75th Percentile
Median
25th Percentile

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: $\pm$ [0.02 ug std m-3 + 15%].

Difference dependence on NO_3 value:
- **AMS/KAMS Comparison:**
    - Difference calculated by AMS 60s - KAMS.
    - Median, 25th, and 75th 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, 25th, and 75th 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.