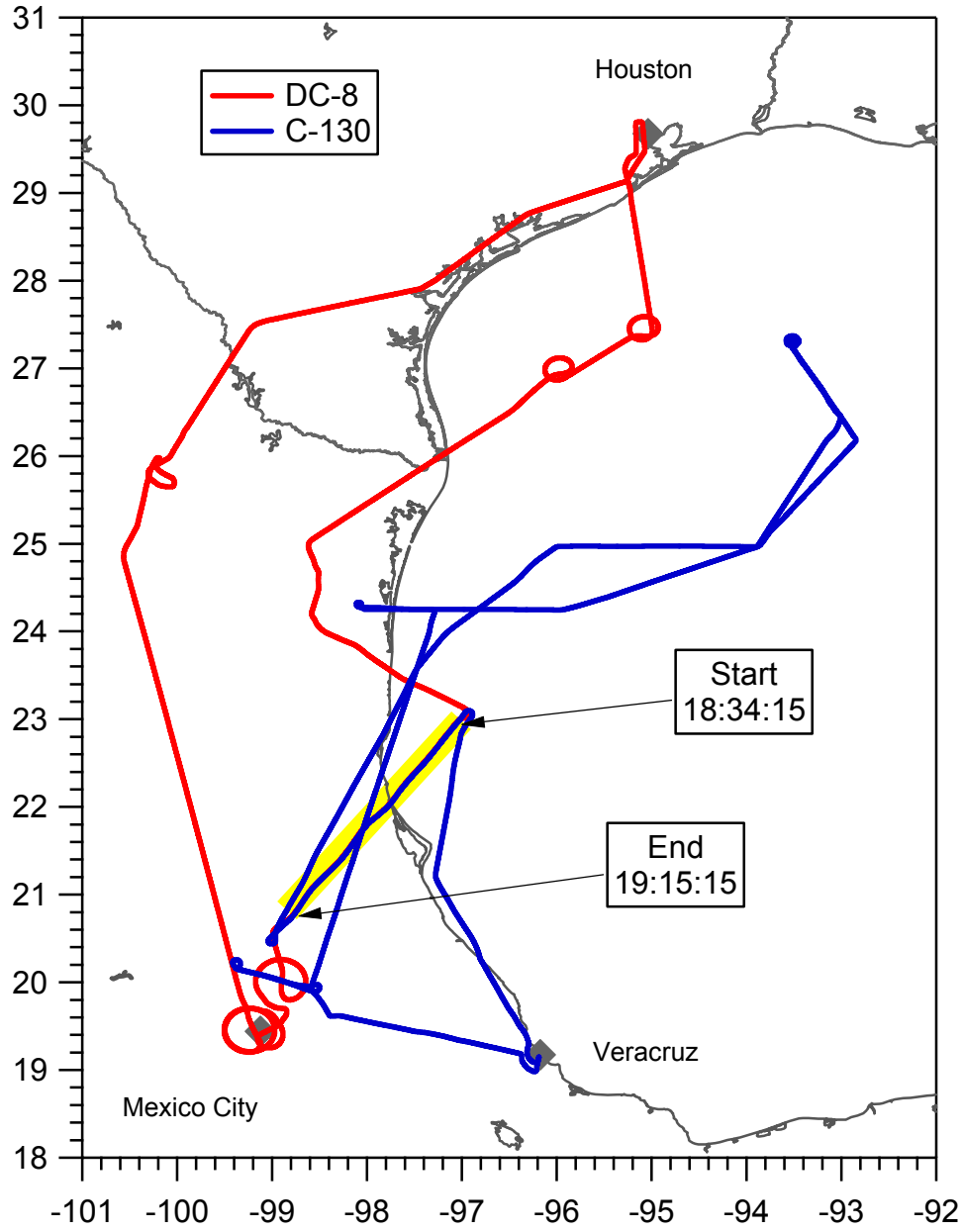
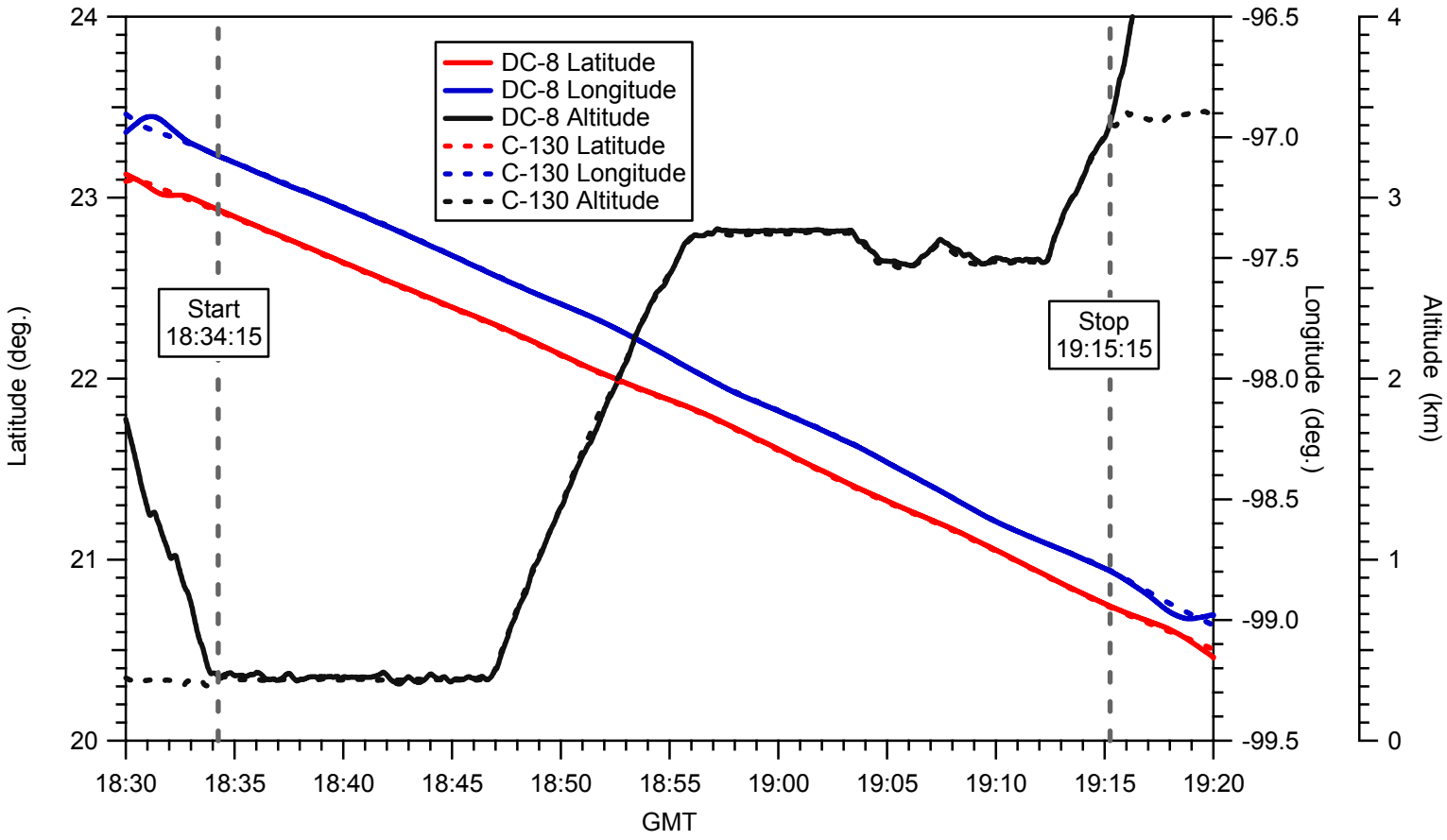
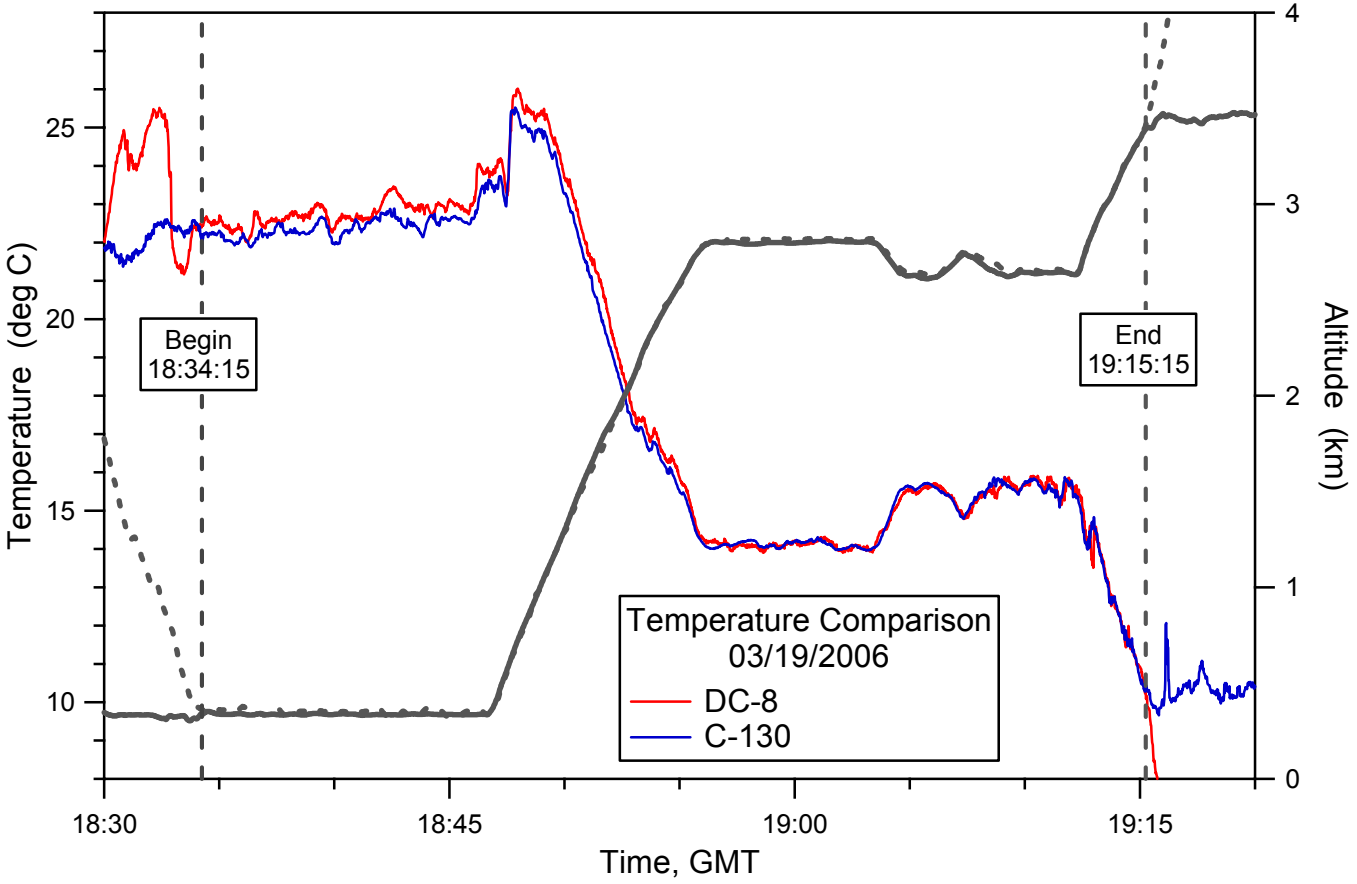
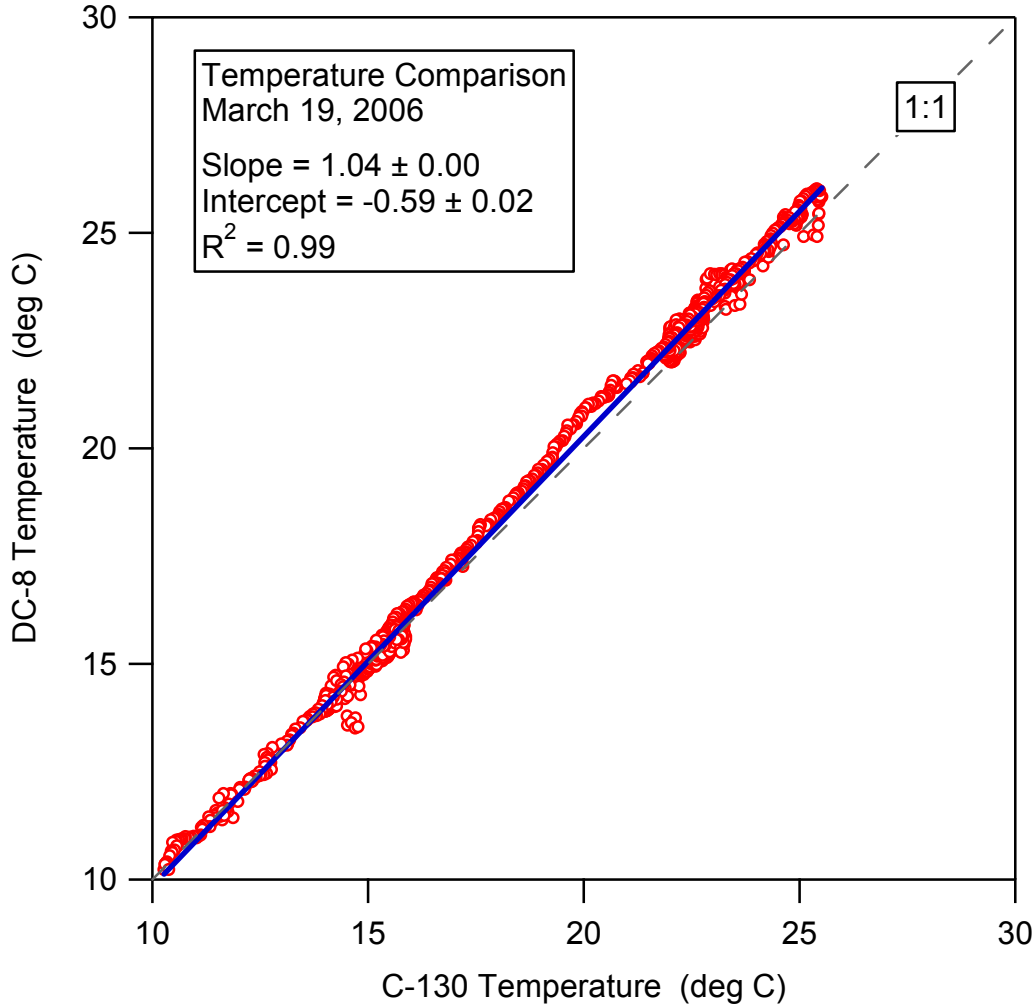
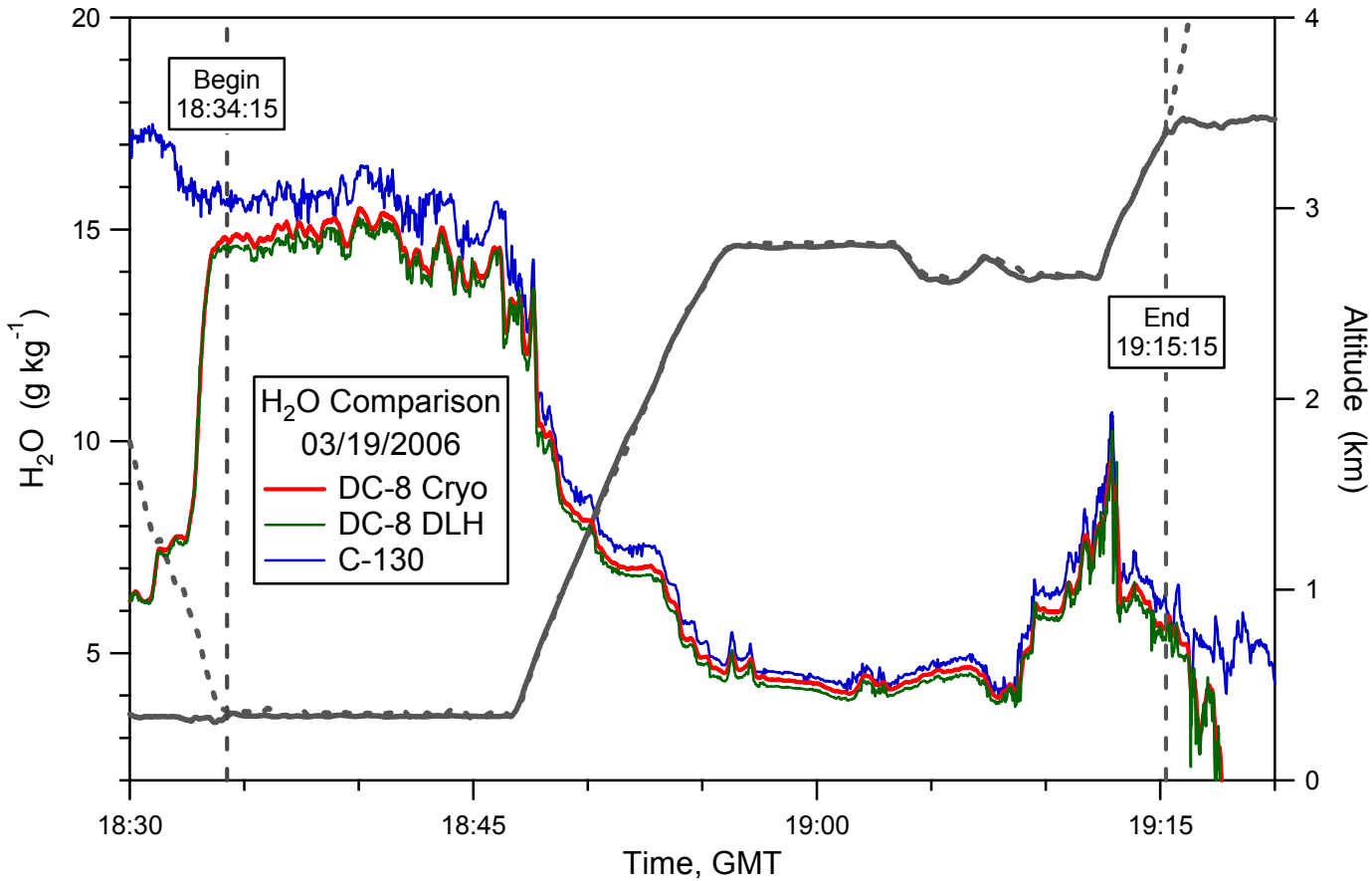
Preliminary Measurement Comparison: 03/19/2006

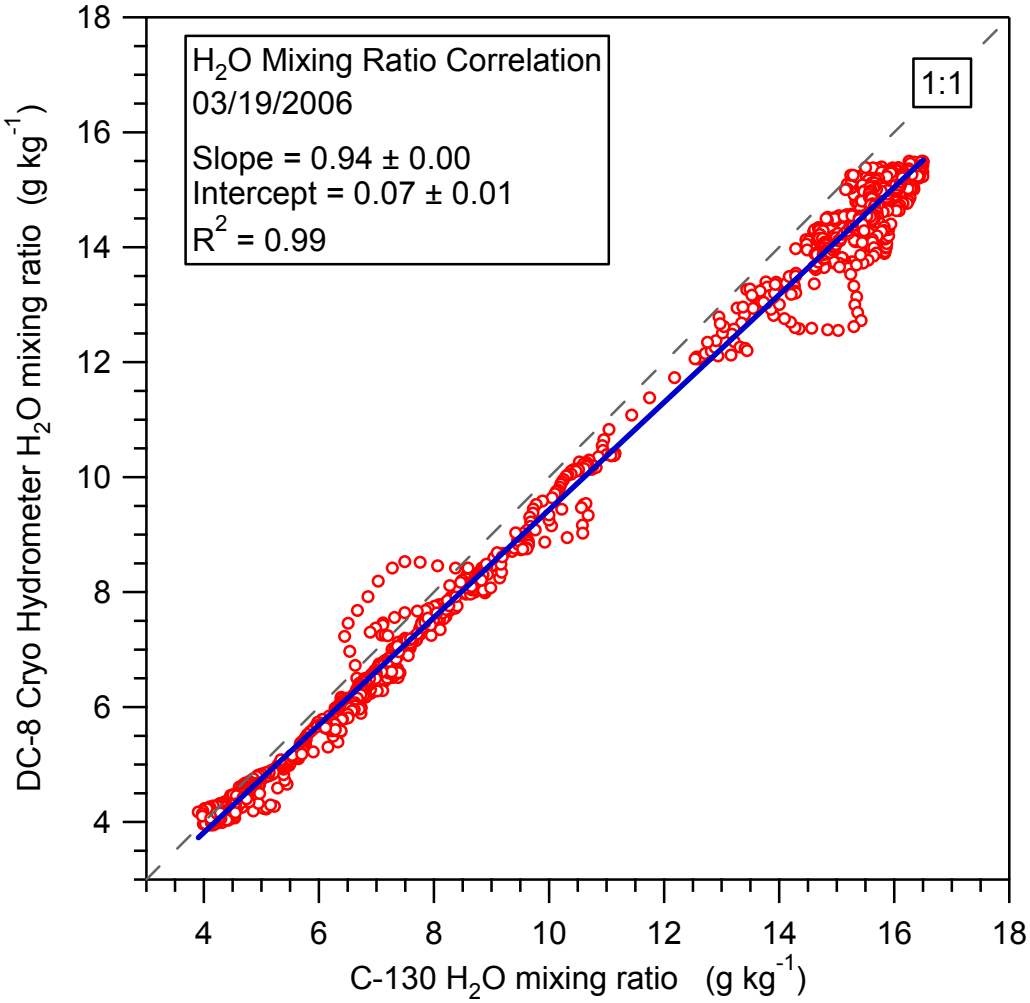


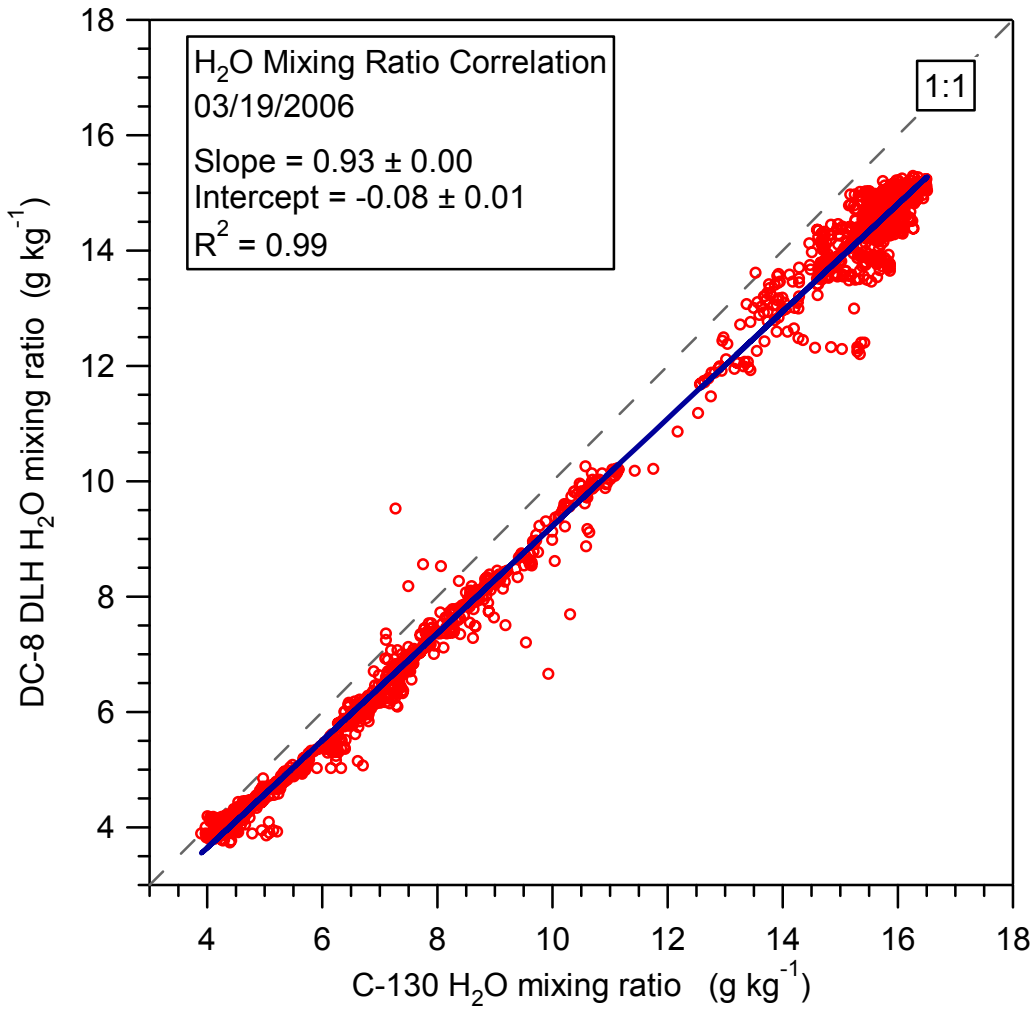

DC-8 Latitude
DC-8 Longitude
DC-8 Altitude
C-130 Latitude
C-130 Longitude
C-130 Altitude
Start
18:34:15
Stop
19:15:15
Latitude (deg.)
Longitude (deg.)
Altitude (km)
GMT
24
23
22
21
20
-96.5
-97.0
-97.5
-98.0
-98.5
-99.0
-99.5
4
3
2
1
0
18:30
18:35
18:40
18:45
18:50
18:55
19:00
19:05
19:10
19:15
19:20

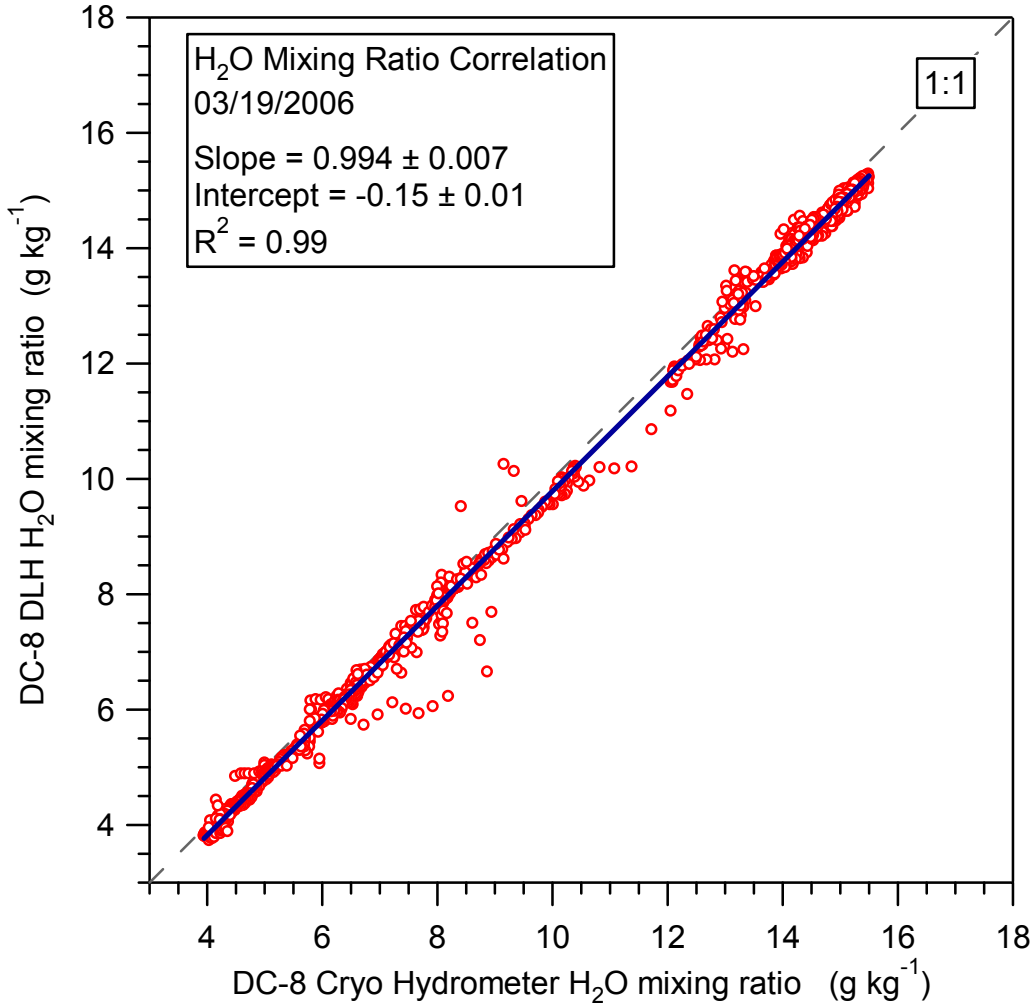

Temperature Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
Temperature (deg C)
Altitude (km)
Time, GMT
18:30
18:45
19:00
19:15
10
15
20
25
0
1
2
3
4

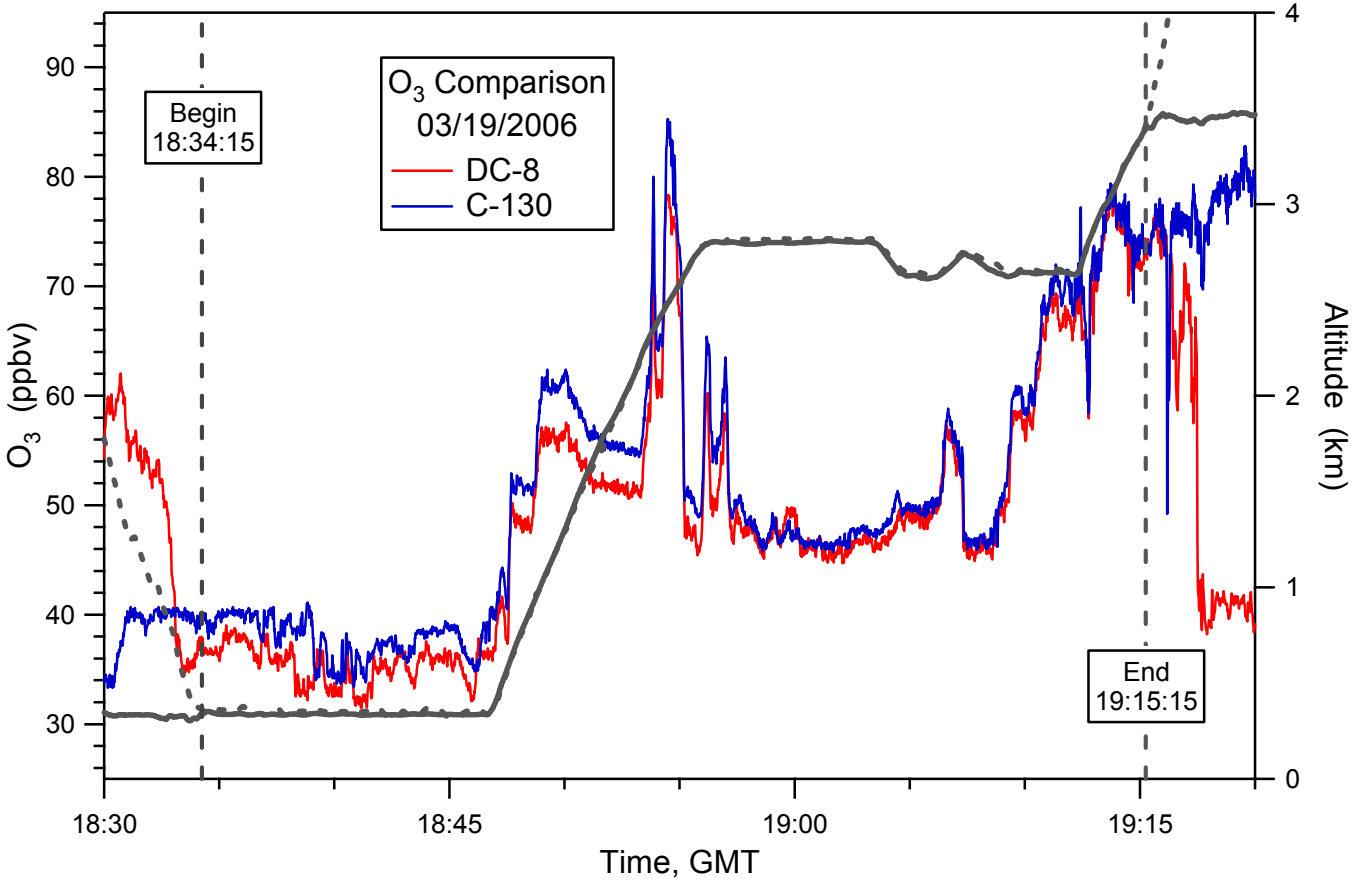

Temperature Comparison
March 19, 2006
Slope = 1.04 ± 0.00
Intercept = -0.59 ± 0.02
R2 = 0.99
1:1
DC-8 Temperature (deg C)
C-130 Temperature (deg C)
10
15
20
25
30

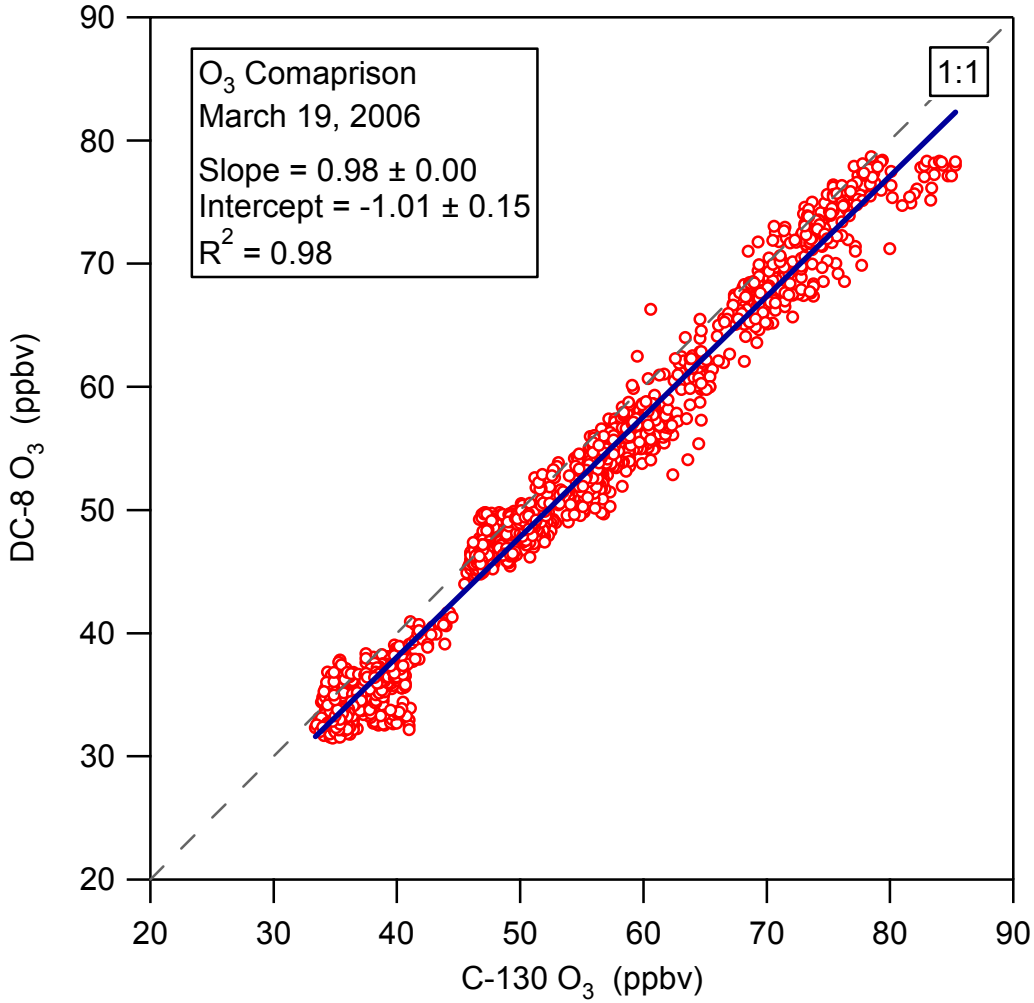

Begin
18:34:15
End
19:15:15
H2O Comparison
03/19/2006
DC-8 Cryo
DC-8 DLH
C-130
H2O (g kg-1)
Altitude (km)
Time, GMT
20
15
10
5
4
3
2
1
0
18:30
18:45
19:00
19:15

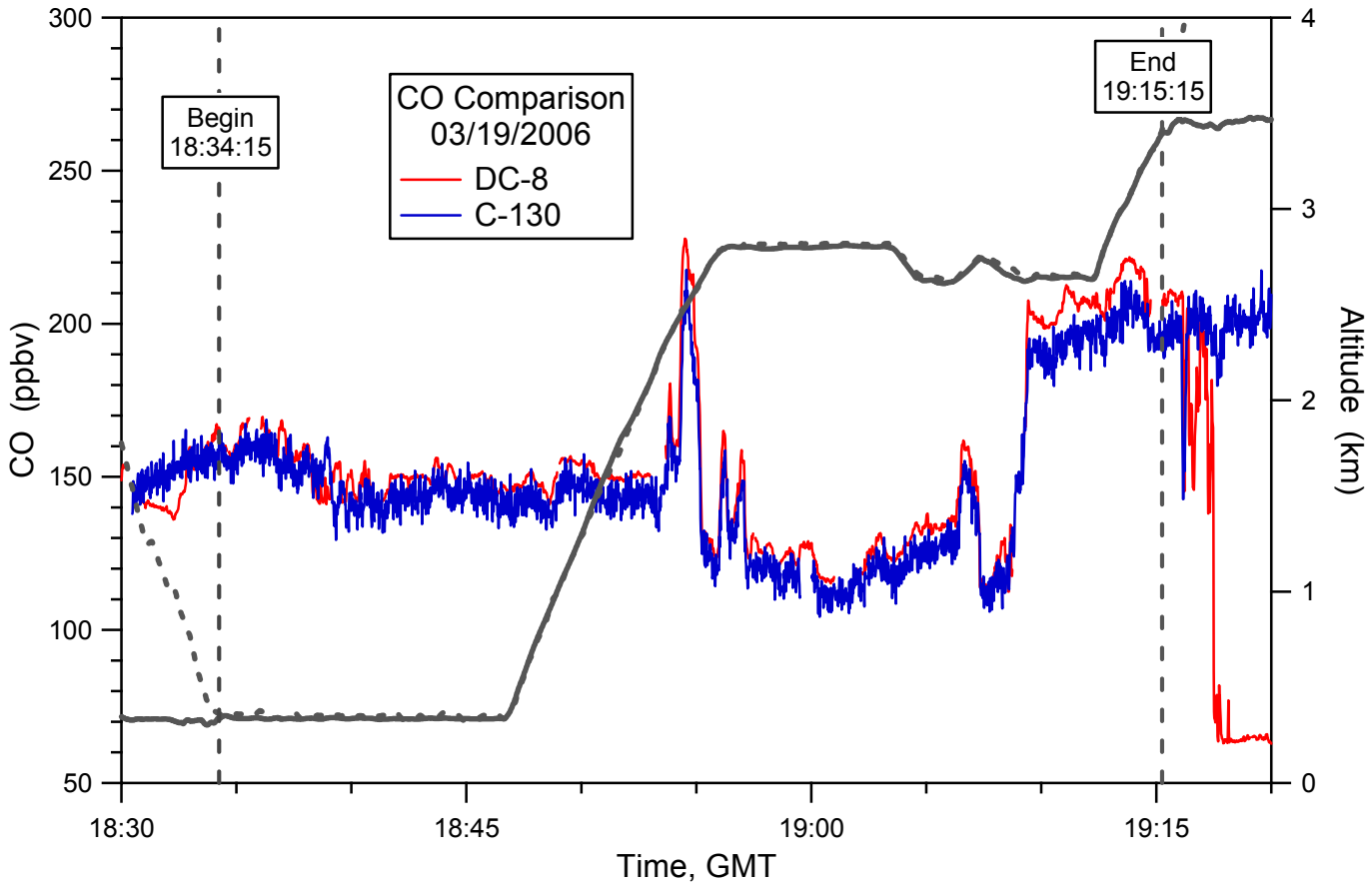

H2O Mixing Ratio Correlation
03/19/2006
Slope = 0.94 ± 0.00
Intercept = 0.07 ± 0.01
R2 = 0.99
1:1
DC-8 Cryo Hydrometer H2O mixing ratio (g kg-1)
C-130 H2O mixing ratio (g kg-1)
4
6
8
10
12
14
16
18

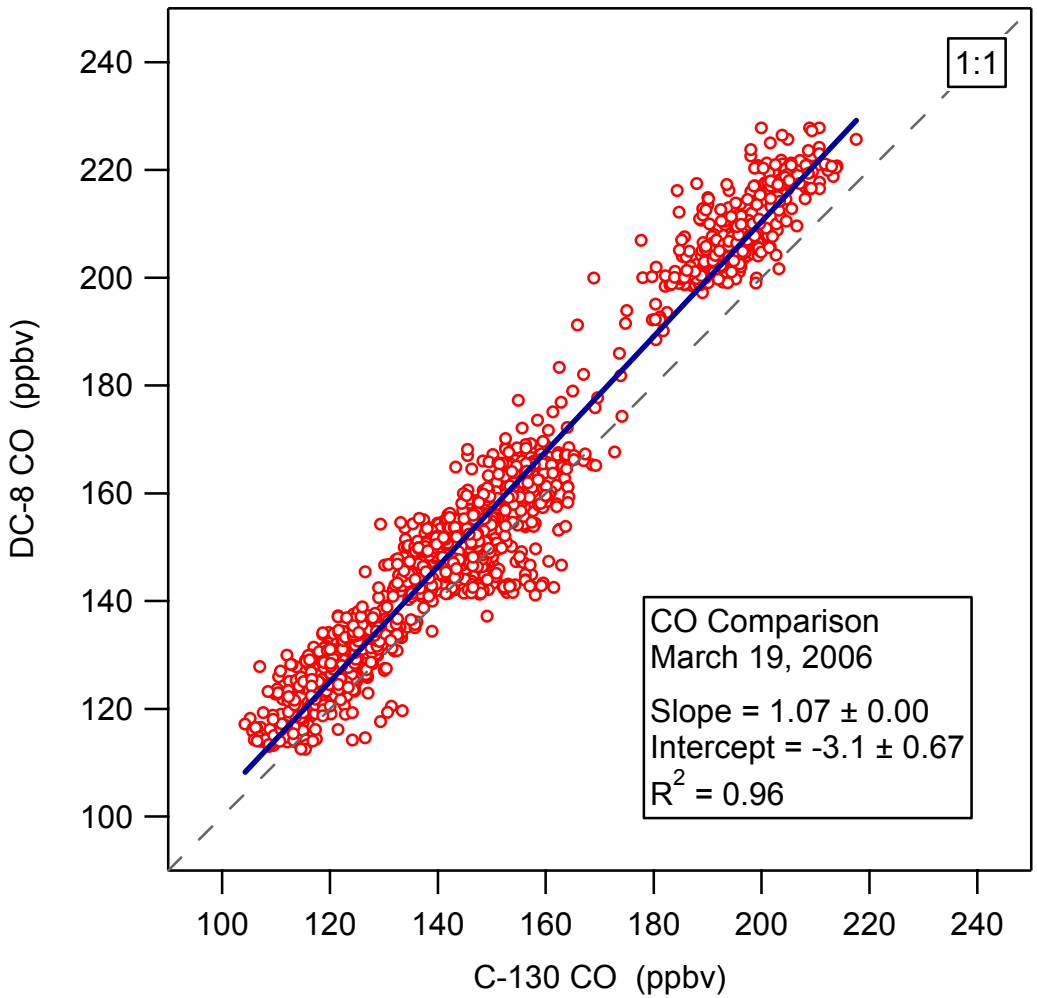

H2O Mixing Ratio Correlation
03/19/2006
Slope = 0.93 ± 0.00
Intercept = -0.08 ± 0.01
R2 = 0.99
1:1
DC-8 DLH H2O mixing ratio (g kg-1)
C-130 H2O mixing ratio (g kg-1)
4
6
8
10
12
14
16
18

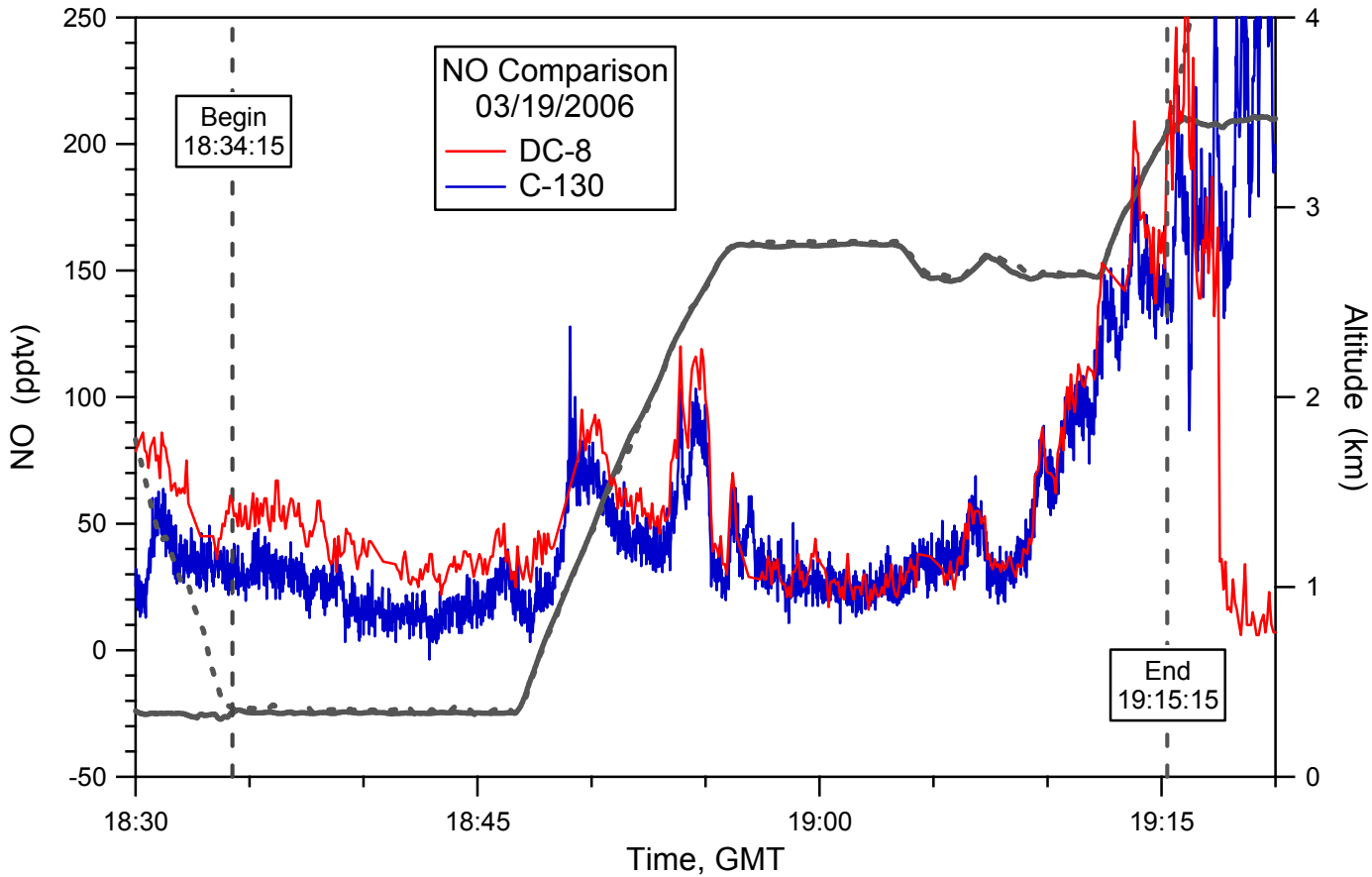

H2O Mixing Ratio Correlation
03/19/2006
Slope = 0.994 ± 0.007
Intercept = -0.15 ± 0.01
R2 = 0.99
1:1
DC-8 DLH H2O mixing ratio (g kg-1)
DC-8 Cryo Hydrometer H2O mixing ratio (g kg-1)
4
6
8
10
12
14
16
18

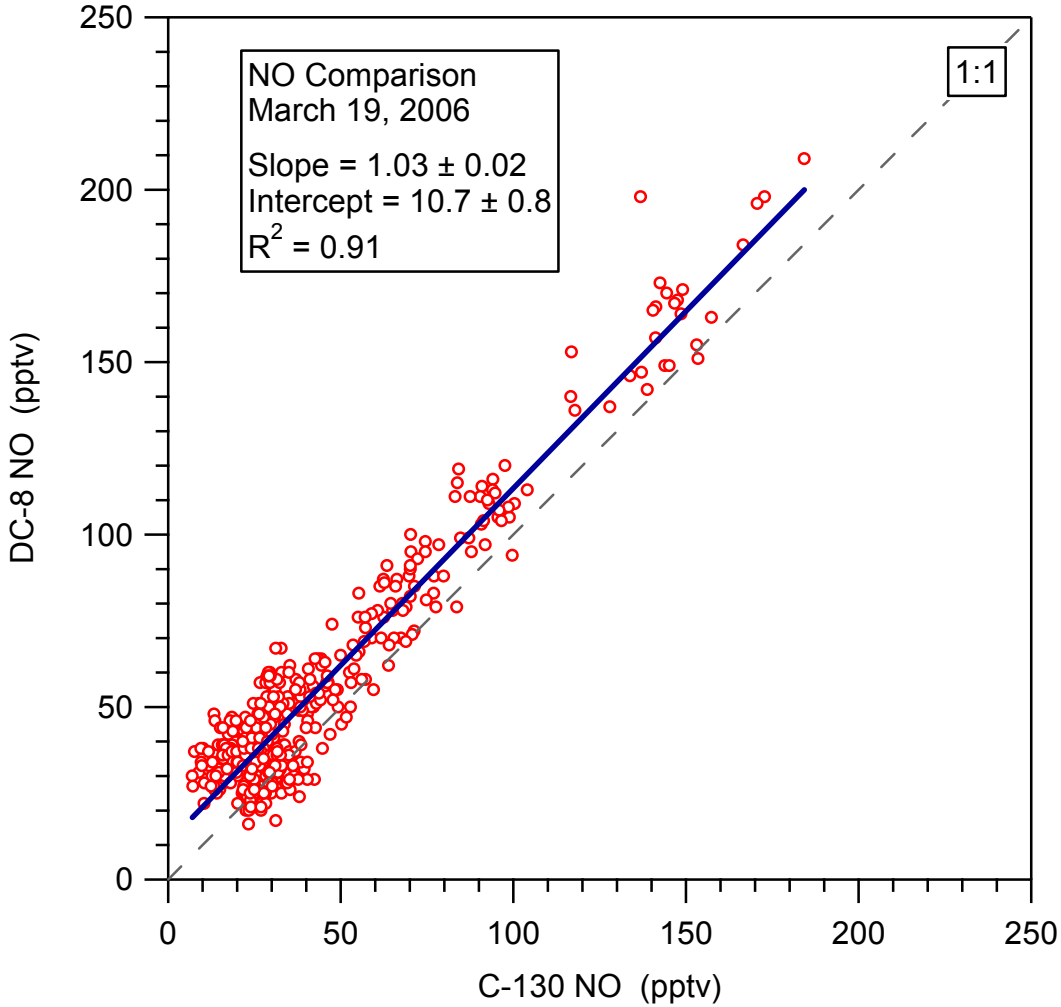

O3 Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
O3 (ppbv)
Altitude (km)
Time, GMT
90
80
70
60
50
40
30
4
3
2
1
0
18:30
18:45
19:00
19:15

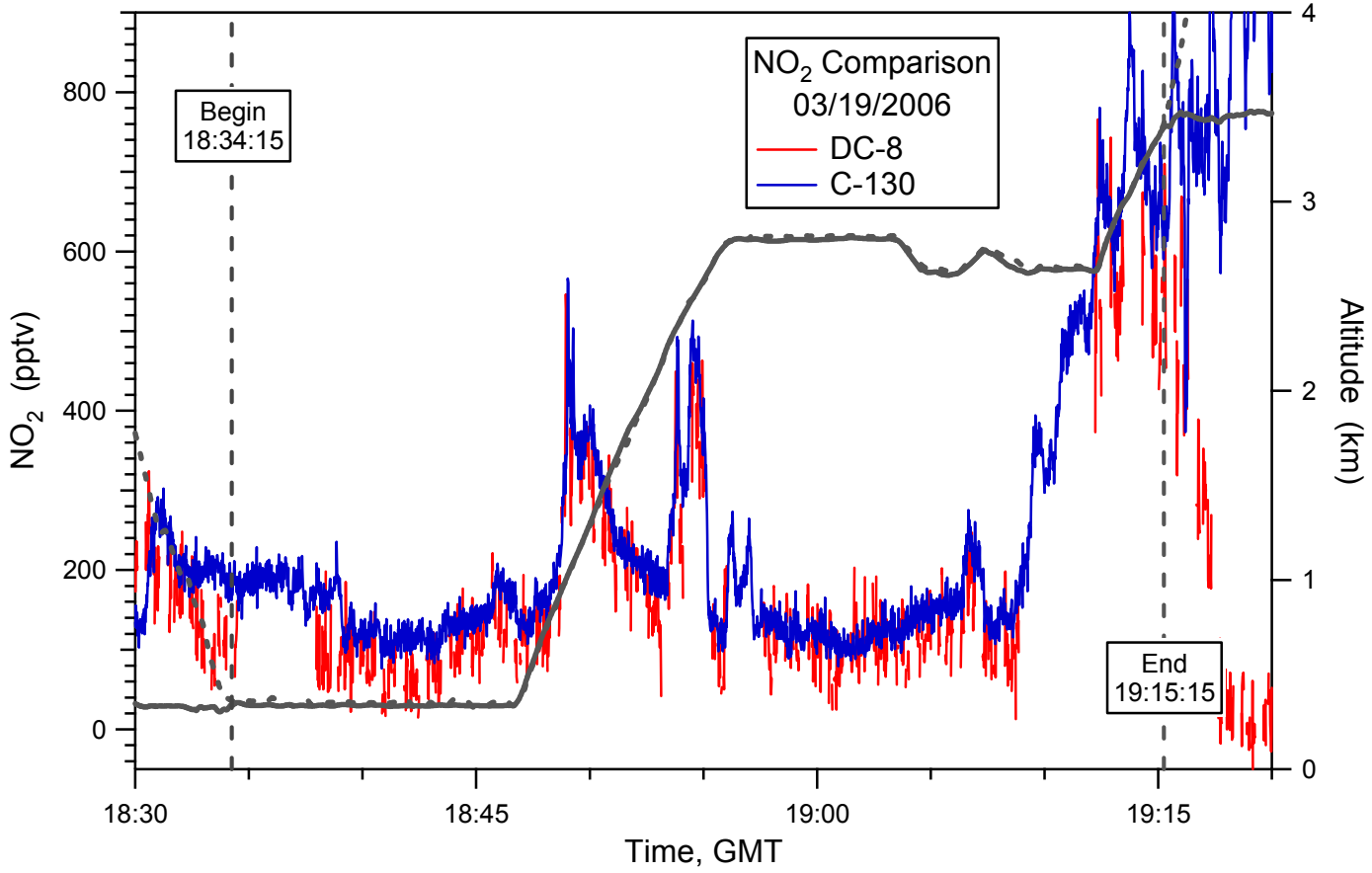

O3 Comaprison
March 19, 2006
Slope = 0.98 ± 0.00
Intercept = -1.01 ± 0.15
R2 = 0.98
1:1
DC-8 O3 (ppbv)
C-130 O3 (ppbv)
20
30
40
50
60
70
80
90

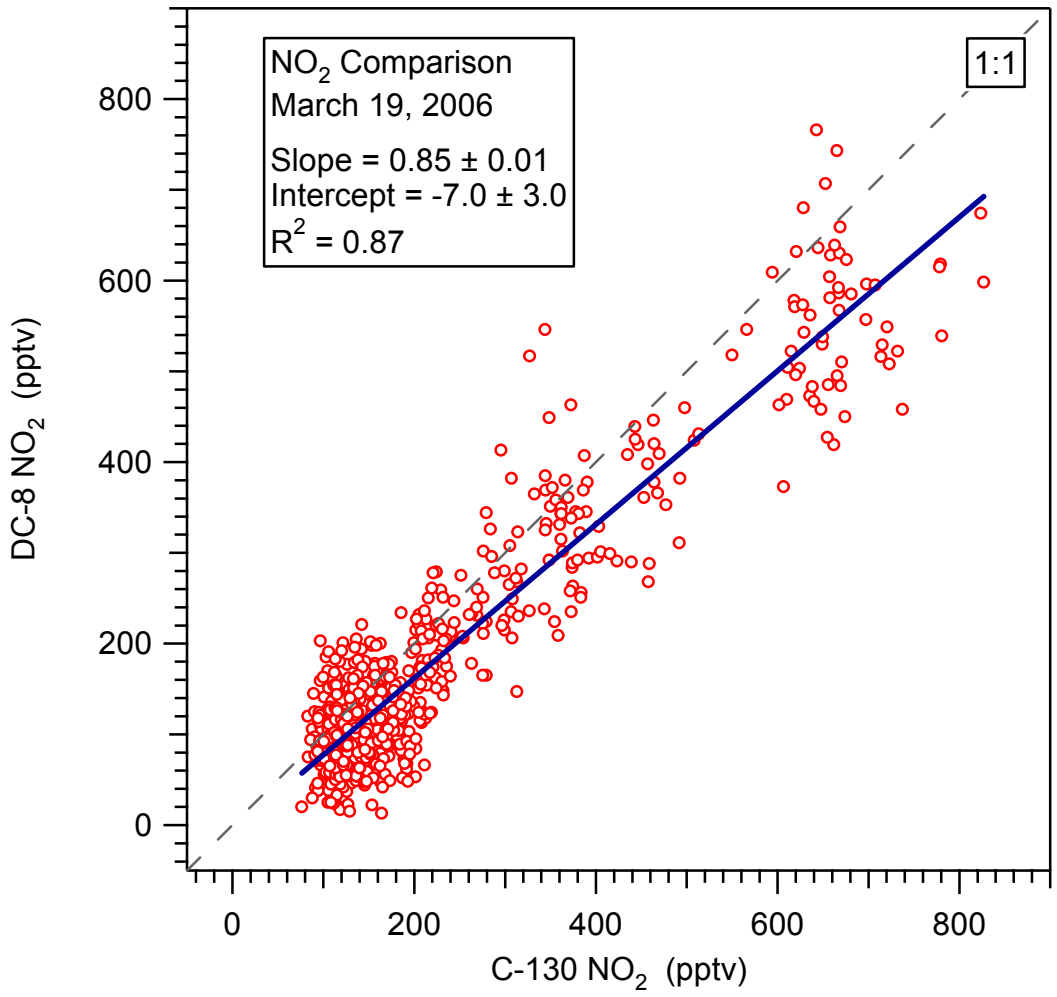

CO Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
CO (ppbv)
Altitude (km)
Time, GMT
300
250
200
150
100
50
4
3
2
1
0
18:30
18:45
19:00
19:15

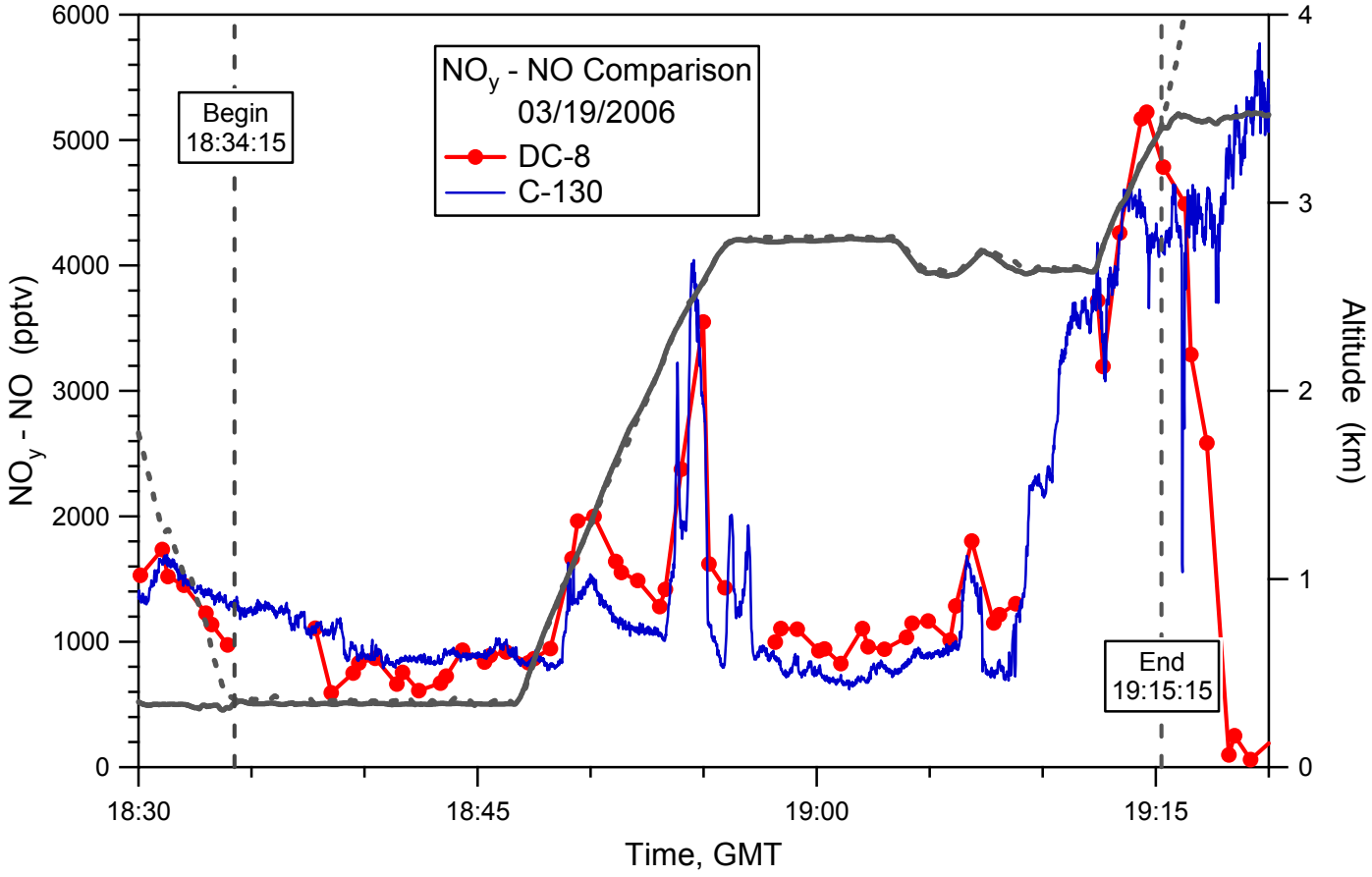

1:1
CO Comparison
March 19, 2006
Slope = 1.07 ± 0.00
Intercept = -3.1 ± 0.67
R2 = 0.96
DC-8 CO (ppbv)
C-130 CO (ppbv)
100
120
140
160
180
200
220
240

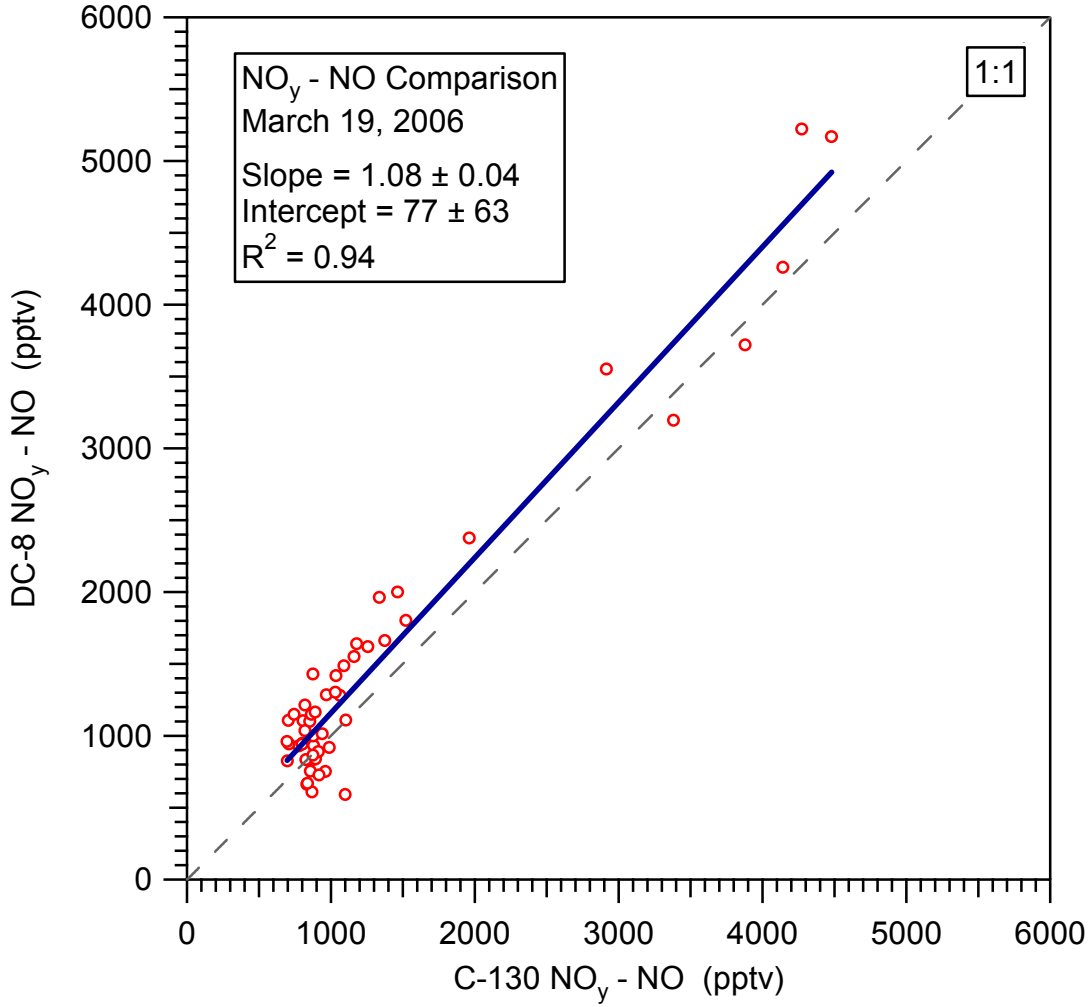

NO Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
NO (pptv)
Altitude (km)
Time, GMT
250
200
150
100
50
0
-50
4
3
2
1
0
18:30
18:45
19:00
19:15

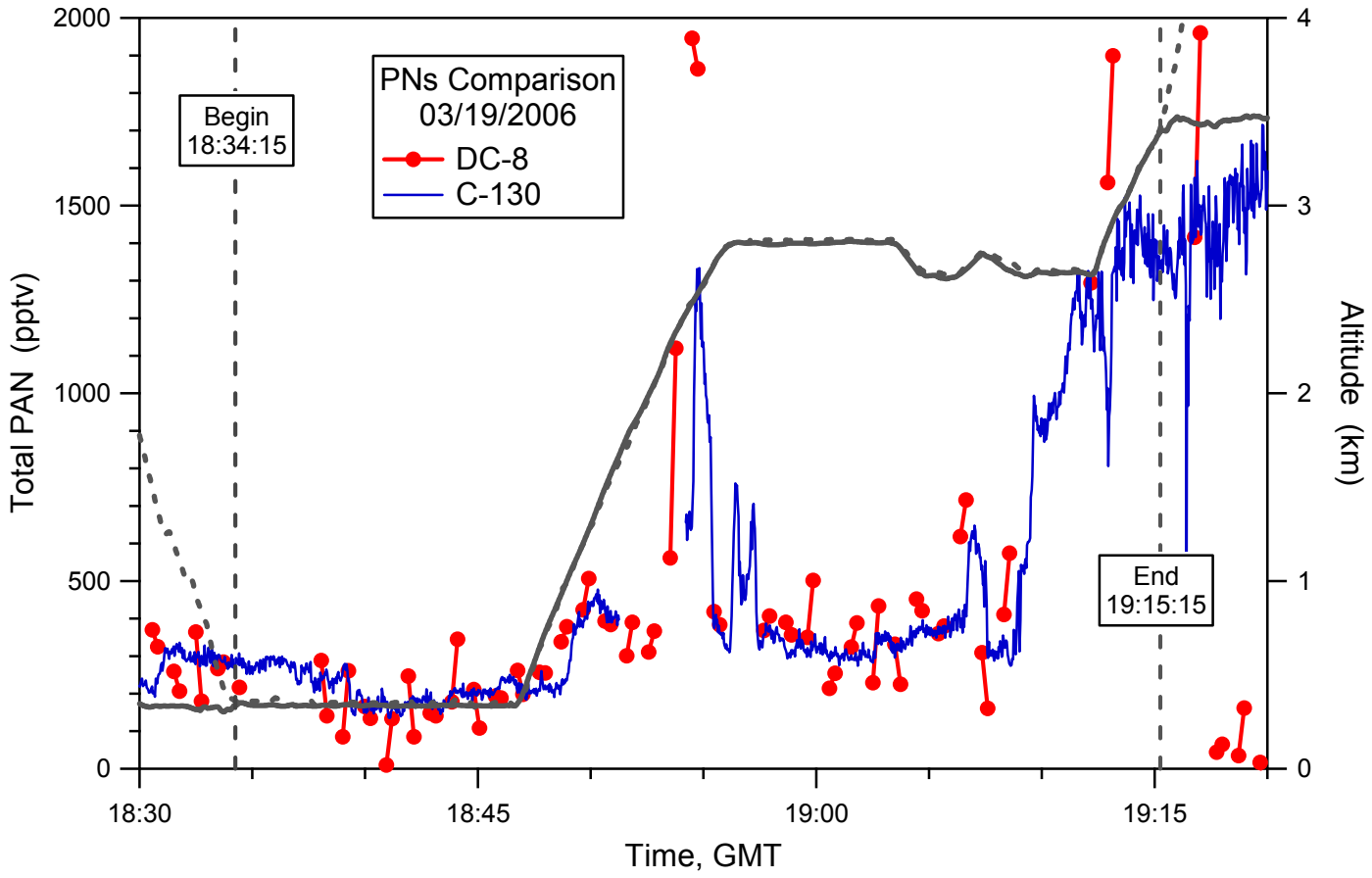

NO Comparison
March 19, 2006
Slope = 1.03 ± 0.02
Intercept = 10.7 ± 0.8
R2 = 0.91
1:1
DC-8 NO (pptv)
C-130 NO (pptv)
0
50
100
150
200
250

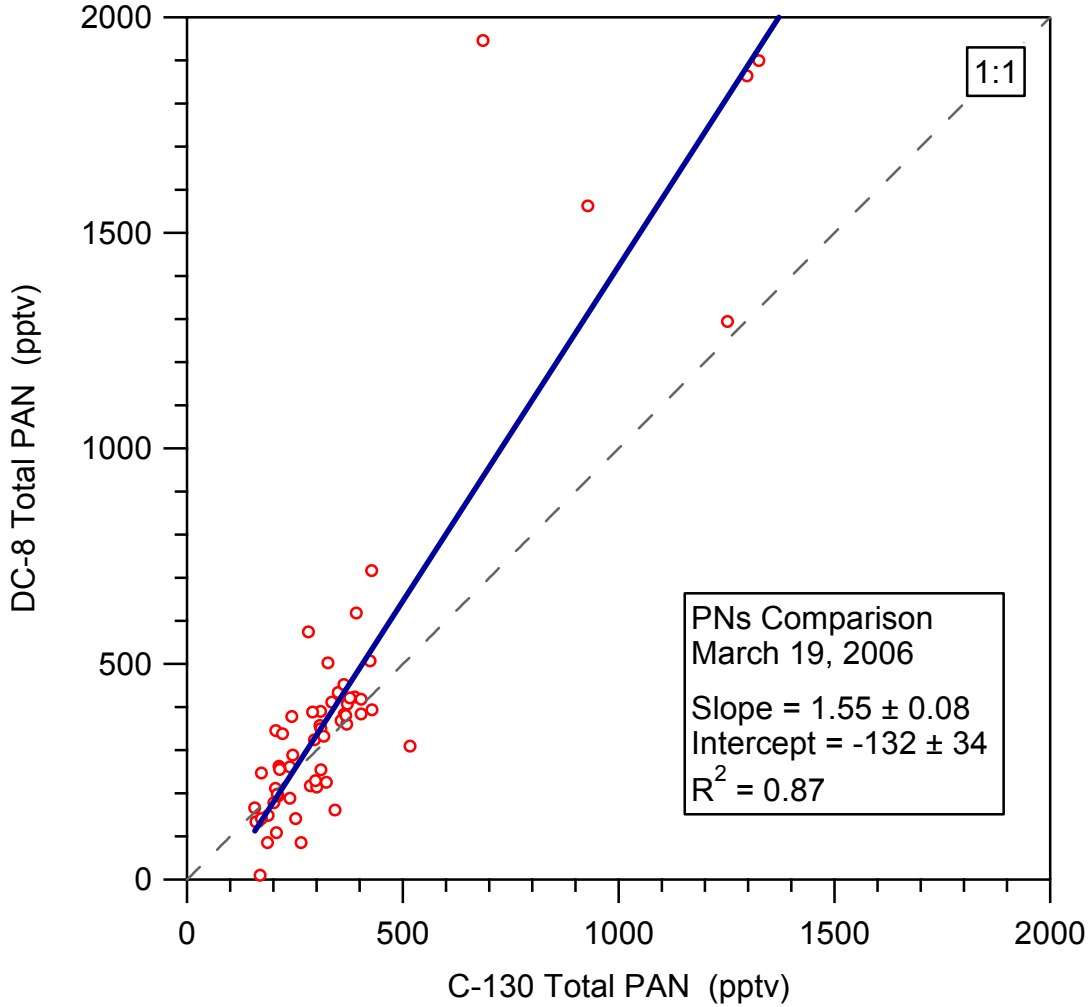

NO2 Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
NO2 (pptv)
Altitude (km)
Time, GMT
0
200
400
600
800
0
1
2
3
4
18:30
18:45
19:00
19:15

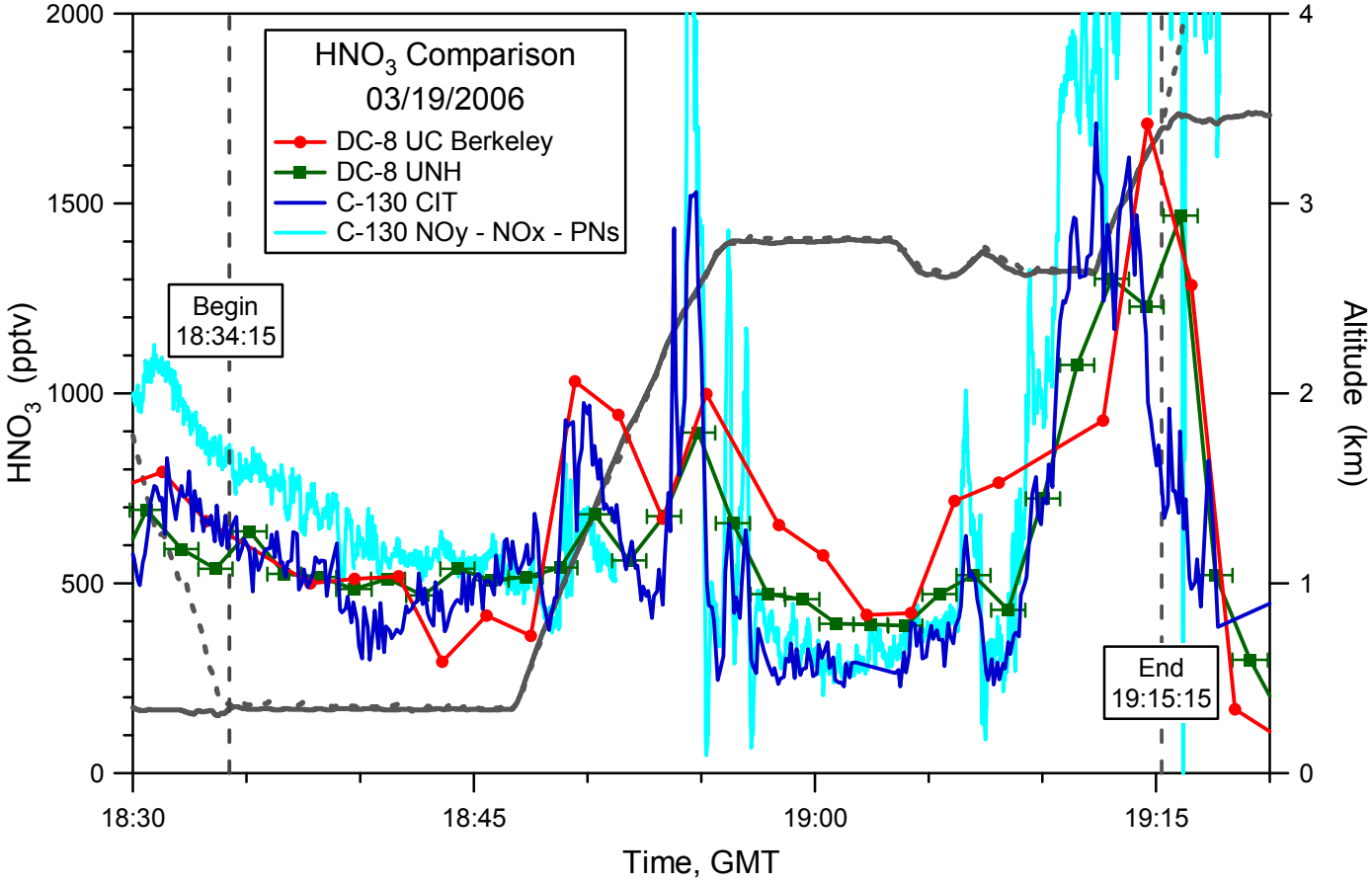

NO2 Comparison
March 19, 2006
Slope = 0.85 ± 0.01
Intercept = -7.0 ± 3.0
R2 = 0.87
1:1
DC-8 NO2 (pptv)
C-130 NO2 (pptv)
0
200
400
600
800

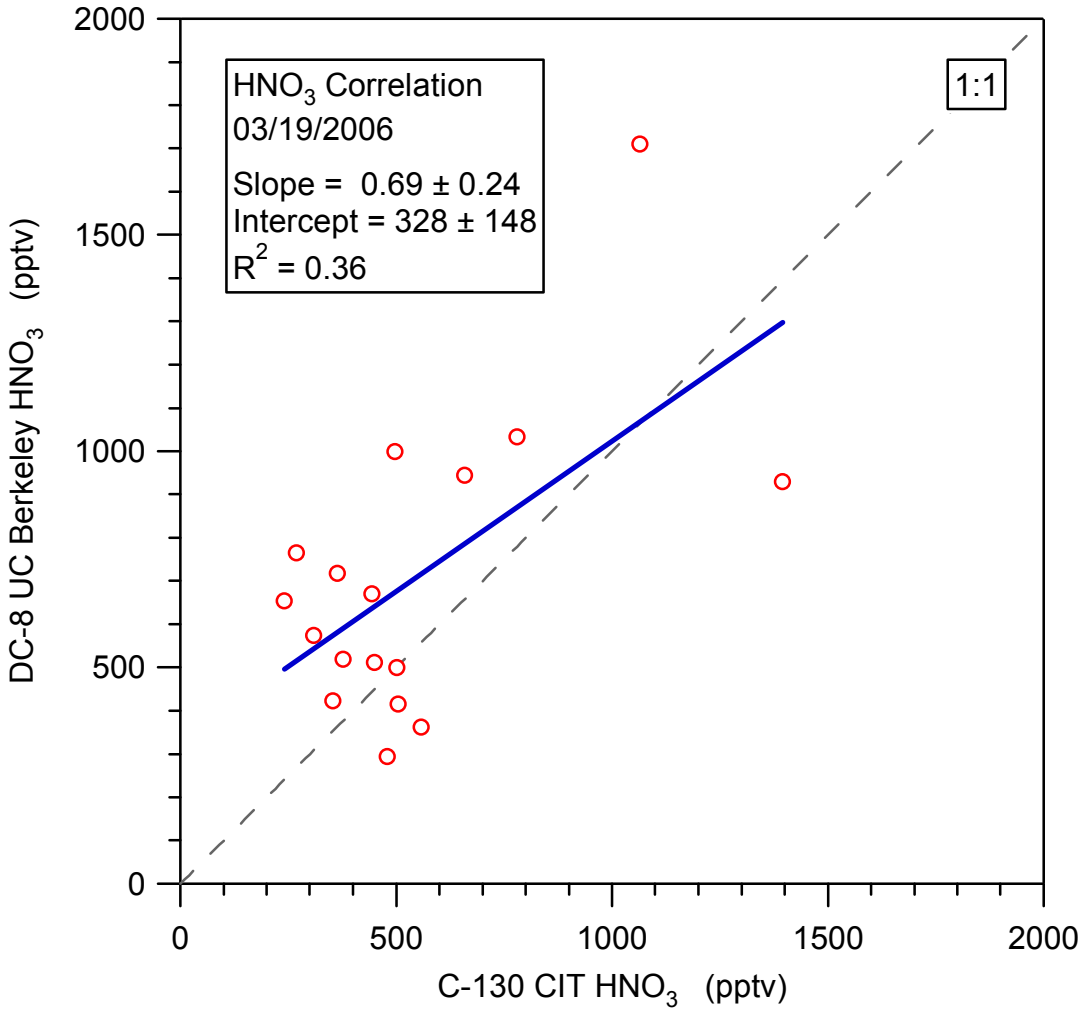

NOy - NO Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
NOy - NO (pptv)
Altitude (km)
Time, GMT
6000
5000
4000
3000
2000
1000
0
4
3
2
1
0
18:30
18:45
19:00
19:15

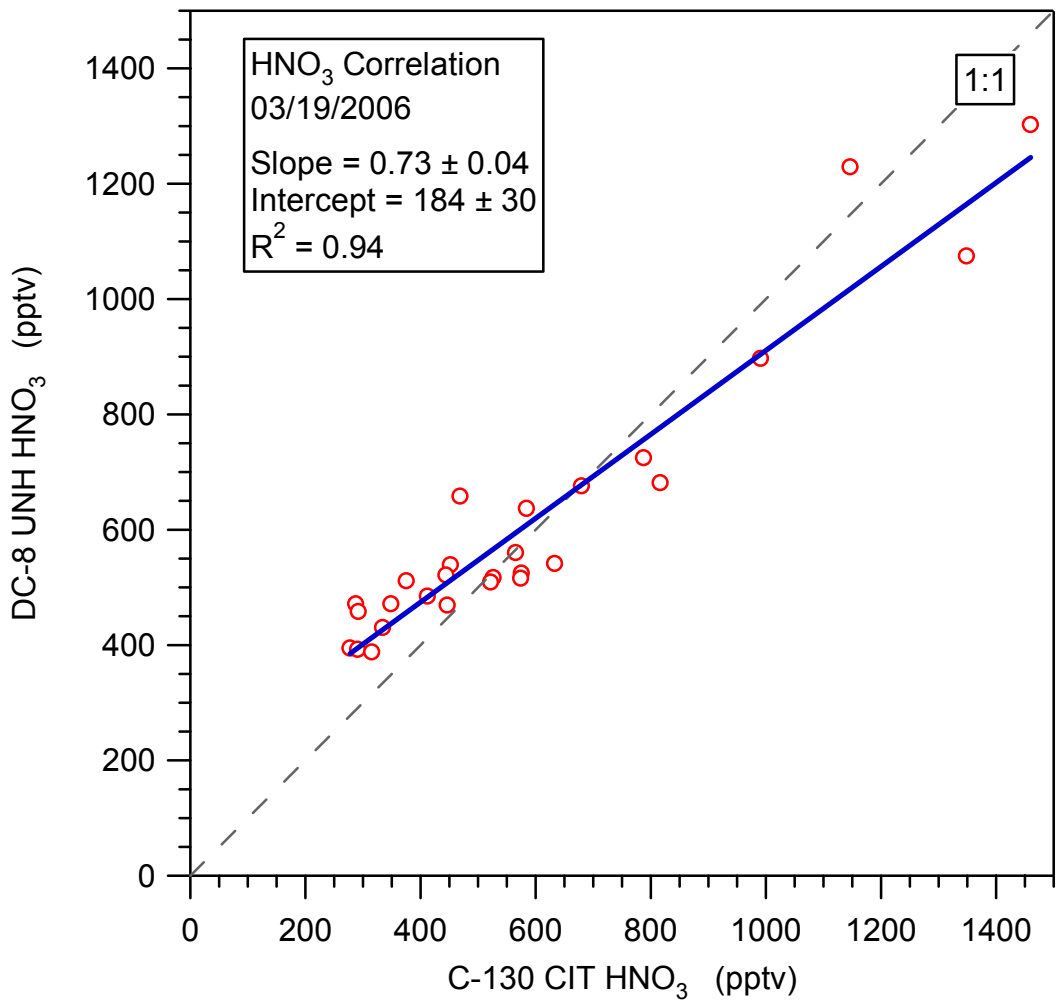

NOy - NO Comparison
March 19, 2006
Slope = 1.08 ± 0.04
Intercept = 77 ± 63
R2 = 0.94
1:1
DC-8 NOy - NO (pptv)
C-130 NOy - NO (pptv)
0
1000
2000
3000
4000
5000
6000

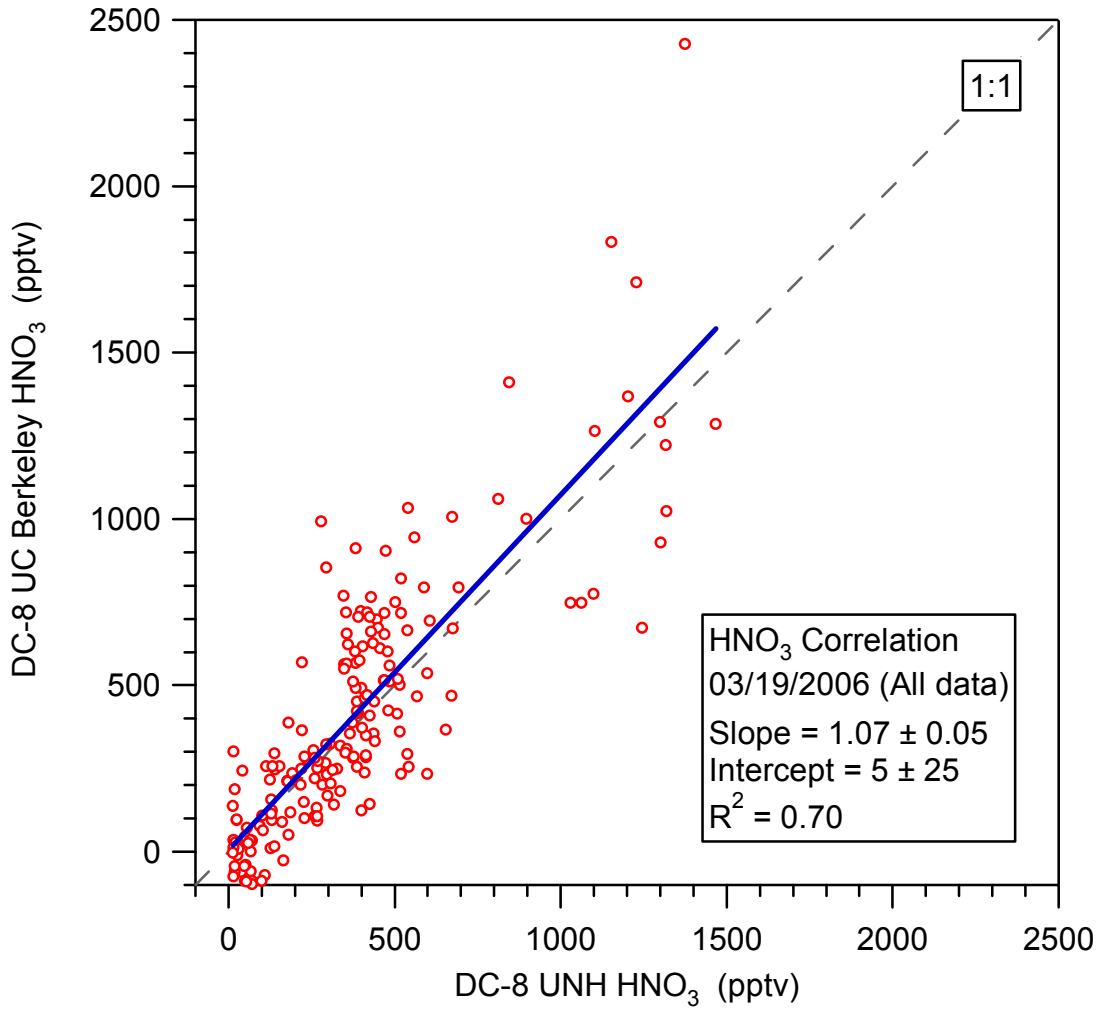

PNs Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
Total PAN (pptv)
Altitude (km)
Time, GMT
2000
1500
1000
500
0
4
3
2
1
0
18:30
18:45
19:00
19:15

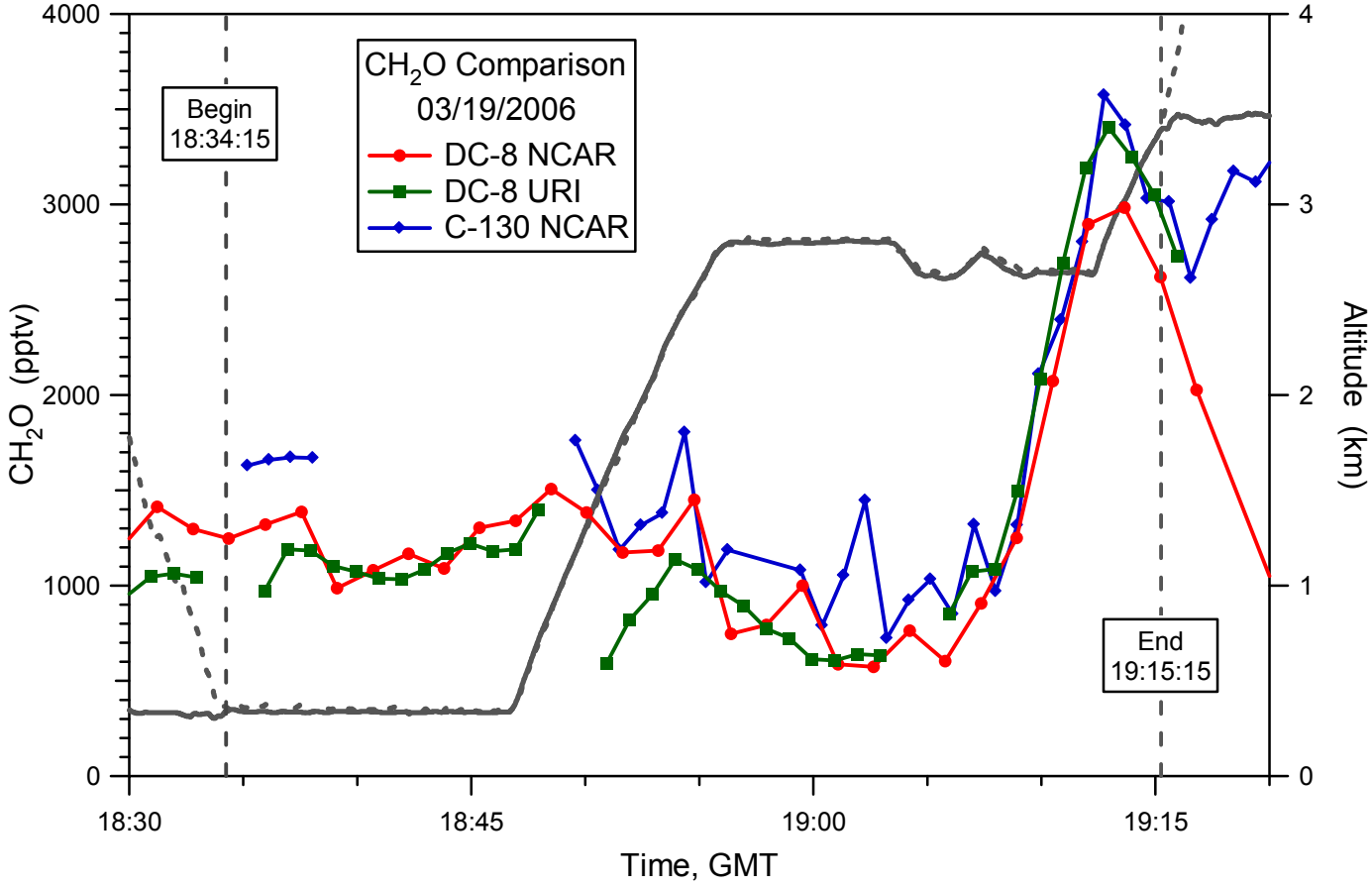

2000
1500
1000
500
0
0
500
1000
1500
2000
DC-8 Total PAN (pptv)
C-130 Total PAN (pptv)
1:1
PNs Comparison
March 19, 2006
Slope = 1.55 ± 0.08
Intercept = -132 ± 34
R2 = 0.87

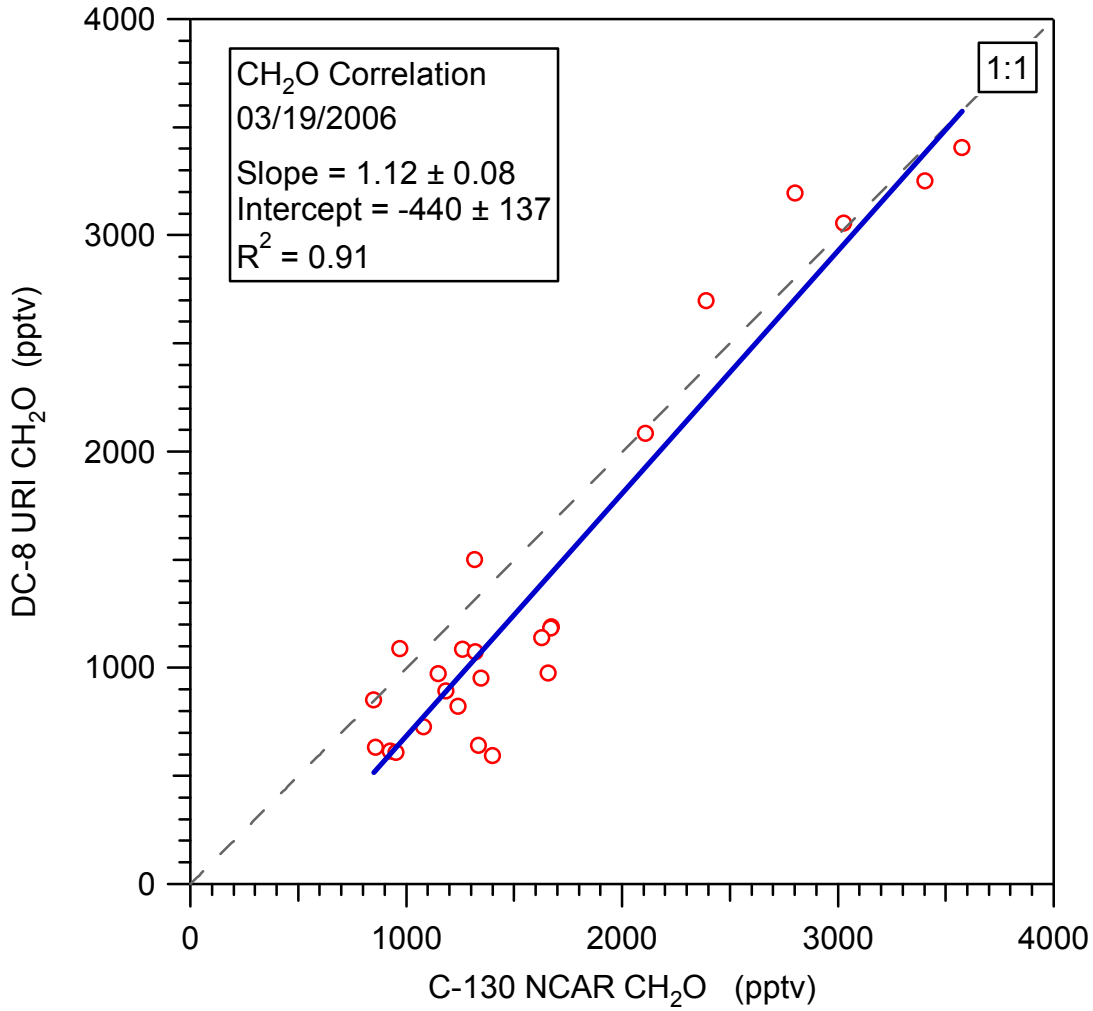

HNO3 Comparison
03/19/2006
DC-8 UC Berkeley
DC-8 UNH
C-130 CIT
C-130 NOy - NOx - PNs
Begin
18:34:15
End
19:15:15
HNO3 (pptv)
Altitude (km)
Time, GMT
2000
1500
1000
500
0
4
3
2
1
0
18:30
18:45
19:00
19:15

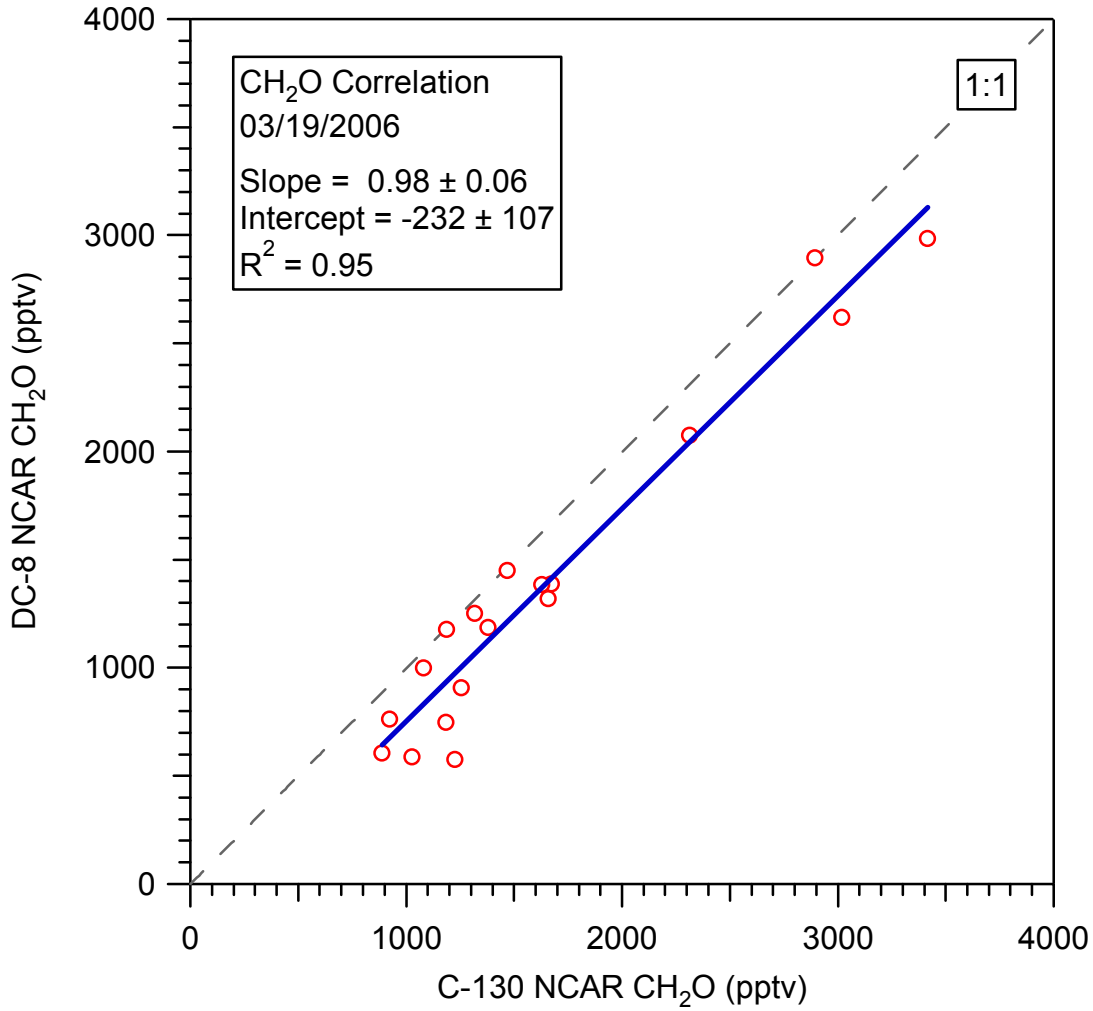

HNO3 Correlation
03/19/2006
Slope = 0.69 ± 0.24
Intercept = 328 ± 148
R2 = 0.36
1:1
DC-8 UC Berkeley HNO3 (pptv)
C-130 CIT HNO3 (pptv)
0
500
1000
1500
2000

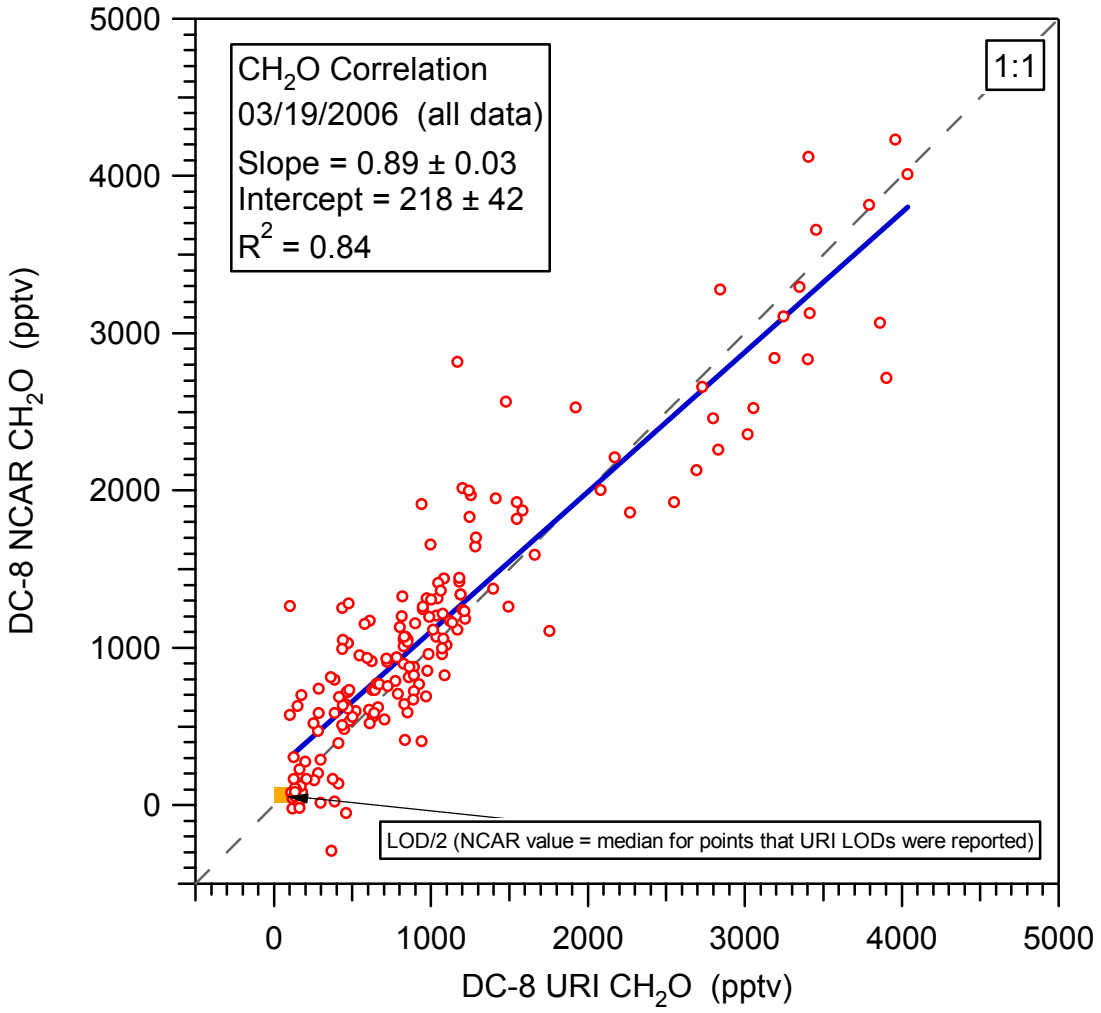

HNO3 Correlation
03/19/2006
Slope = 0.73 ± 0.04
Intercept = 184 ± 30
R2 = 0.94
1:1
DC-8 UNH HNO3 (pptv)
C-130 CIT HNO3 (pptv)
0
200
400
600
800
1000
1200
1400

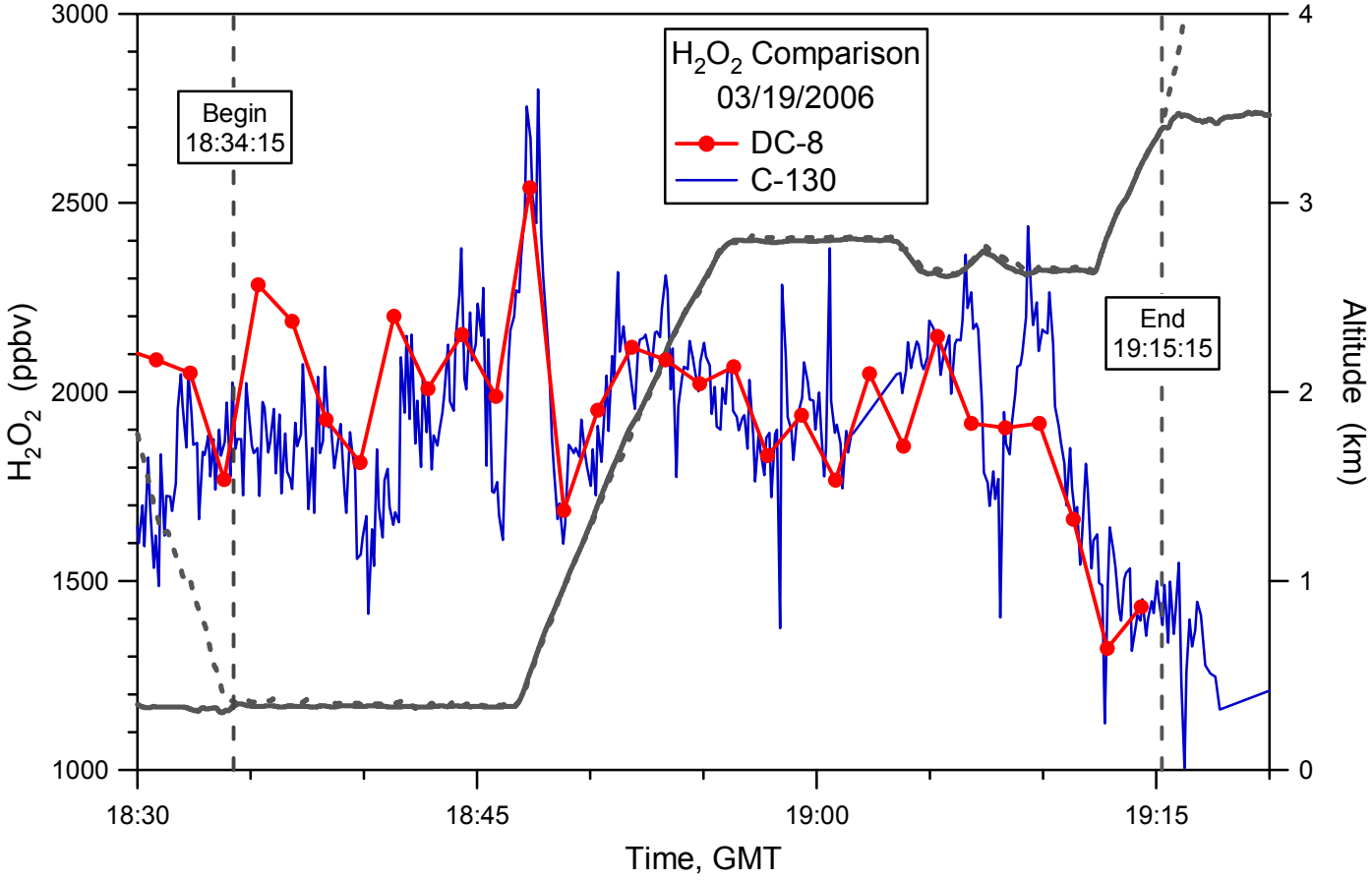

2500
2000
1500
1000
500
0
0
500
1000
1500
2000
2500
DC-8 UC Berkeley HNO3 (pptv)
DC-8 UNH HNO3 (pptv)
1:1
HNO3 Correlation
03/19/2006 (All data)
Slope = 1.07 ± 0.05
Intercept = 5 ± 25
R2 = 0.70

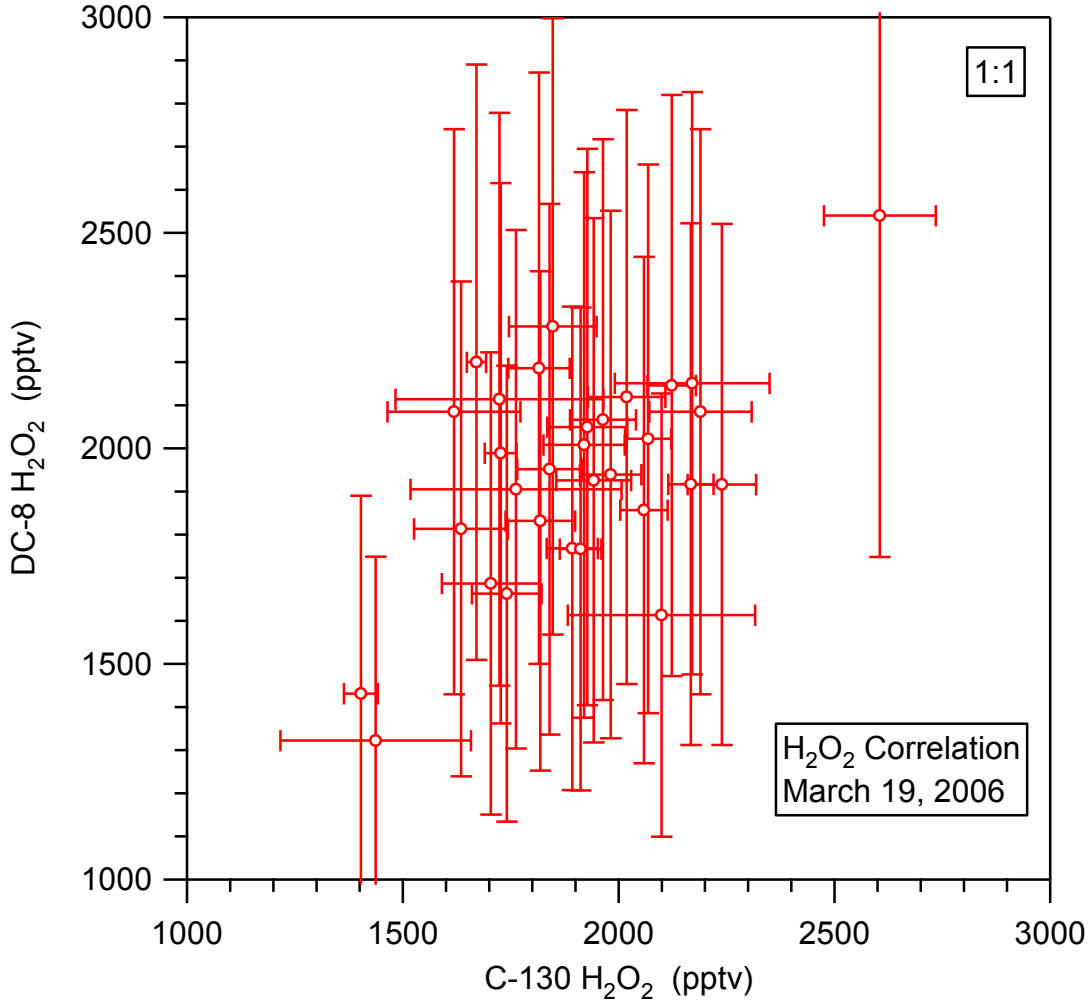

CH2O Comparison
03/19/2006
DC-8 NCAR
DC-8 URI
C-130 NCAR
Begin
18:34:15
End
19:15:15
CH2O (pptv)
Altitude (km)
Time, GMT
4000
3000
2000
1000
0
4
3
2
1
0
18:30
18:45
19:00
19:15

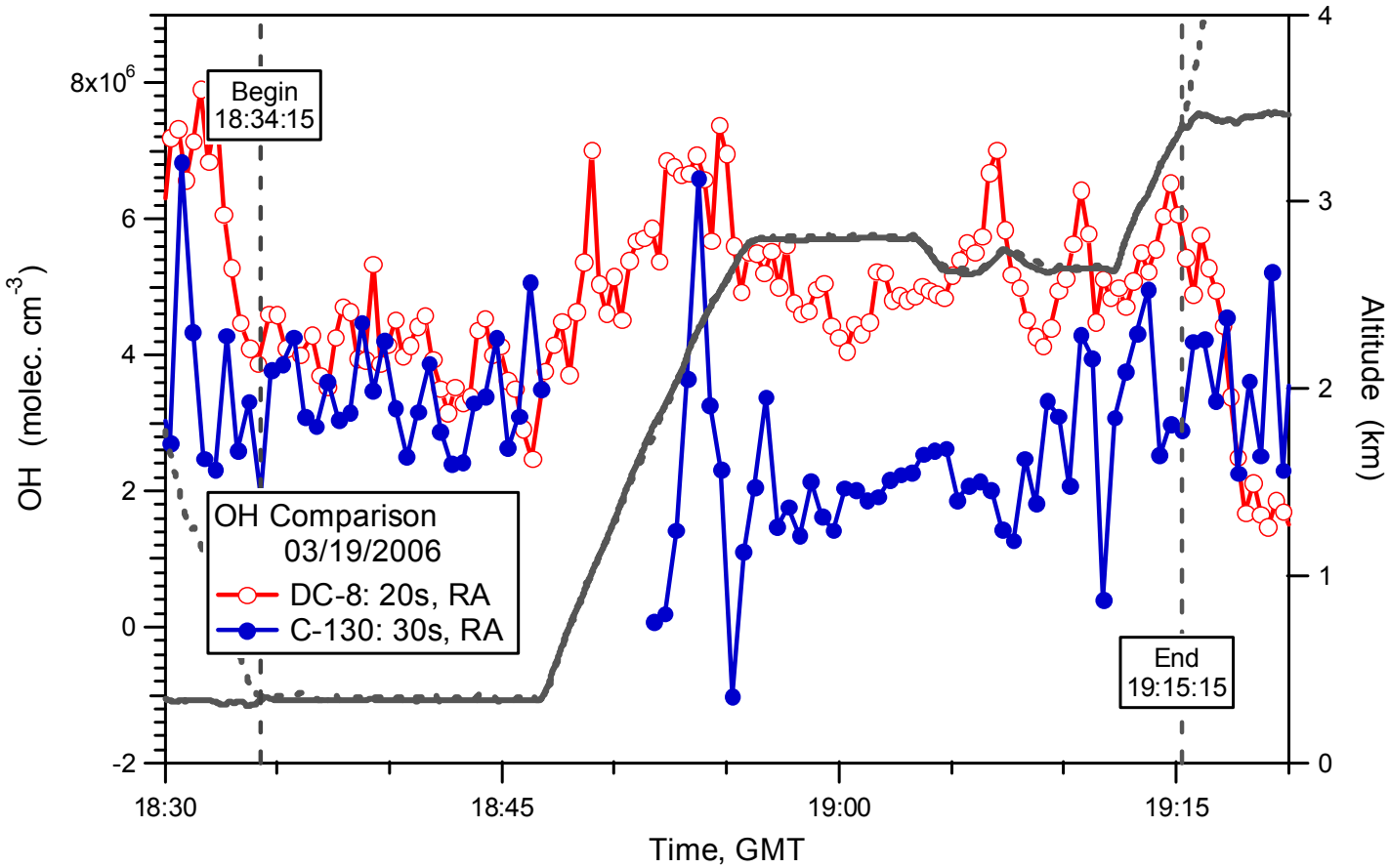

CH2O Correlation
03/19/2006
Slope = 1.12 ± 0.08
Intercept = -440 ± 137
R2 = 0.91
1:1
DC-8 URI CH2O (pptv)
C-130 NCAR CH2O (pptv)
0
1000
2000
3000
4000


CH2O Correlation
03/19/2006
Slope = 0.98 ± 0.06
Intercept = -232 ± 107
R2 = 0.95
1:1
DC-8 NCAR CH2O (pptv)
C-130 NCAR CH2O (pptv)
0
1000
2000
3000
4000

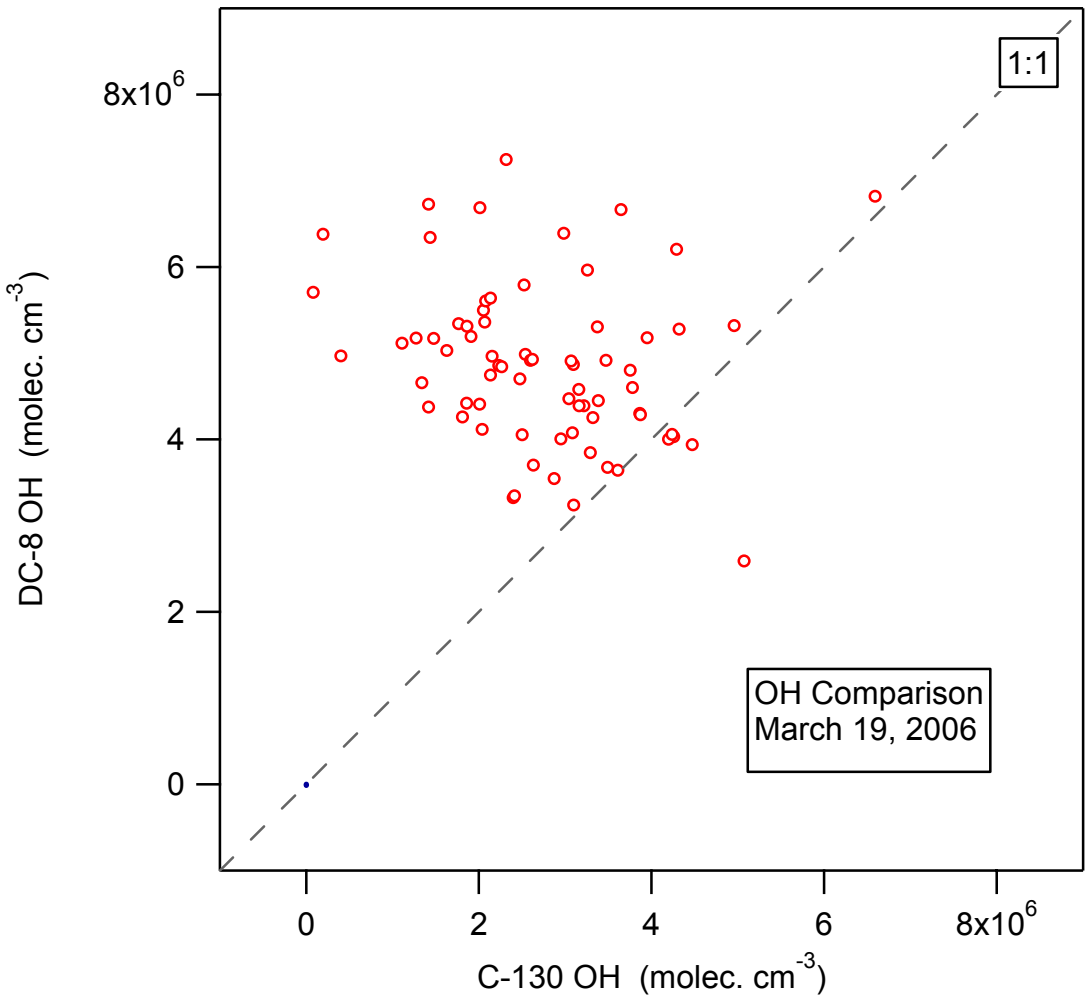

CH2O Correlation
03/19/2006 (all data)
Slope = 0.89 ± 0.03
Intercept = 218 ± 42
R2 = 0.84
1:1
LOD/2 (NCAR value = median for points that URI LODs were reported)
DC-8 NCAR CH2O (pptv)
DC-8 URI CH2O (pptv)
5000
4000
3000
2000
1000
0
0
1000
2000
3000
4000
5000

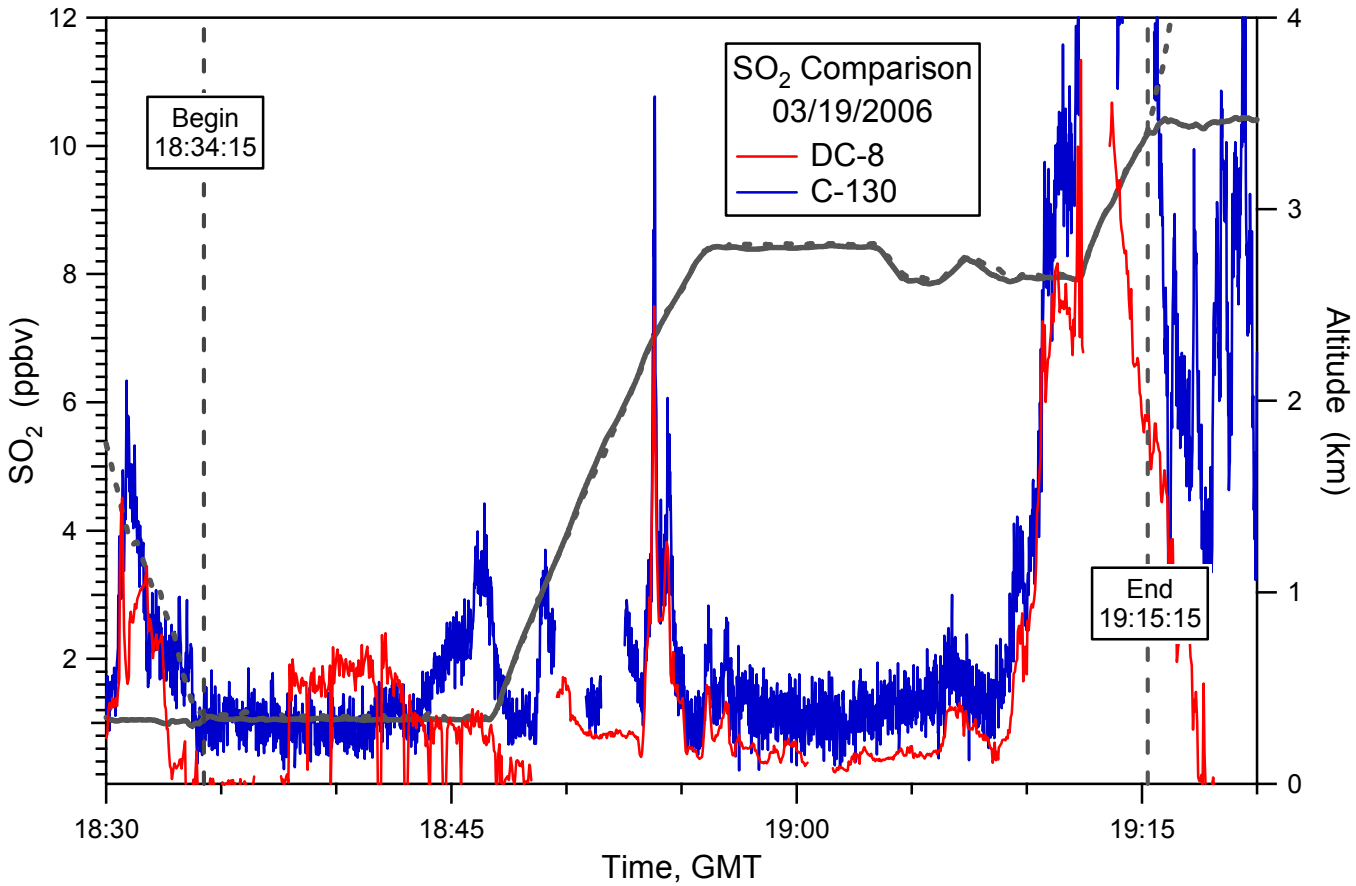

H_2O_2 Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
H_2O_2 (ppbv)
Altitude (km)
Time, GMT
3000
2500
2000
1500
1000
4
3
2
1
0
18:30
18:45
19:00
19:15

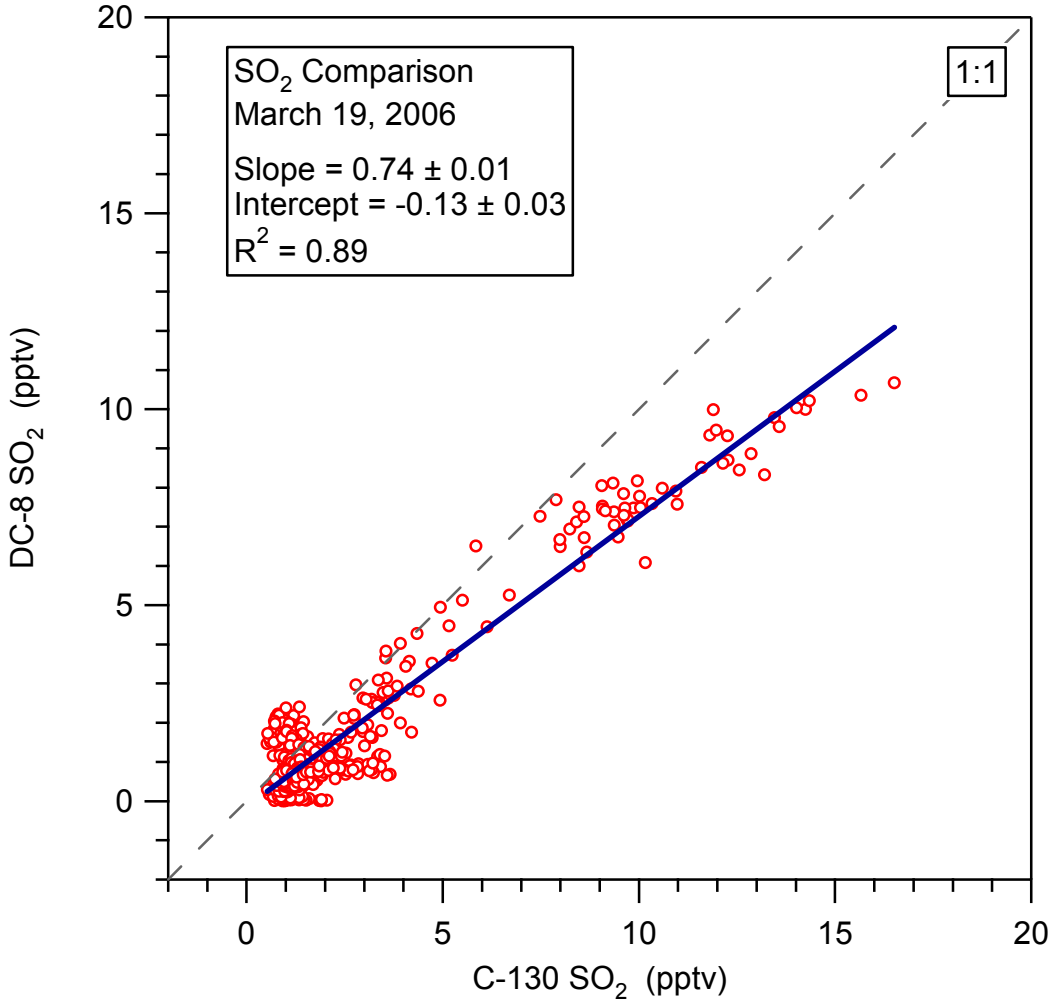

1:1
H_2O_2 Correlation
March 19, 2006
DC-8 H_2O_2 (pptv)
C-130 H_2O_2 (pptv)
1000
1500
2000
2500
3000

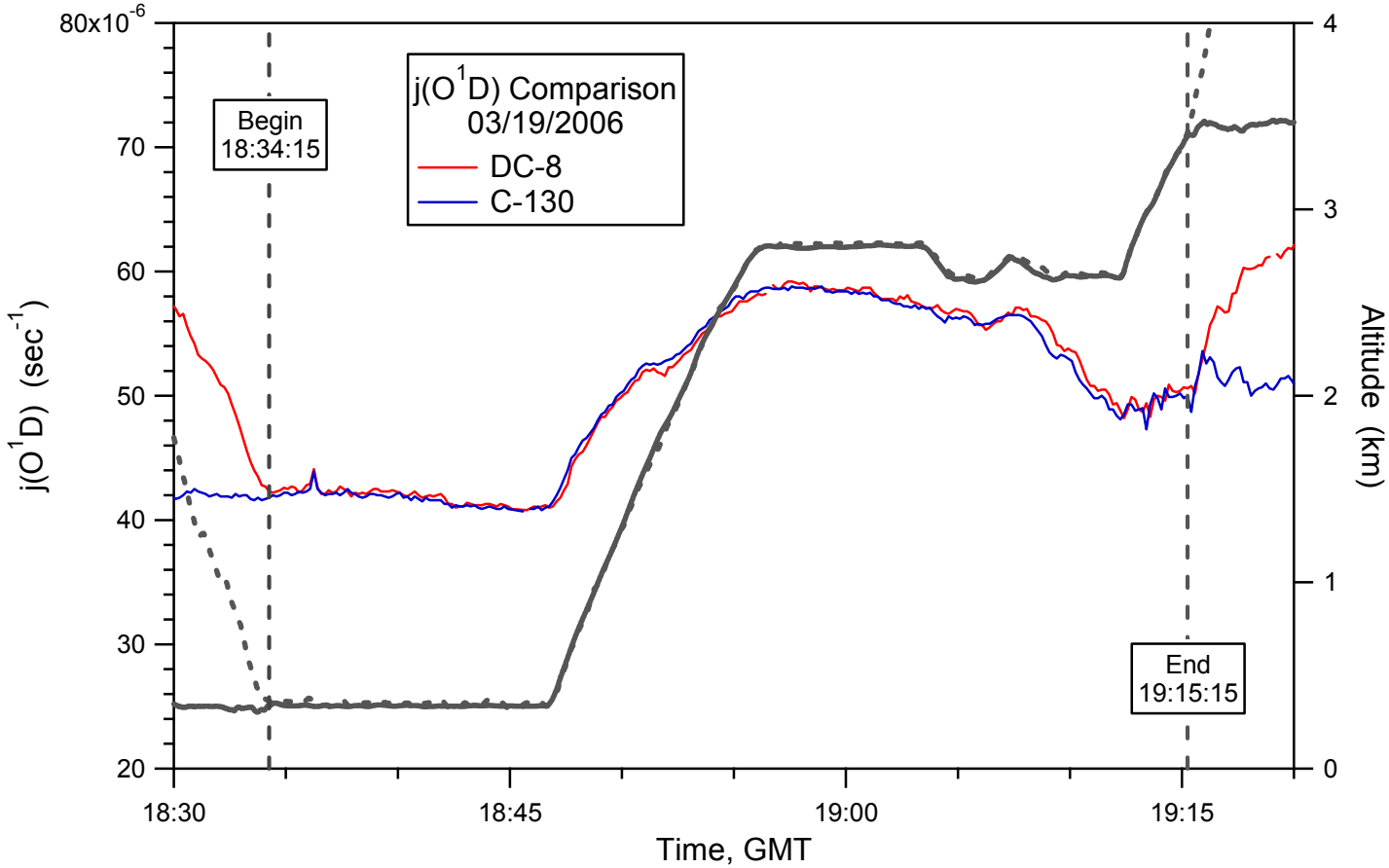


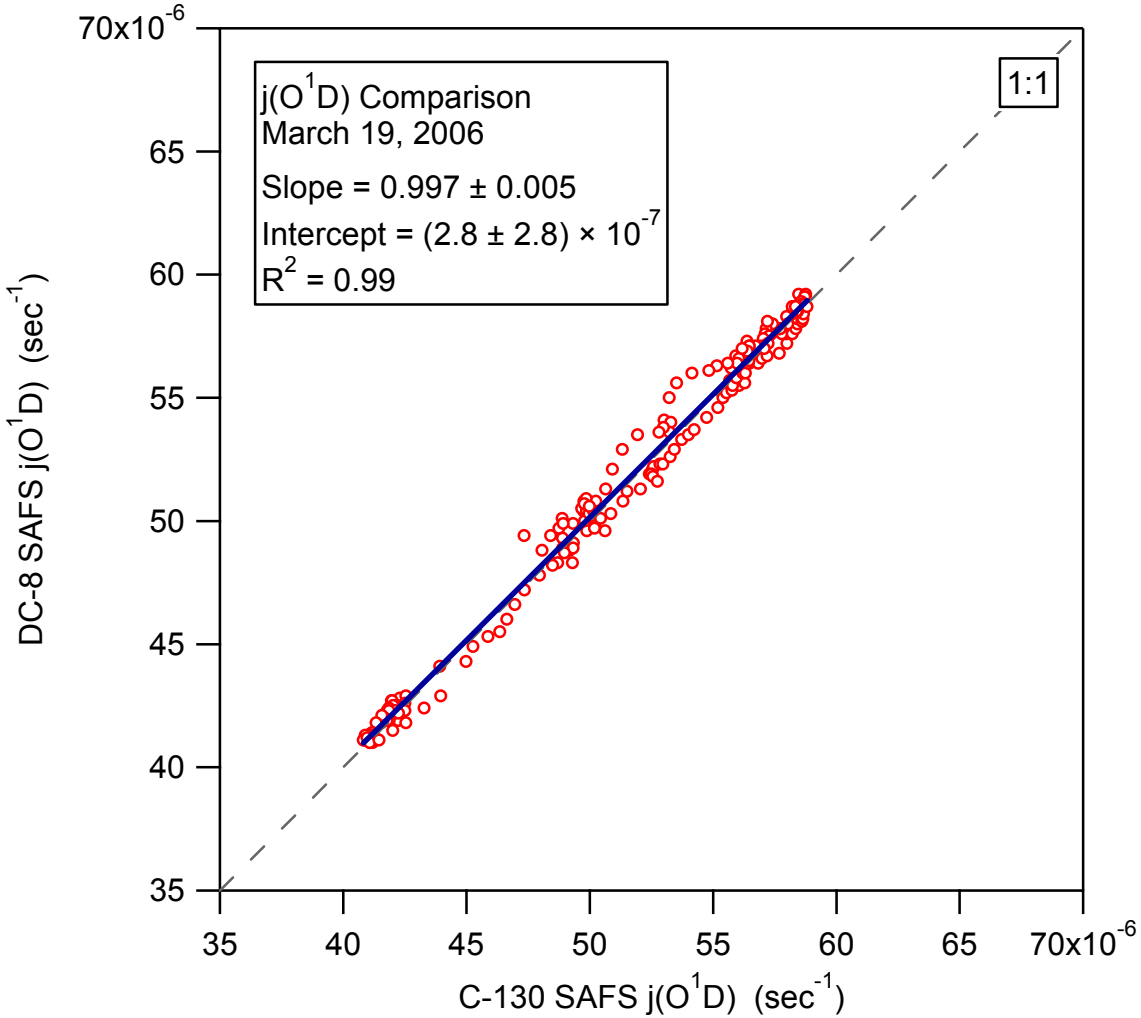
Note: Altitude independent calibration factor applied to C-130 data.

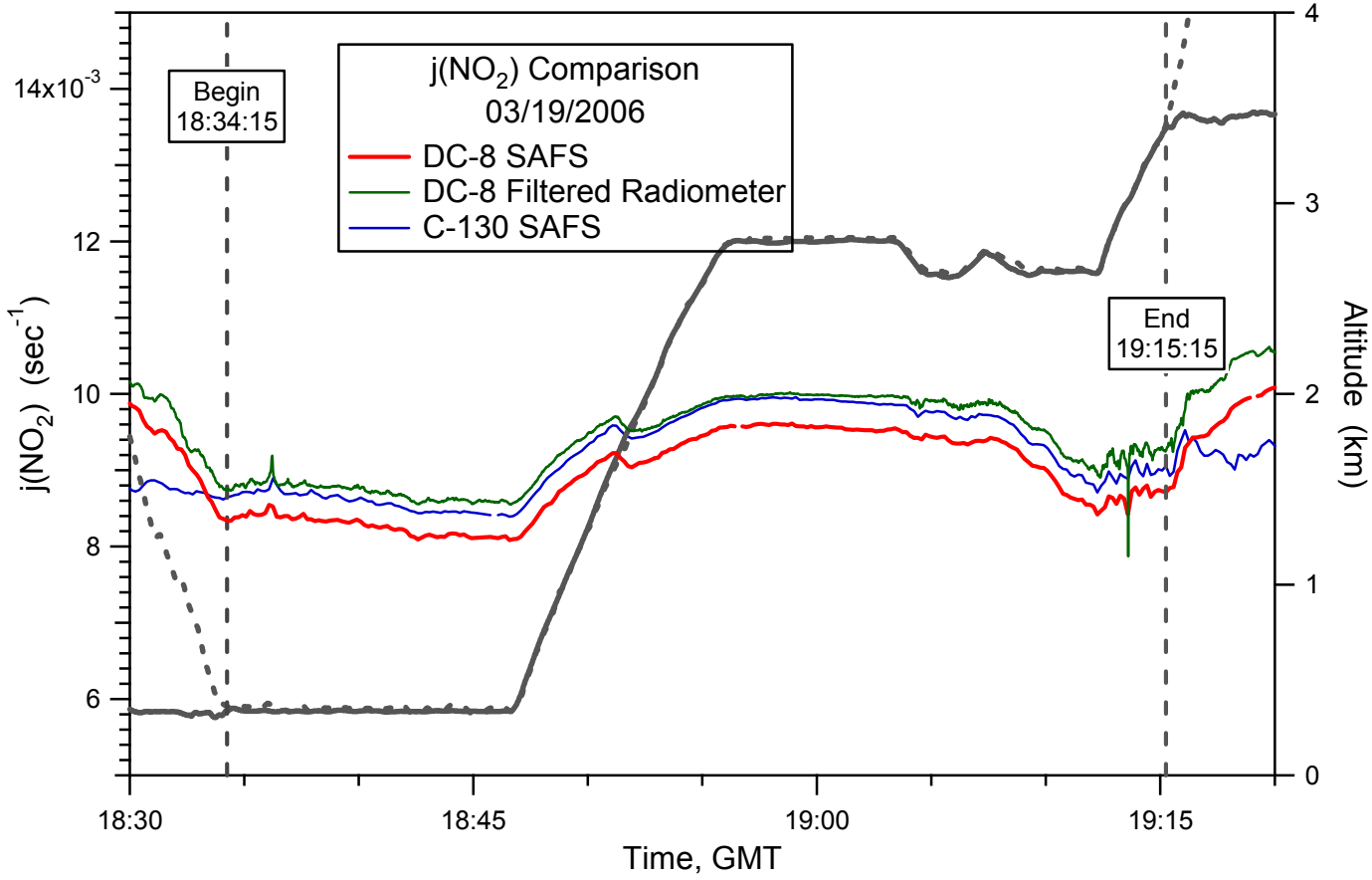

1:1
OH Comparison
March 19, 2006
DC-8 OH (molec. cm-3)
C-130 OH (molec. cm-3)
0
2
4
6
8x10^6

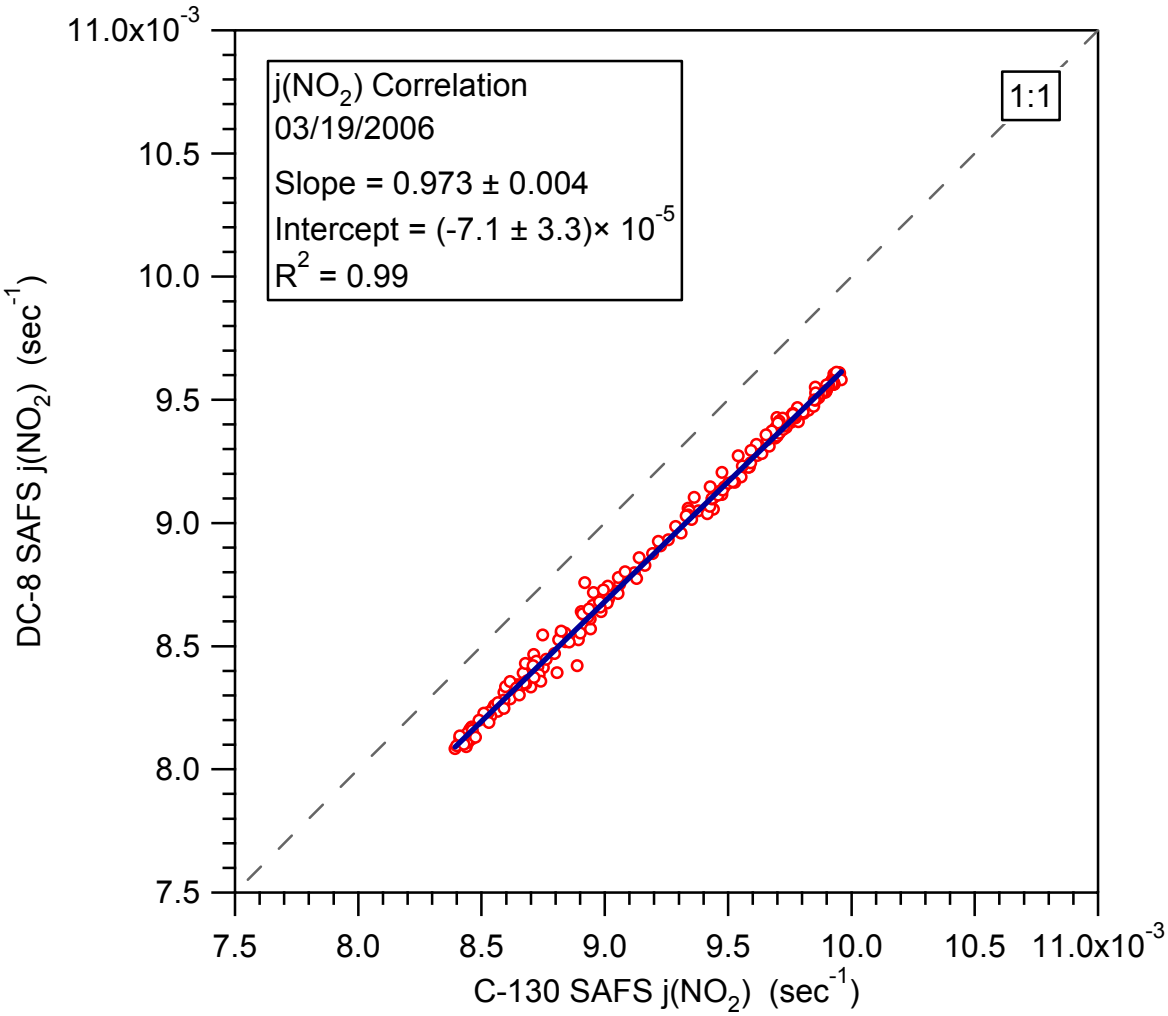

SO2 Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
SO2 (ppbv)
Altitude (km)
Time, GMT
18:30
18:45
19:00
19:15
12
10
8
6
4
2
4
3
2
1
0

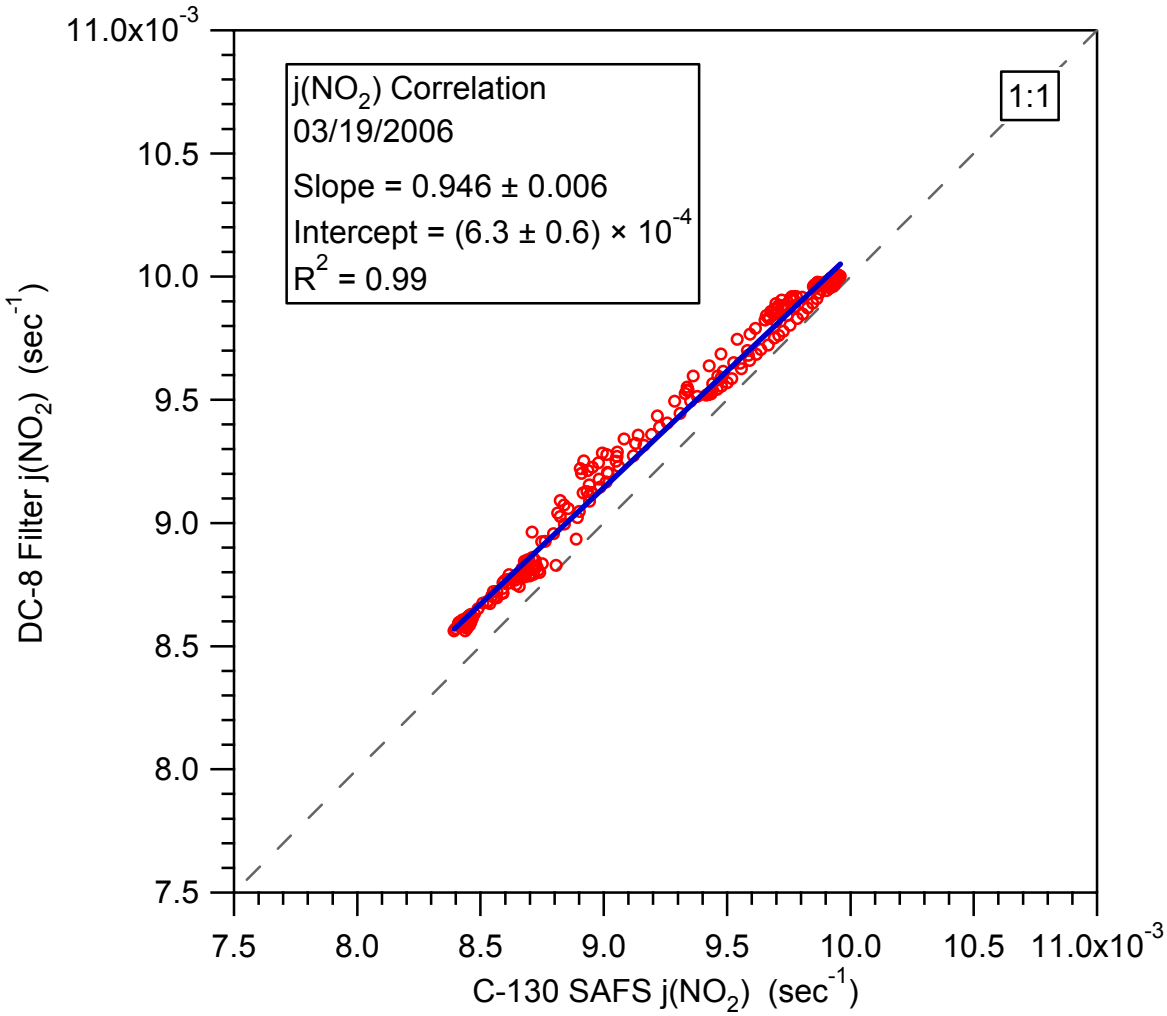

SO2 Comparison
March 19, 2006
Slope = 0.74 ± 0.01
Intercept = -0.13 ± 0.03
R2 = 0.89
1:1
DC-8 SO2 (pptv)
C-130 SO2 (pptv)
20
15
10
5
0
0
5
10
15
20

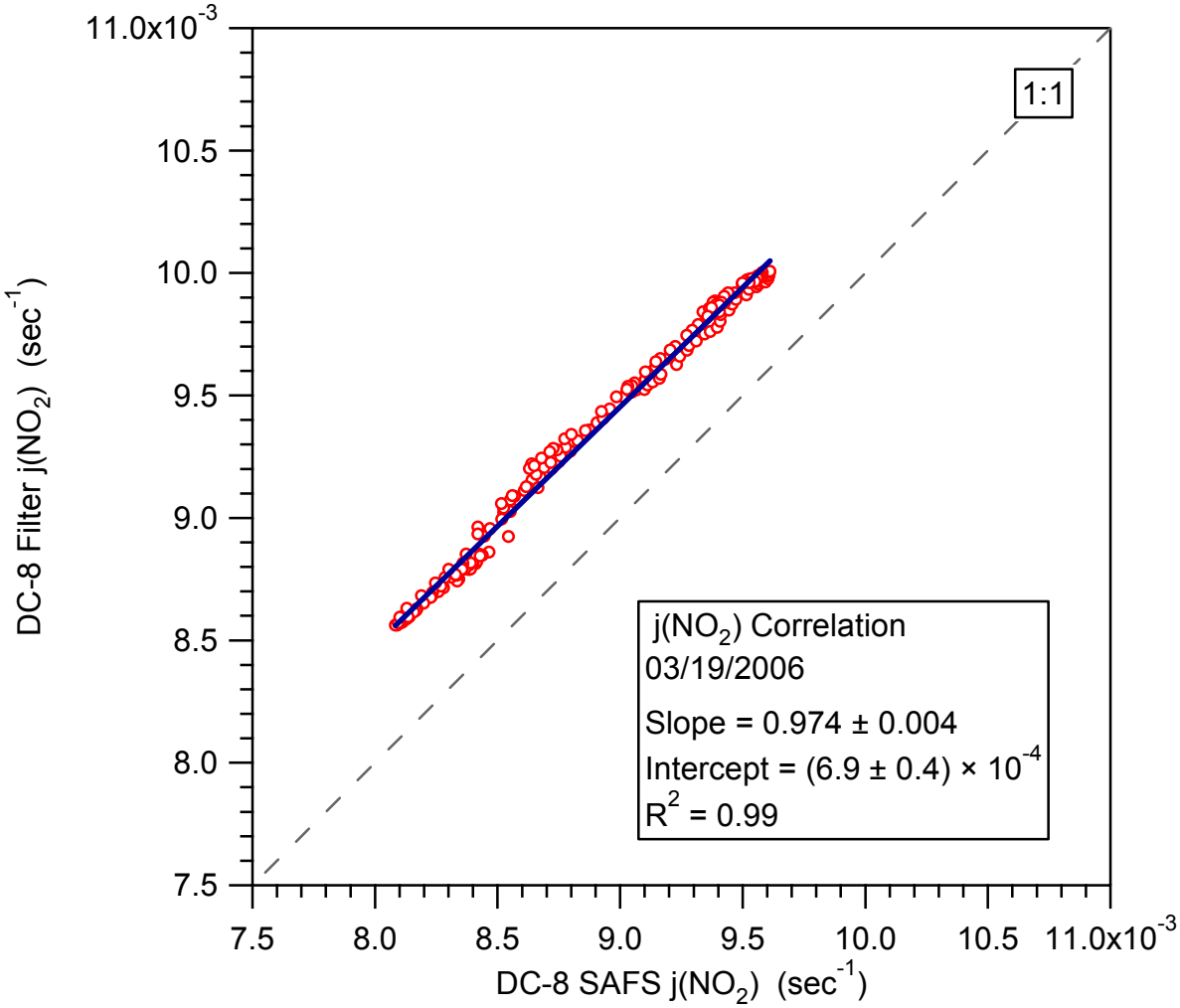

j(O1D) Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
80x10-6
70
60
50
40
30
20
j(O1D) (sec-1)
4
3
2
1
0
Altitude (km)
18:30
18:45
19:00
19:15
Time, GMT

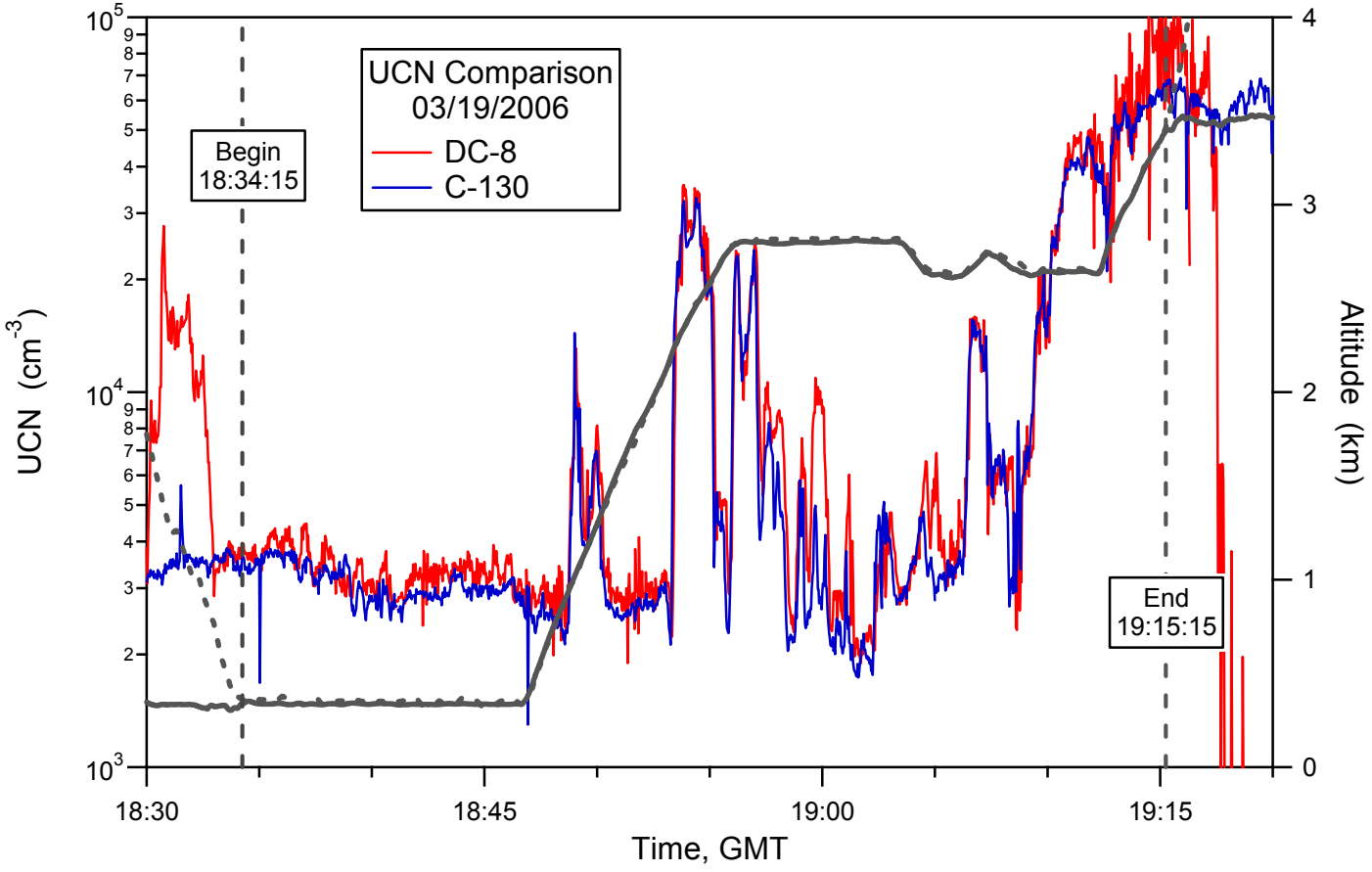

j(O1D) Comparison
March 19, 2006
Slope = 0.997 ± 0.005
Intercept = (2.8 ± 2.8) × 10-7
R2 = 0.99
1:1
70x10-6
65
60
55
50
45
40
35
35
40
45
50
55
60
65
70x10-6
DC-8 SAFS j(O1D) (sec-1)
C-130 SAFS j(O1D) (sec-1)

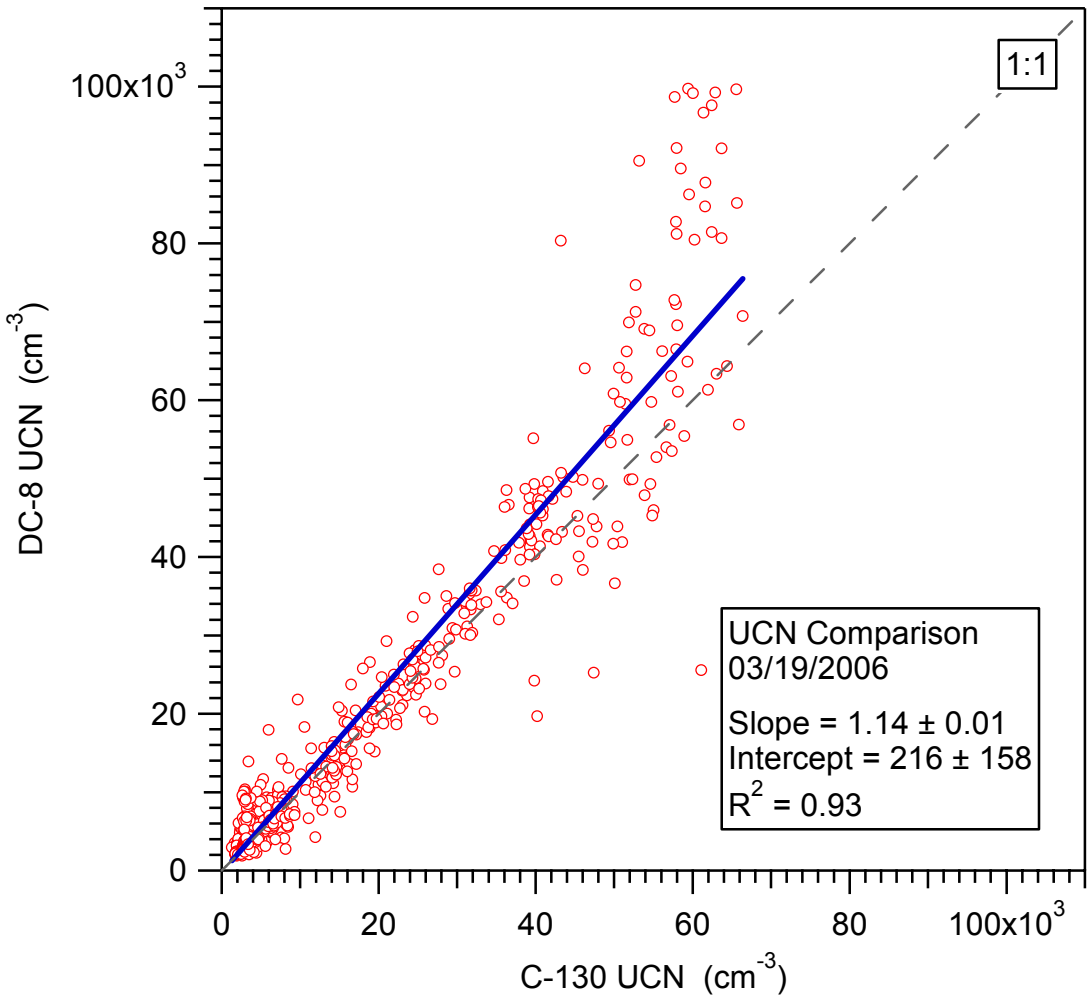

j(NO2) Comparison
03/19/2006
DC-8 SAFS
DC-8 Filtered Radiometer
C-130 SAFS
Begin
18:34:15
End
19:15:15
14x10-3
12
10
8
6
j(NO2) (sec-1)
4
3
2
1
0
Altitude (km)
18:30
18:45
19:00
19:15
Time, GMT

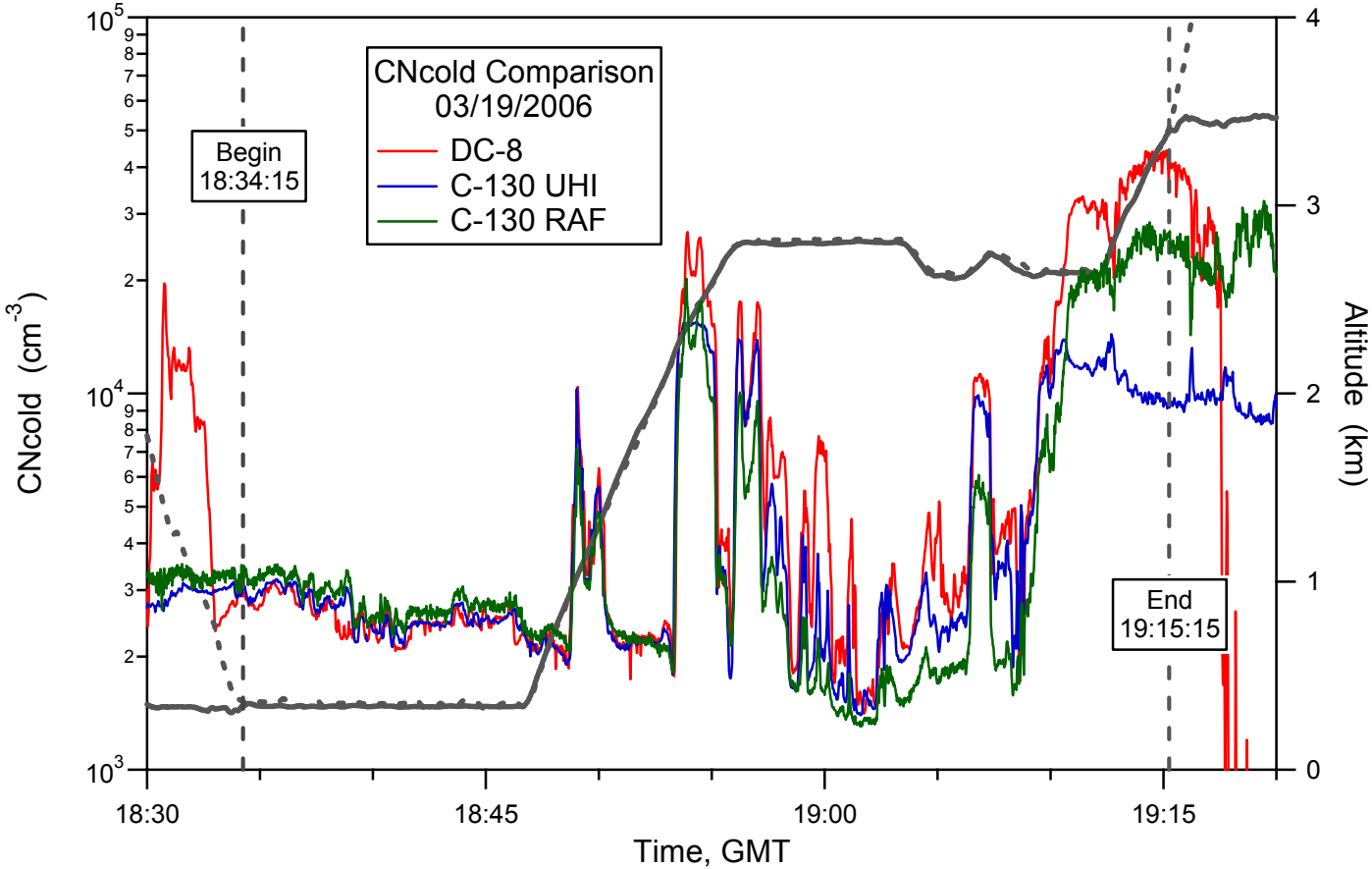

j(NO2) Correlation
03/19/2006
Slope = 0.973 ± 0.004
Intercept = (-7.1 ± 3.3)× 10-5
R2 = 0.99
1:1
11.0x10-3
10.5
10.0
9.5
9.0
8.5
8.0
7.5
DC-8 SAFS j(NO2) (sec-1)
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0x10-3
C-130 SAFS j(NO2) (sec-1)


j(NO2) Correlation
03/19/2006
Slope = 0.946 ± 0.006
Intercept = (6.3 ± 0.6) × 10-4
R2 = 0.99
1:1
11.0x10-3
10.5
10.0
9.5
9.0
8.5
8.0
7.5
DC-8 Filter j(NO2) (sec-1)
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0x10-3
C-130 SAFS j(NO2) (sec-1)

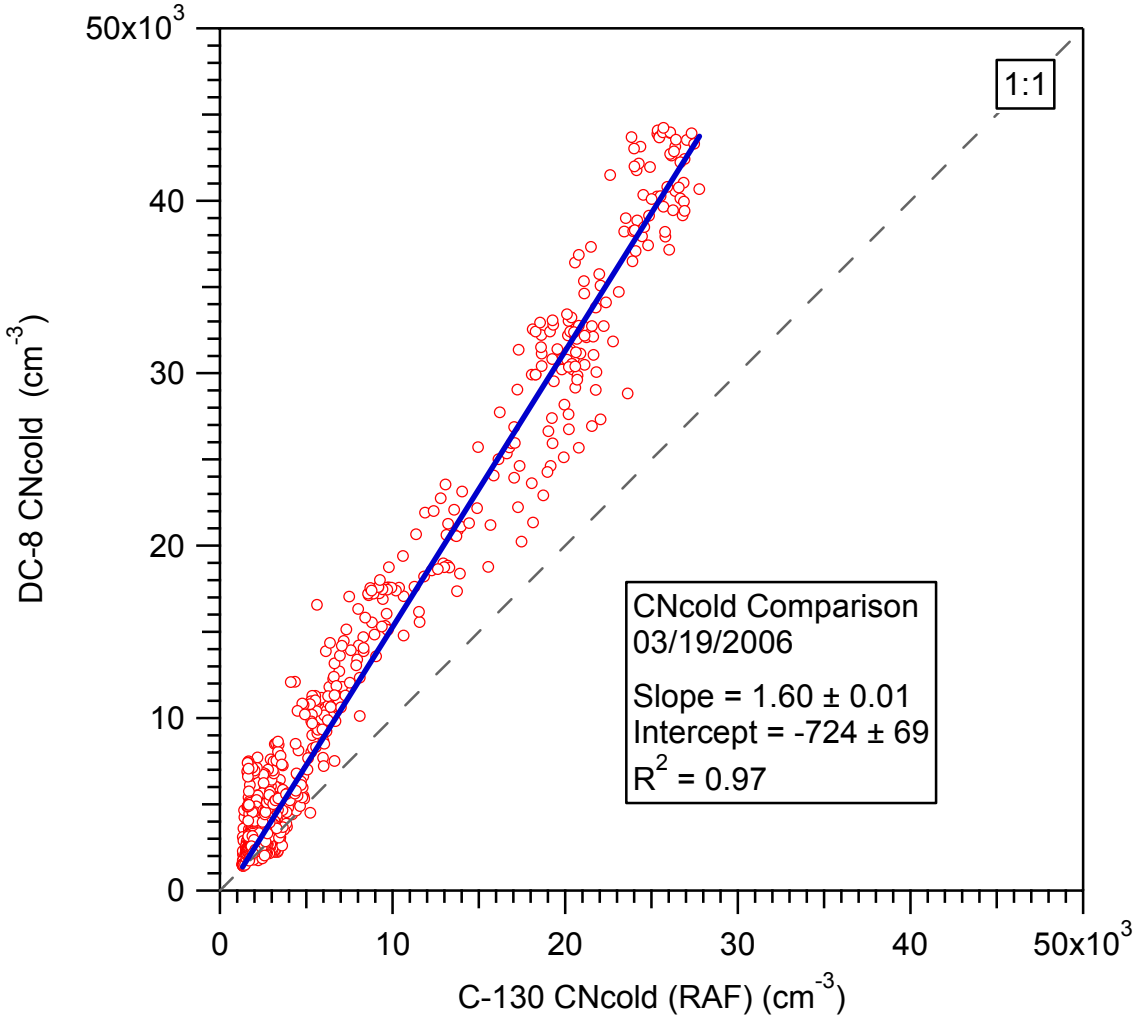

11.0x10^-3
10.5
10.0
9.5
9.0
8.5
8.0
7.5
DC-8 Filter j(NO2) (sec^-1)
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0x10^-3
DC-8 SAFS j(NO2) (sec^-1)
1:1
j(NO2) Correlation
03/19/2006
Slope = 0.974 ± 0.004
Intercept = (6.9 ± 0.4) × 10^-4
R^2 = 0.99

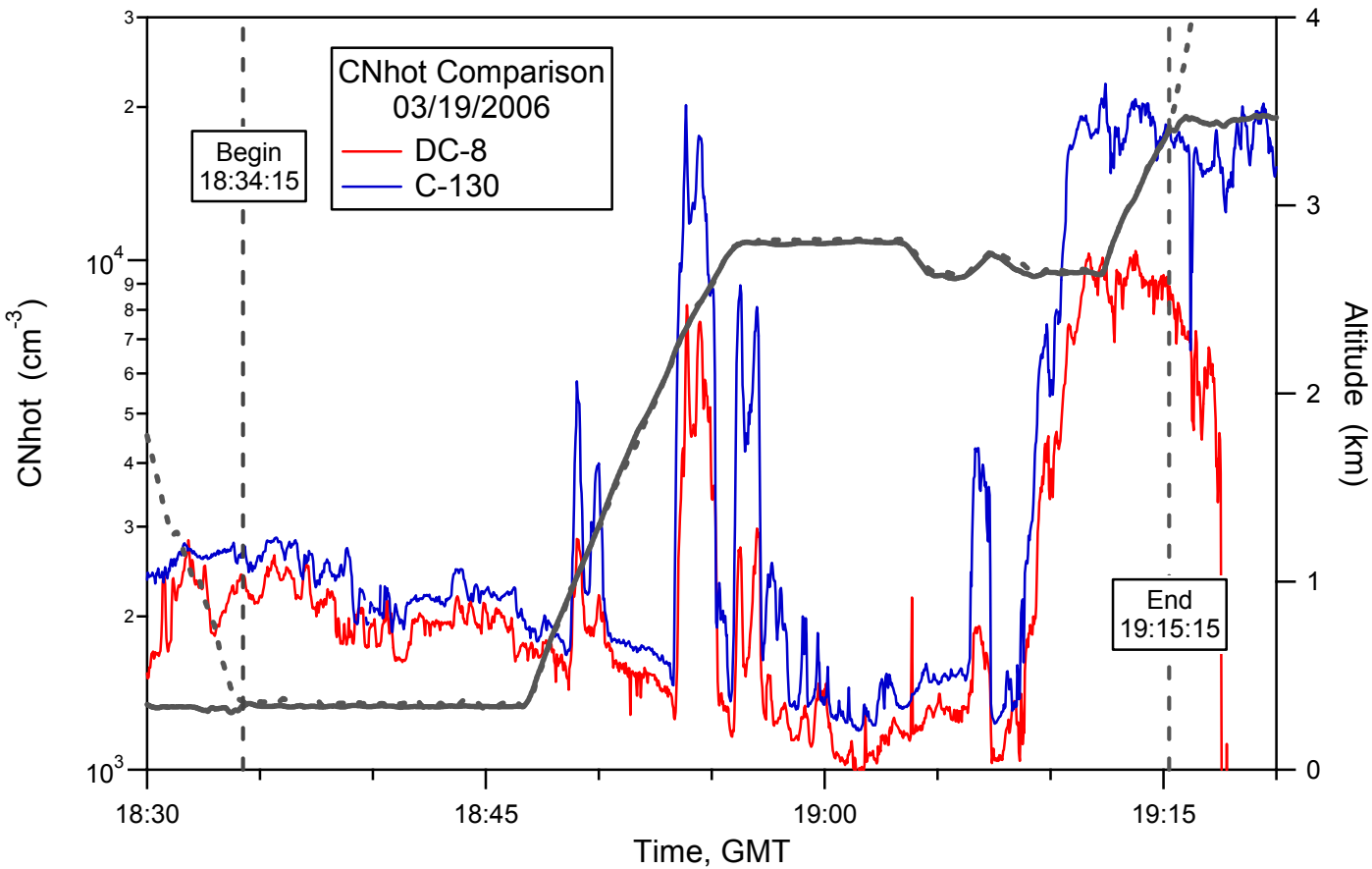

UCN Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
UCN (cm^{-3})
Altitude (km)
Time, GMT
18:30
18:45
19:00
19:15
10^5
10^4
10^3
0
1
2
3
4

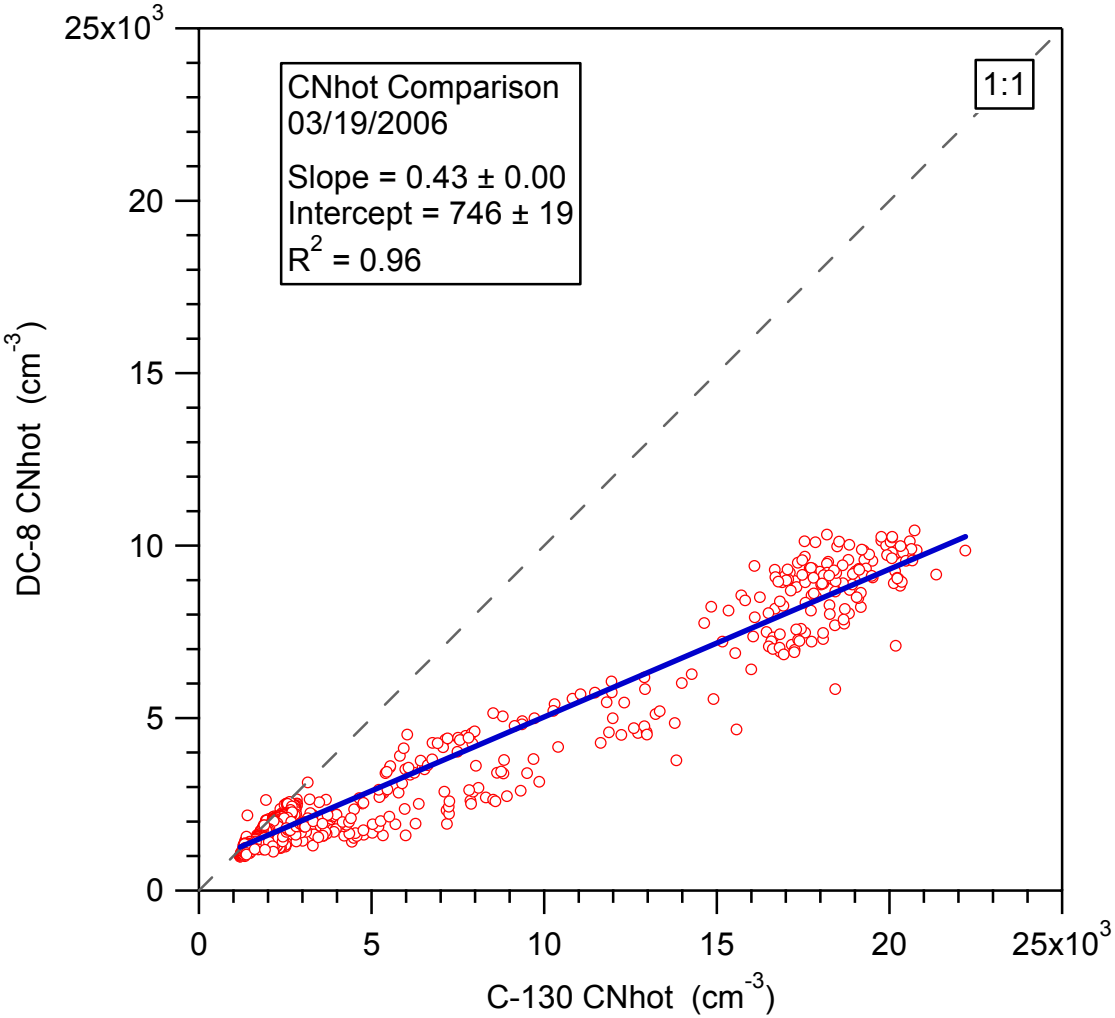

1:1
UCN Comparison
03/19/2006
Slope = 1.14 ± 0.01
Intercept = 216 ± 158
R2 = 0.93
DC-8 UCN (cm-3)
C-130 UCN (cm-3)
0
20
40
60
80
100x103

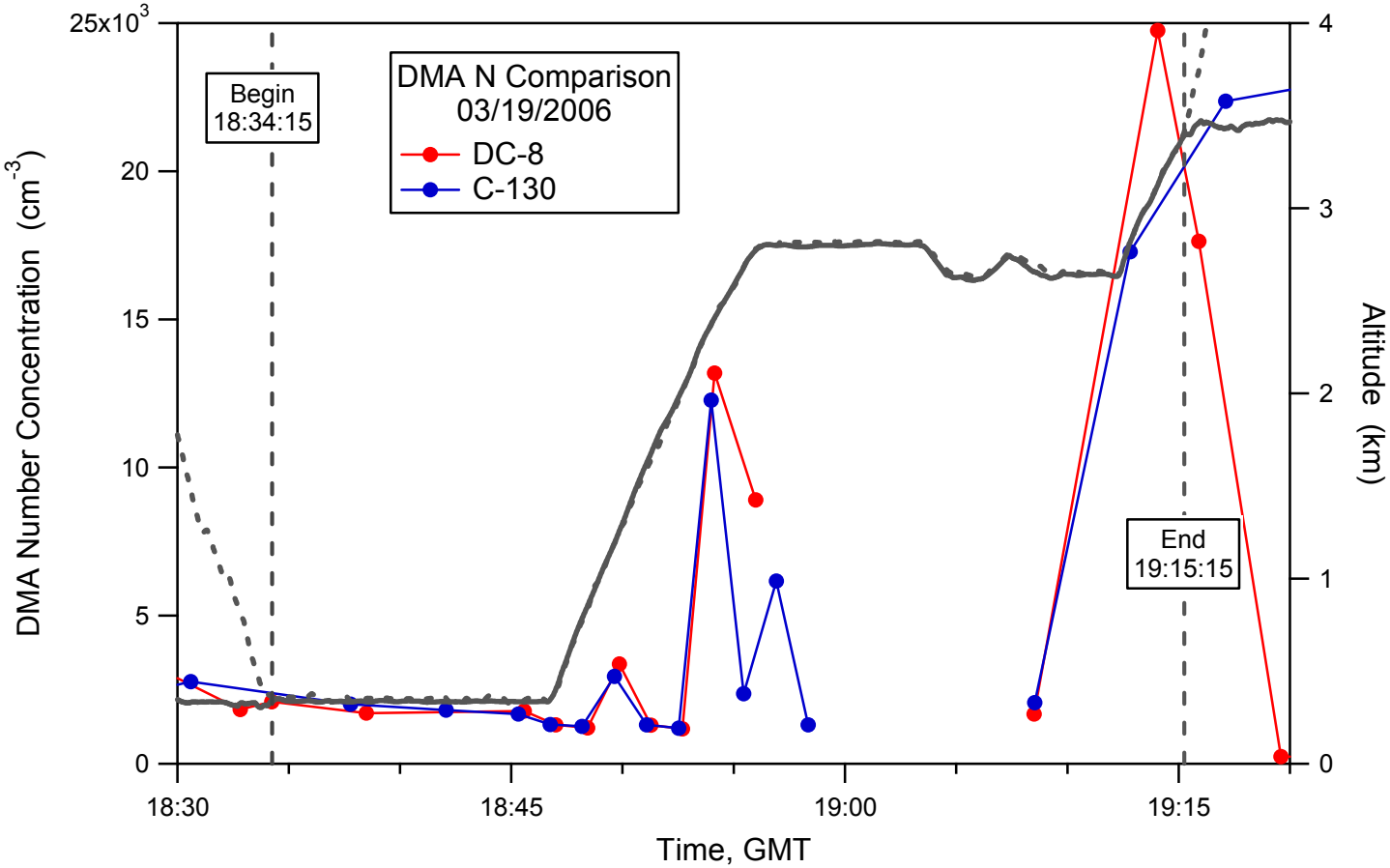


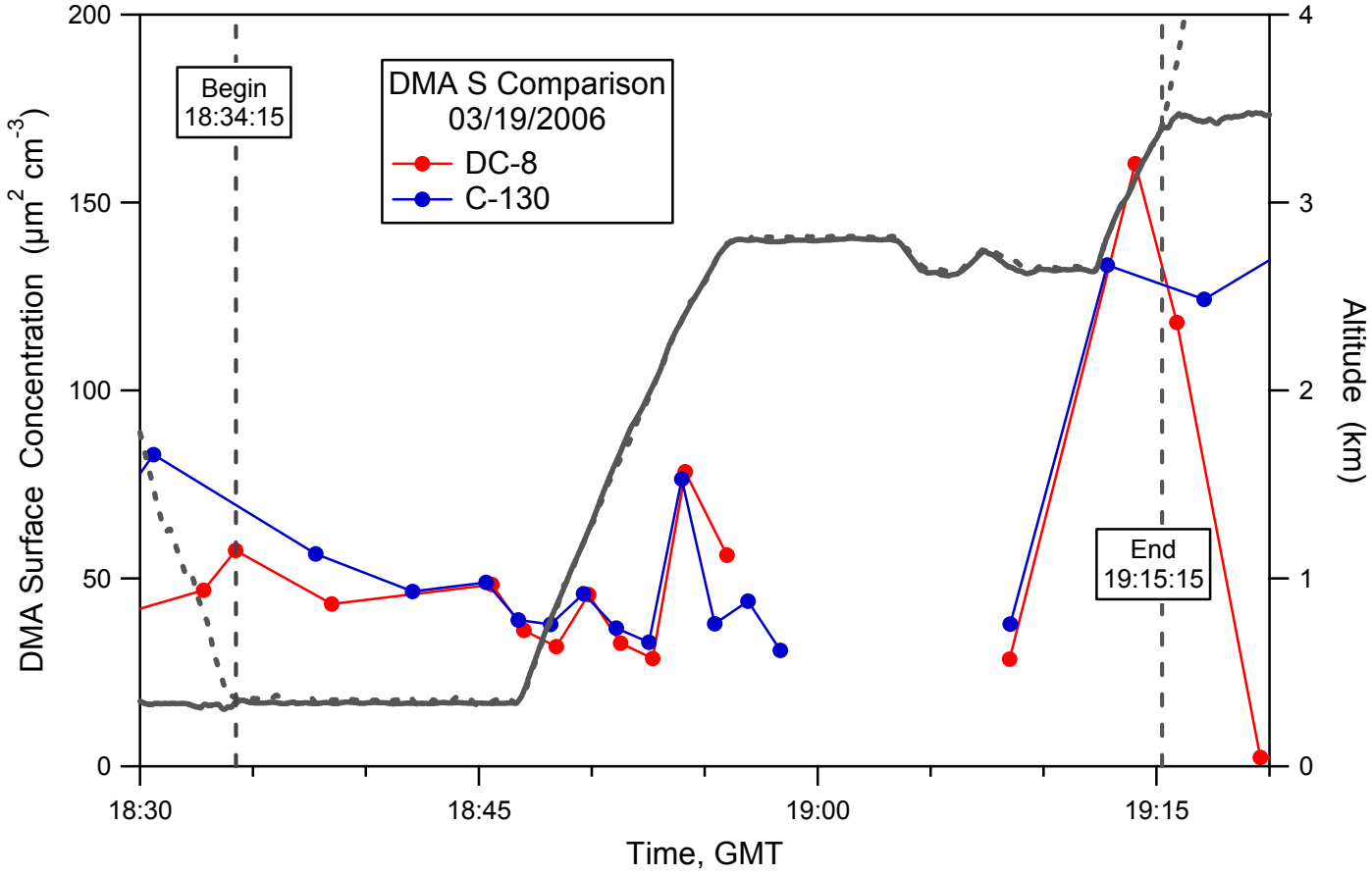
Note: C-130 UHI CN counter was found to have a poor efficiency in detecting small particles

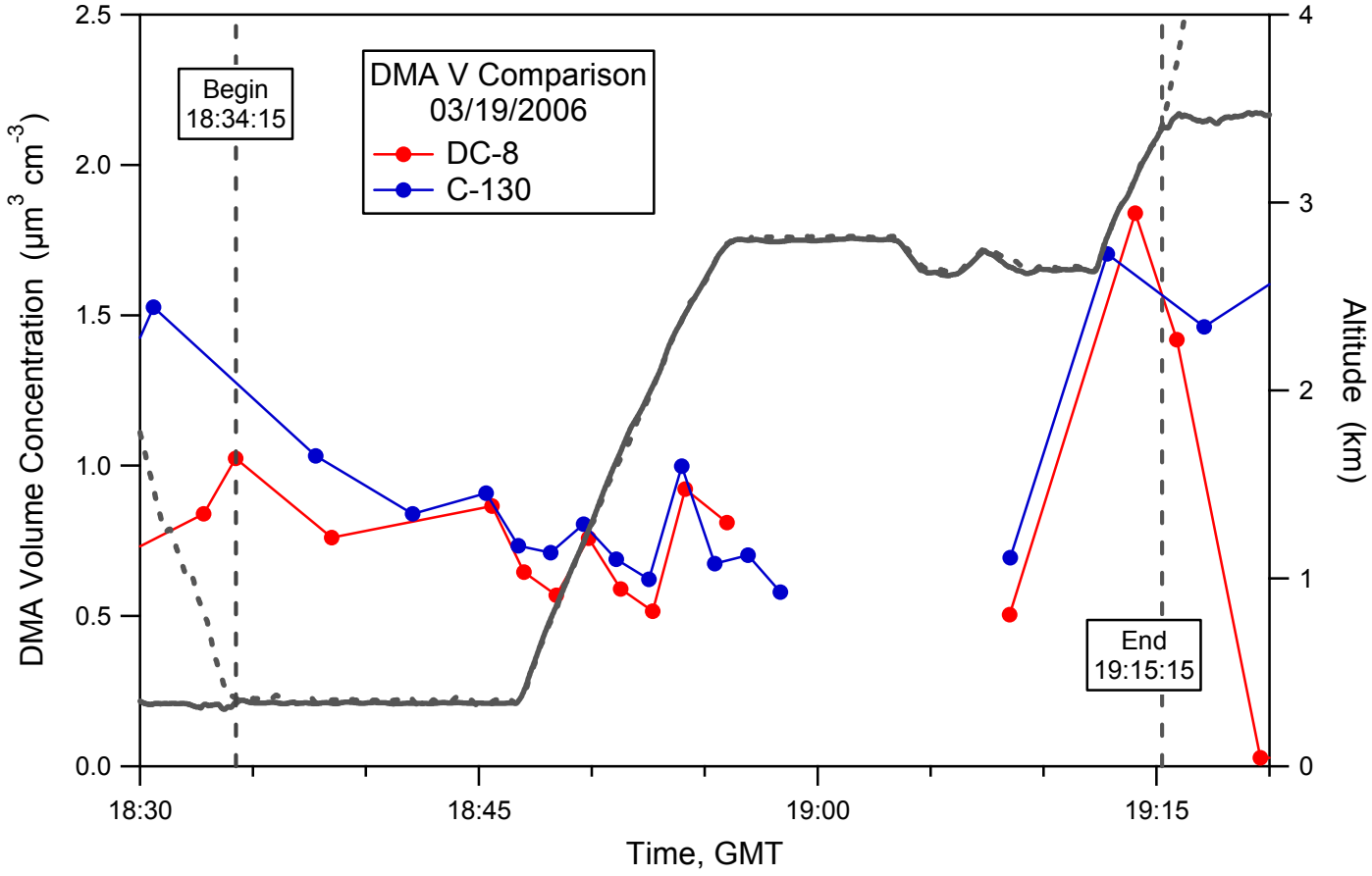

50x10^3
40
30
20
10
0
DC-8 CNcold (cm^-3)
0
10
20
30
40
50x10^3
C-130 CNcold (RAF) (cm^-3)
1:1
CNcold Comparison
03/19/2006
Slope = 1.60 ± 0.01
Intercept = -724 ± 69
R^2 = 0.97

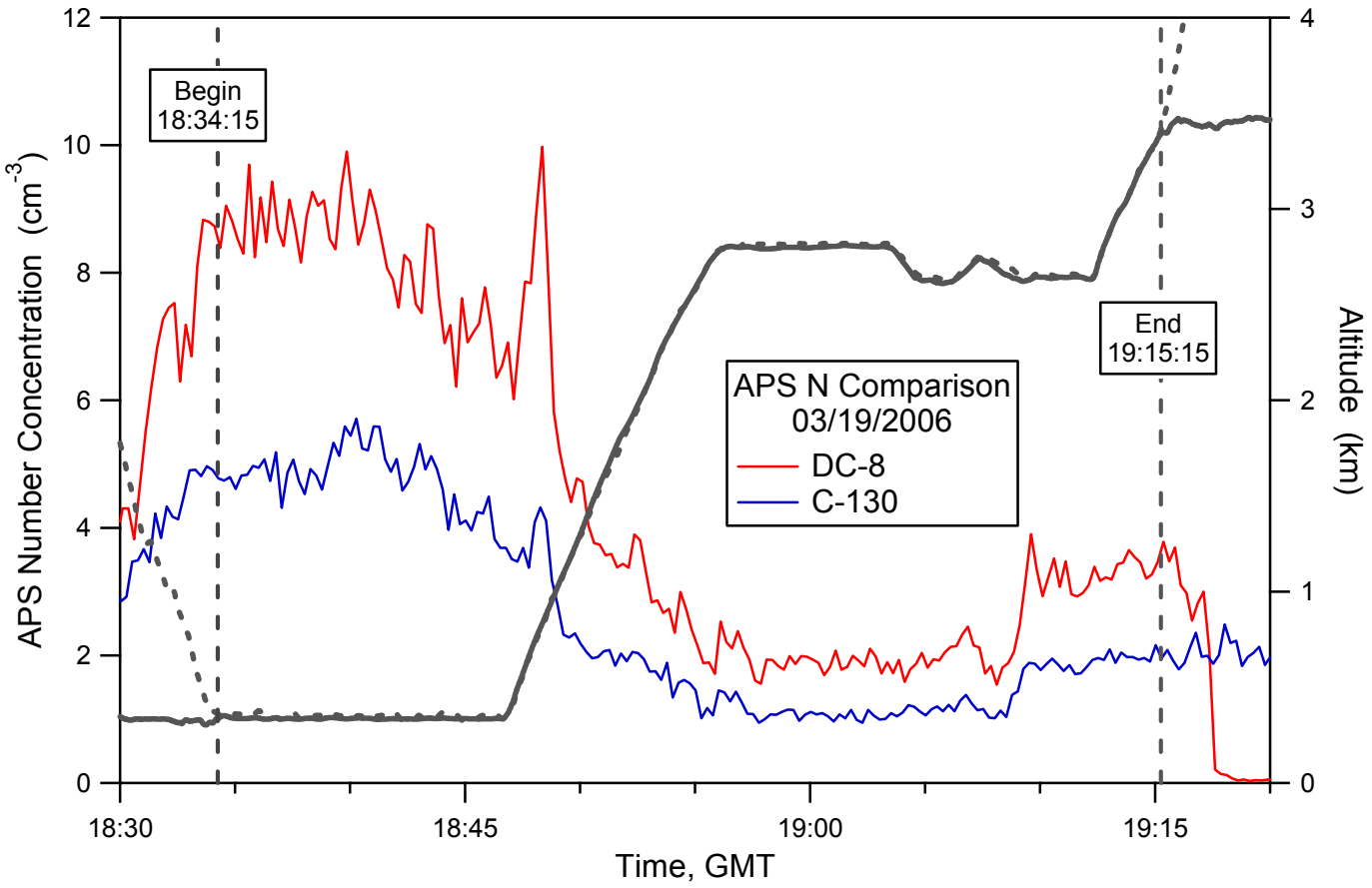

CNhot Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
CNhot (cm-3)
Altitude (km)
Time, GMT
18:30
18:45
19:00
19:15
10^4
10^3
0
1
2
3
4

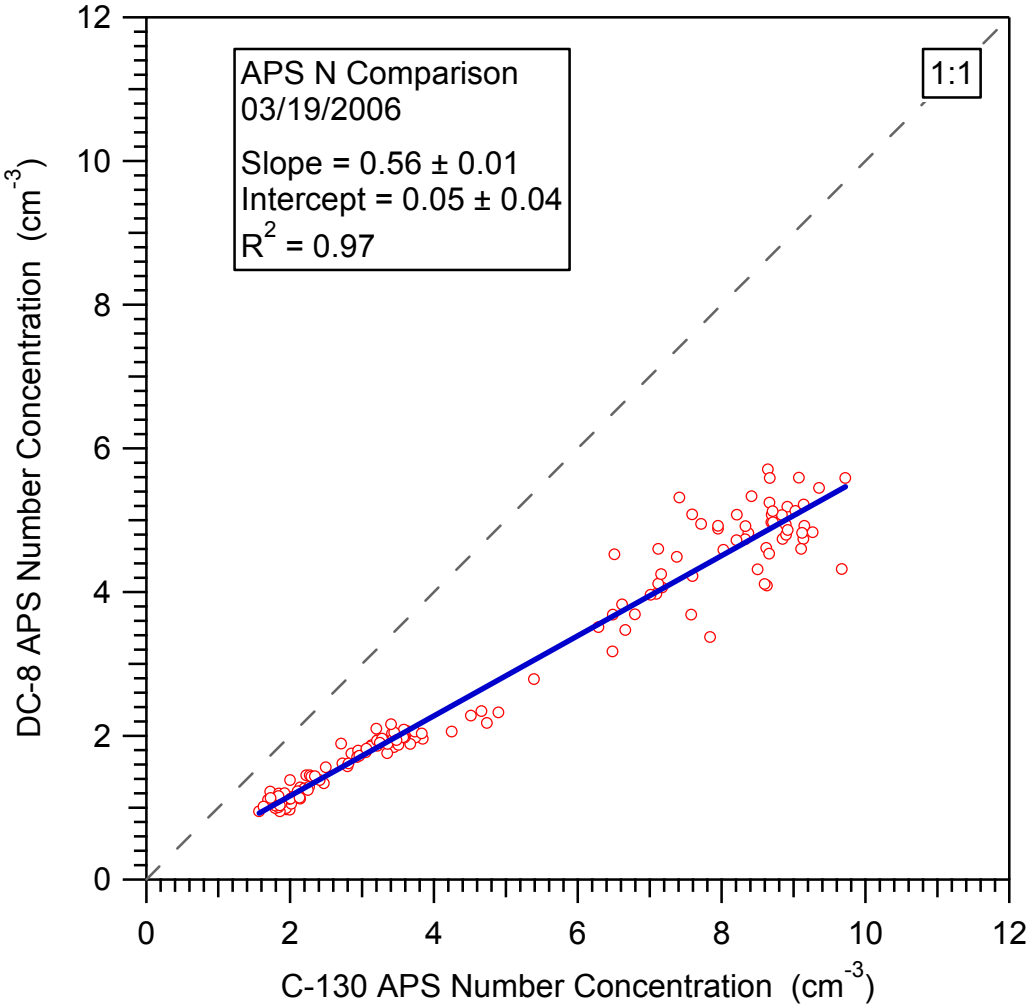

CNhot Comparison
03/19/2006
Slope = 0.43 ± 0.00
Intercept = 746 ± 19
R2 = 0.96
1:1
DC-8 CNhot (cm-3)
C-130 CNhot (cm-3)
0
5
10
15
20
25x103

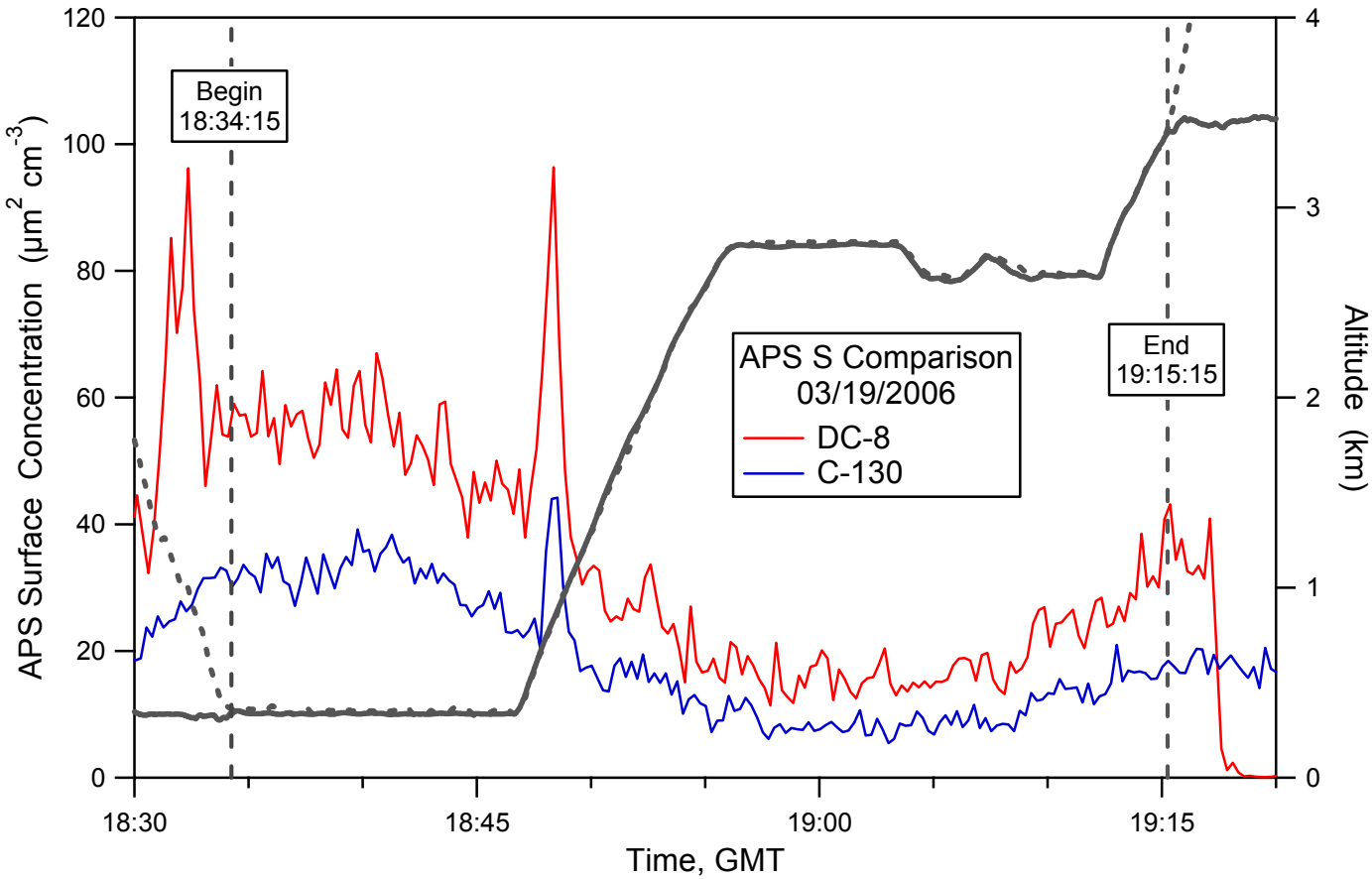

DMA N Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
DMA Number Concentration (cm^{-3})
25x10^3
20
15
10
5
0
Altitude (km)
4
3
2
1
0
18:30
18:45
19:00
19:15
Time, GMT

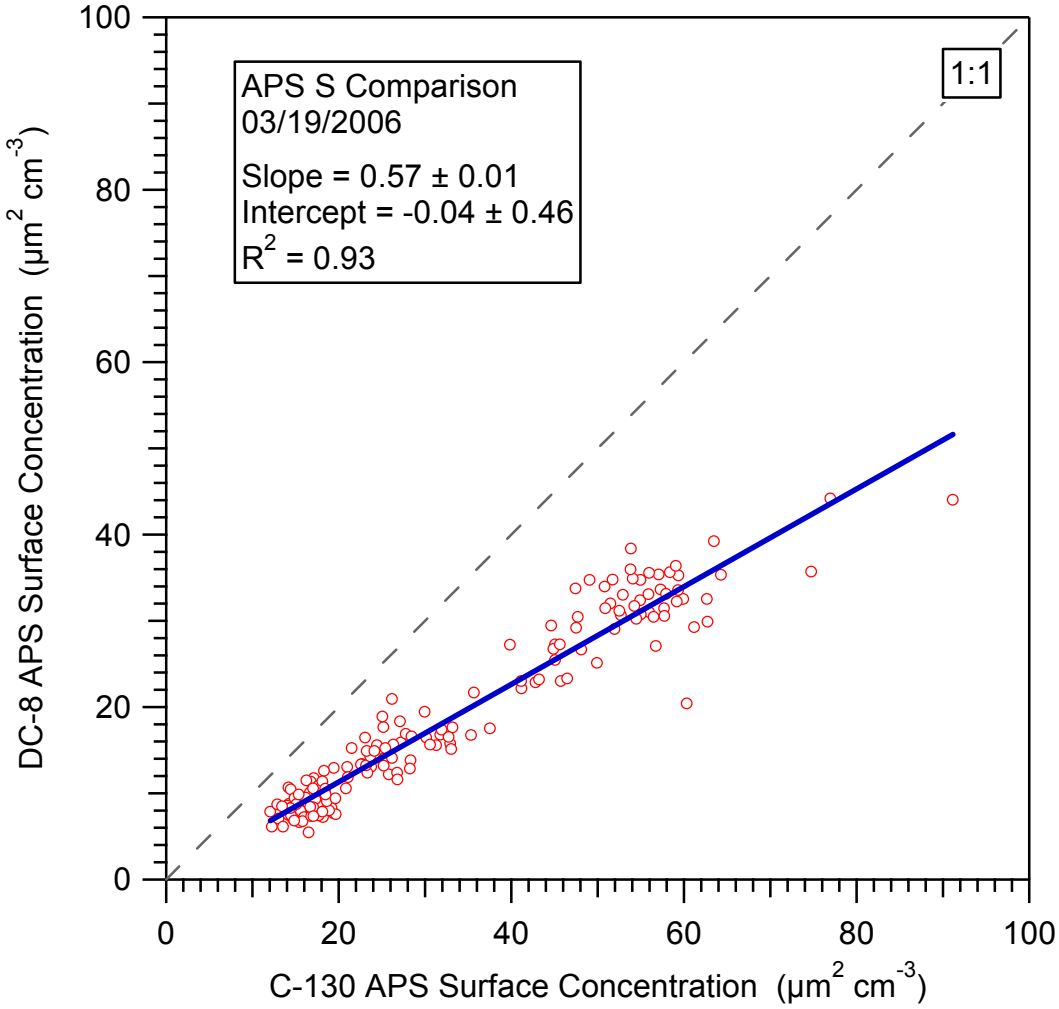

DMA S Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
DMA Surface Concentration (μm^2 cm^{-3})
Altitude (km)
Time, GMT
200
150
100
50
0
4
3
2
1
0
18:30
18:45
19:00
19:15

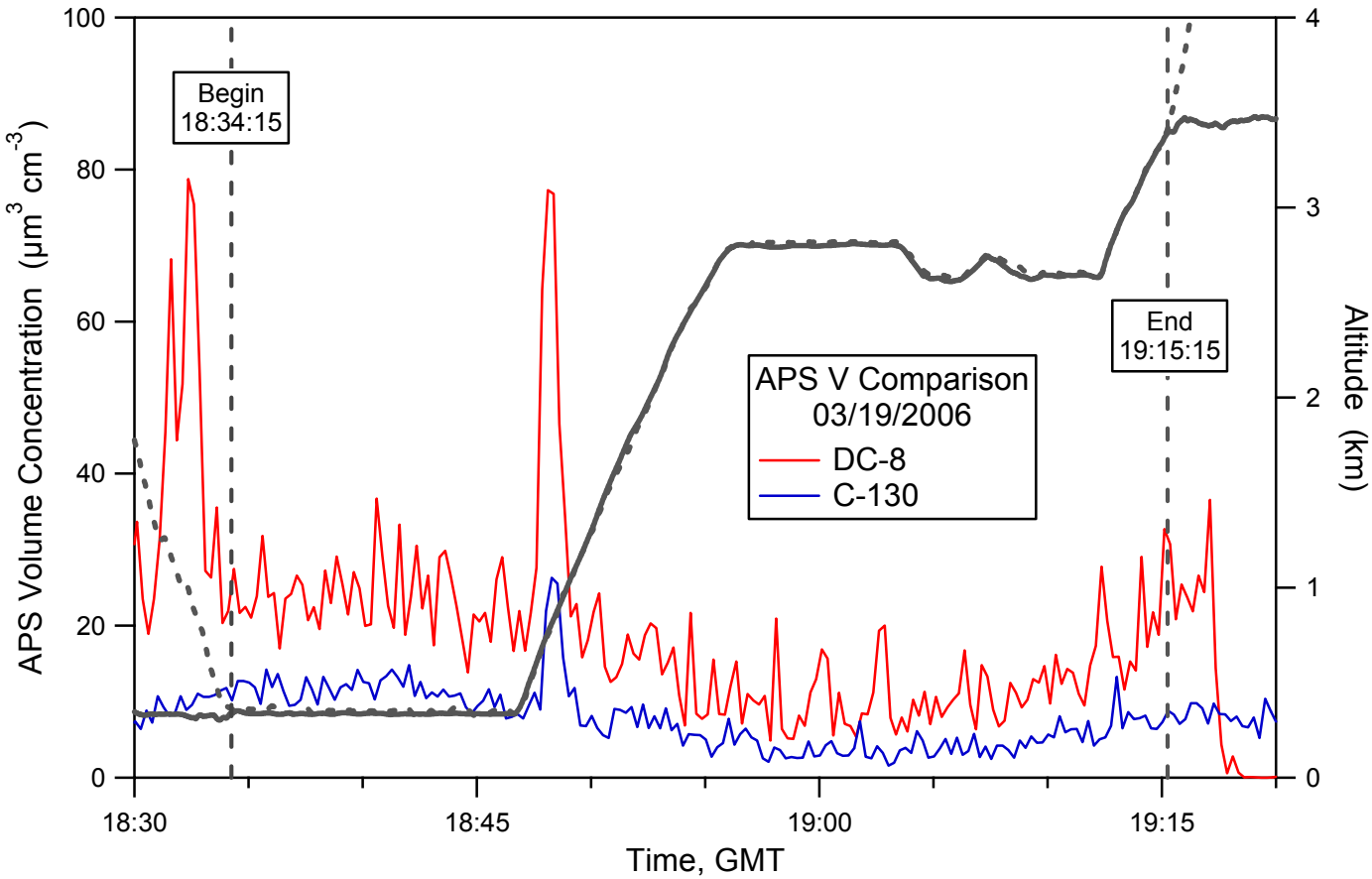

DMA V Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
DMA Volume Concentration (μm3 cm-3)
Altitude (km)
Time, GMT
2.5
2.0
1.5
1.0
0.5
0.0
4
3
2
1
0
18:30
18:45
19:00
19:15

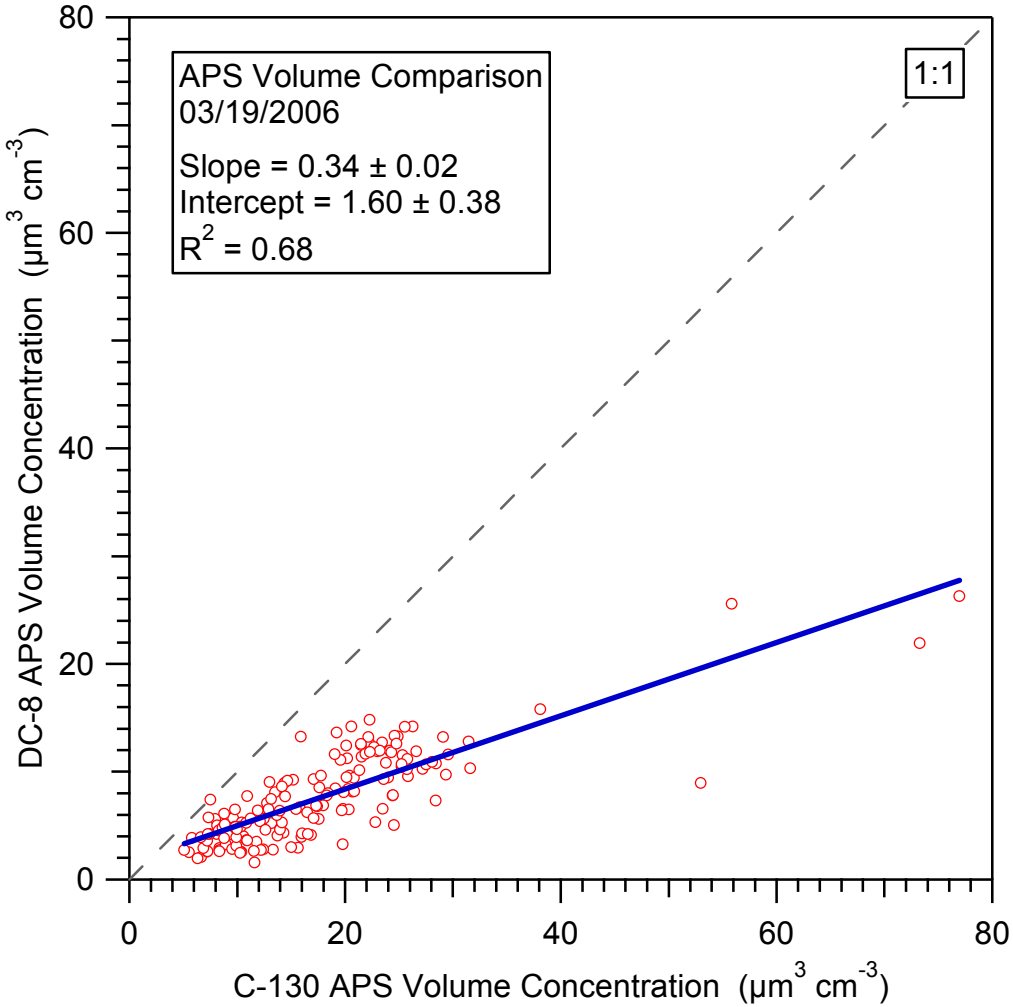

APS N Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
APS Number Concentration (cm^{-3})
Altitude (km)
Time, GMT
18:30
18:45
19:00
19:15
0
2
4
6
8
10
12
0
1
2
3
4

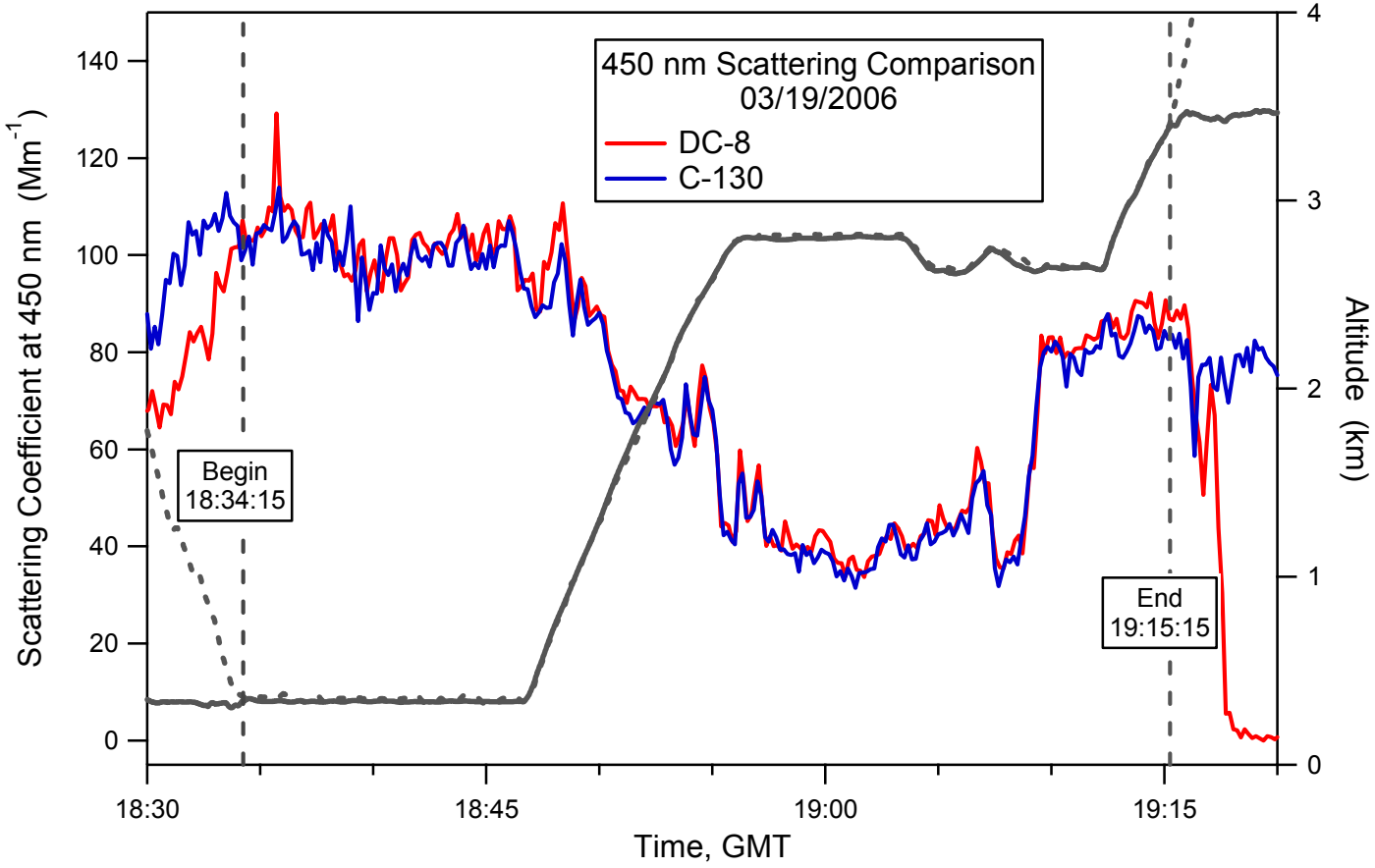

APS N Comparison
03/19/2006
Slope = 0.56 ± 0.01
Intercept = 0.05 ± 0.04
R2 = 0.97
1:1
DC-8 APS Number Concentration (cm-3)
C-130 APS Number Concentration (cm-3)
0
2
4
6
8
10
12

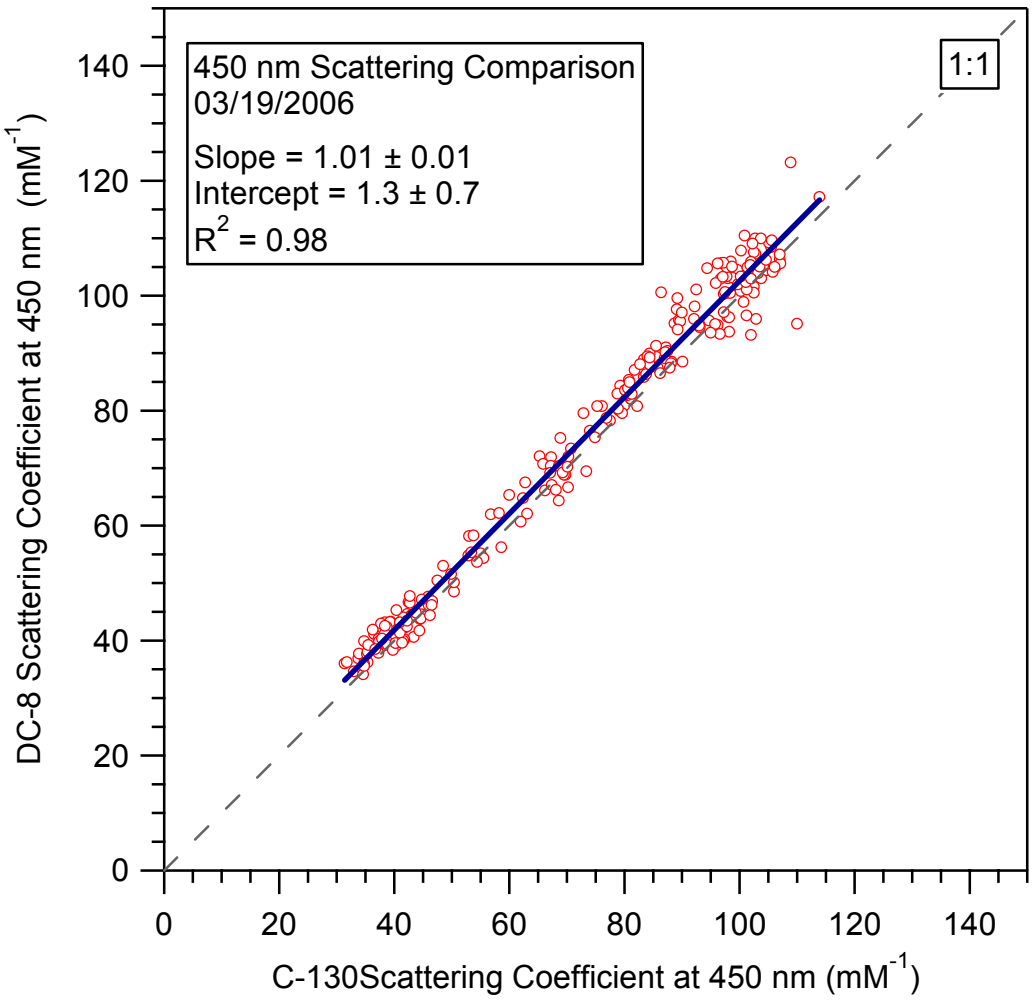

APS S Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
APS Surface Concentration (μm² cm⁻³)
Altitude (km)
Time, GMT
120
100
80
60
40
20
0
4
3
2
1
0
18:30
18:45
19:00
19:15

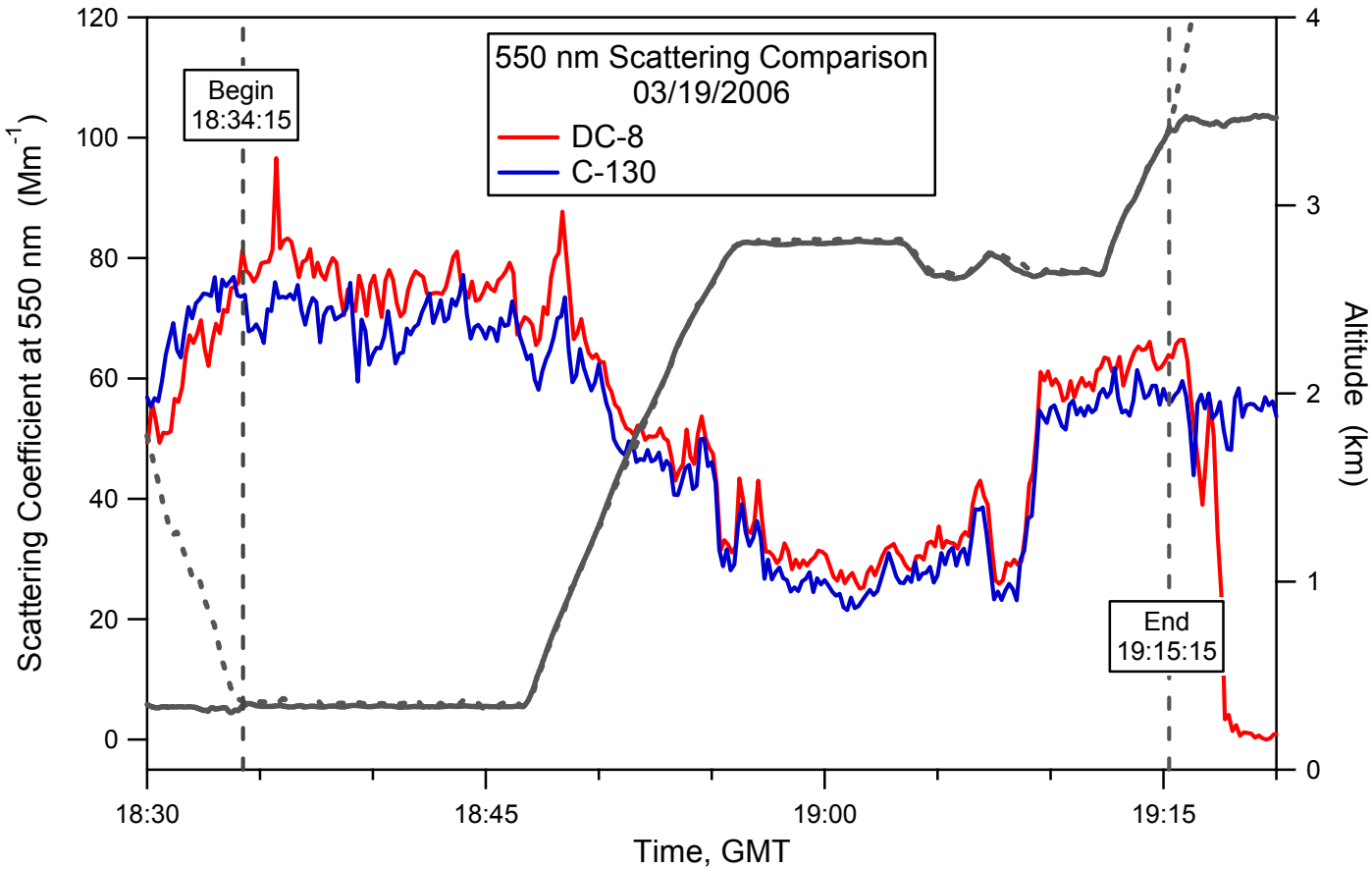

APS S Comparison
03/19/2006
Slope = 0.57 ± 0.01
Intercept = -0.04 ± 0.46
R2 = 0.93
1:1
DC-8 APS Surface Concentration (μm2 cm-3)
C-130 APS Surface Concentration (μm2 cm-3)
0
20
40
60
80
100

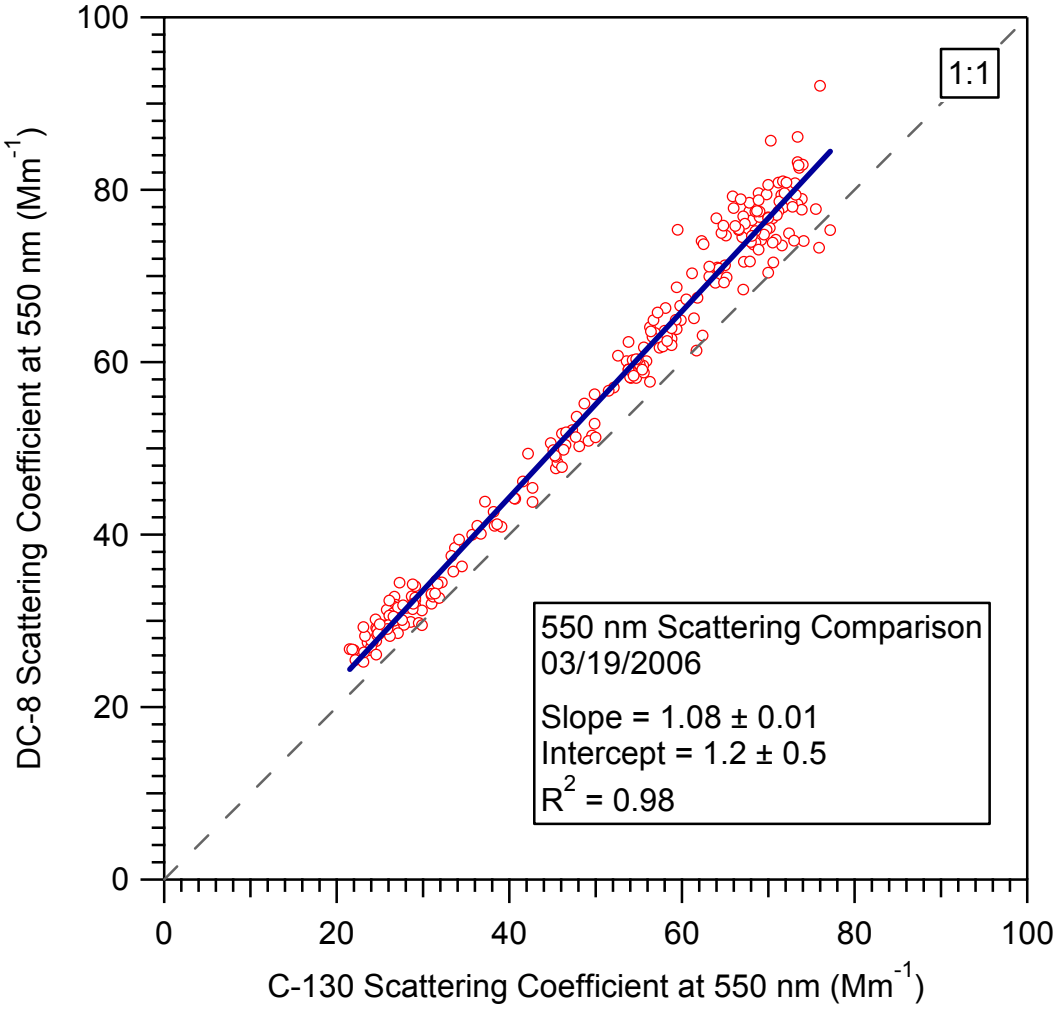

APS V Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
APS Volume Concentration (μm3 cm-3)
Altitude (km)
Time, GMT
100
80
60
40
20
0
4
3
2
1
0
18:30
18:45
19:00
19:15

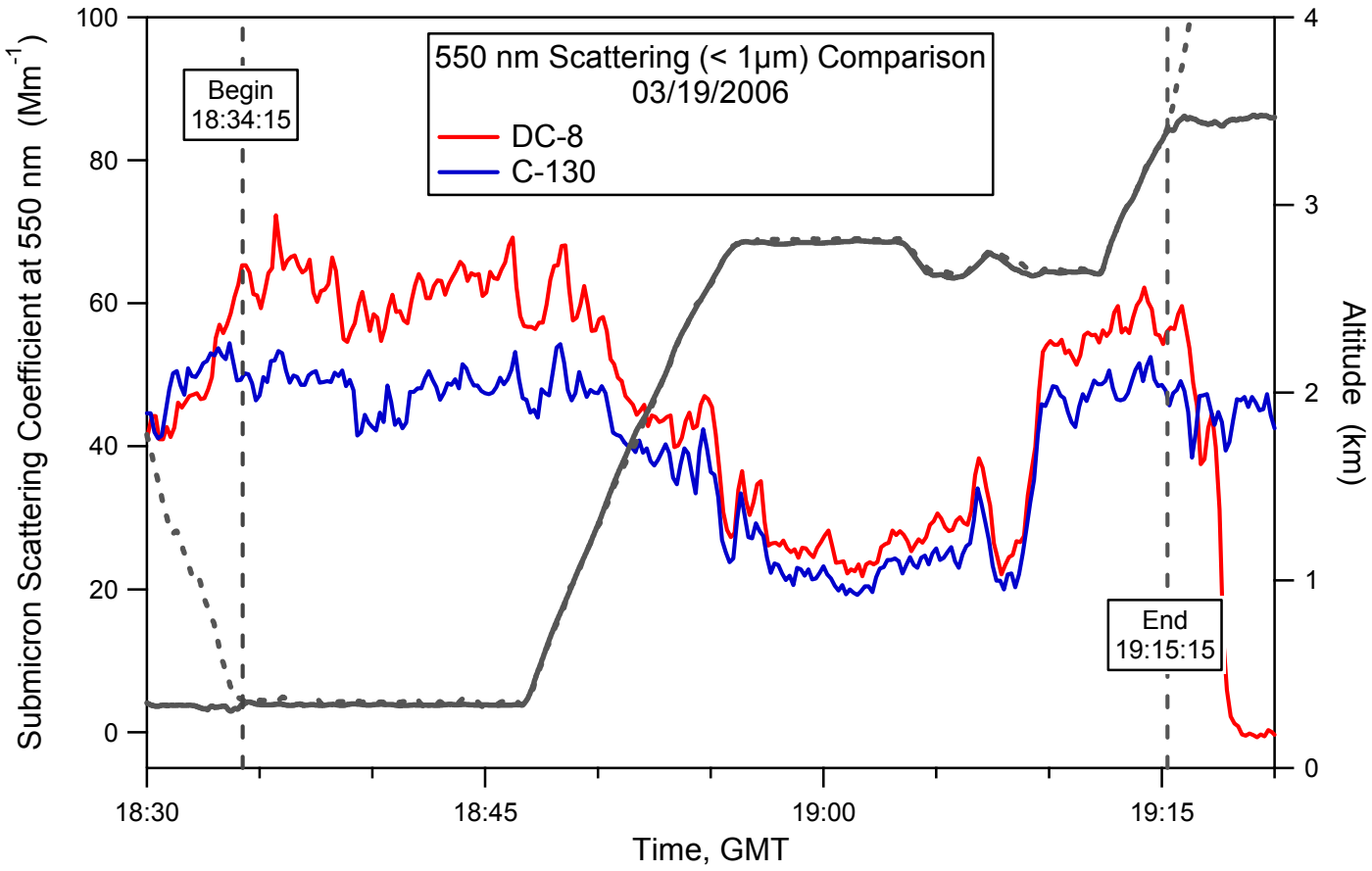

APS Volume Comparison
03/19/2006
Slope = 0.34 ± 0.02
Intercept = 1.60 ± 0.38
R2 = 0.68
1:1
DC-8 APS Volume Concentration (μm3 cm-3)
C-130 APS Volume Concentration (μm3 cm-3)
0
20
40
60
80

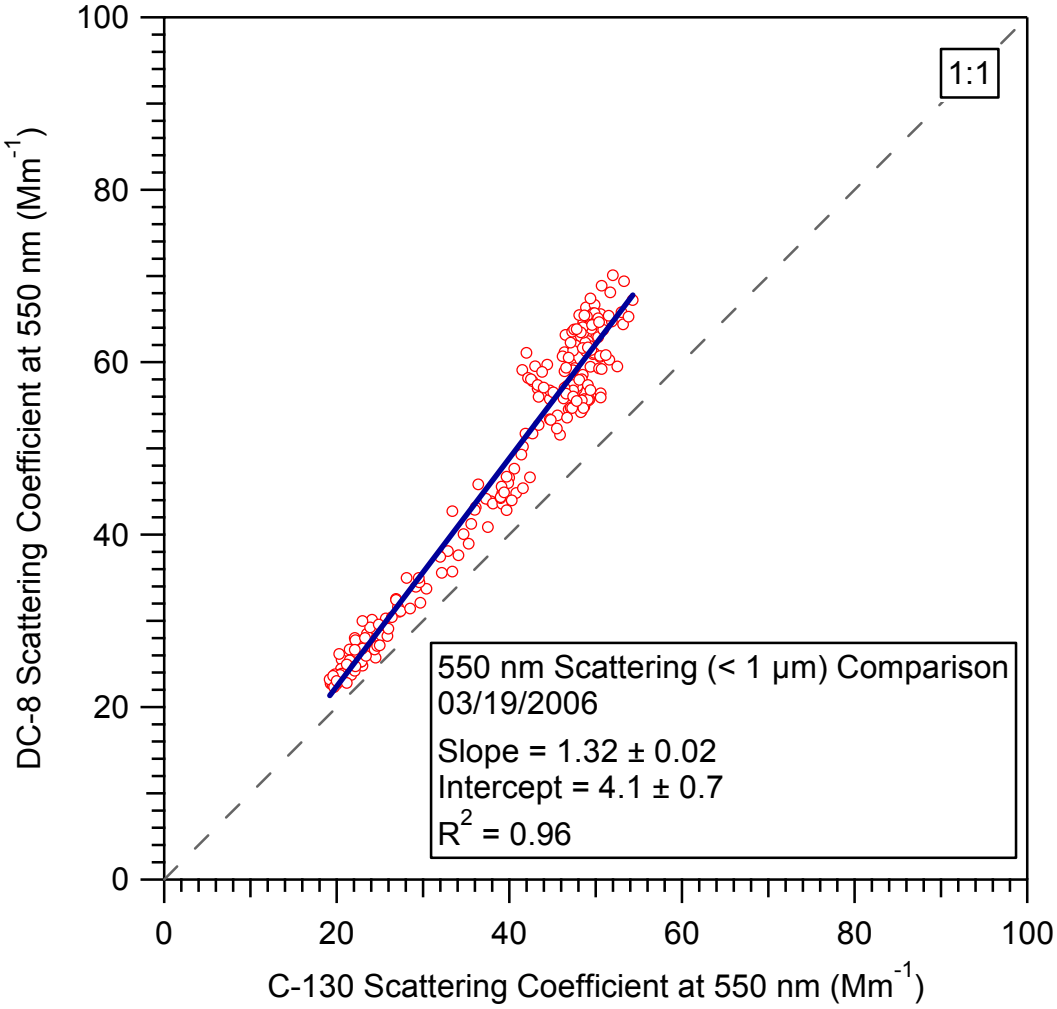

450 nm Scattering Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
Scattering Coefficient at 450 nm (Mm^{-1})
Altitude (km)
Time, GMT
0
20
40
60
80
100
120
140
0
1
2
3
4
18:30
18:45
19:00
19:15

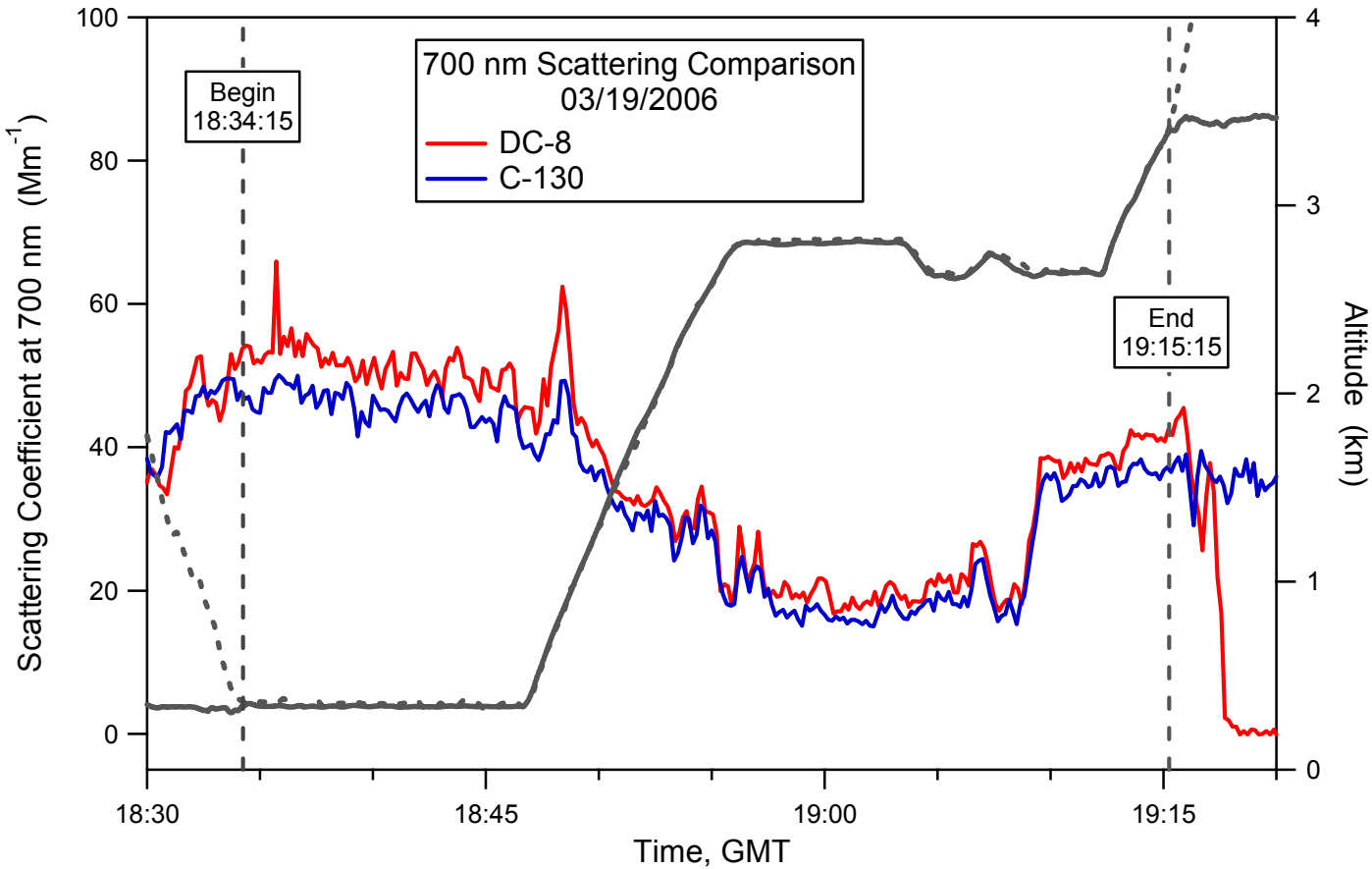

450 nm Scattering Comparison
03/19/2006
Slope = 1.01 ± 0.01
Intercept = 1.3 ± 0.7
R2 = 0.98
1:1
DC-8 Scattering Coefficient at 450 nm (mM-1)
C-130Scattering Coefficient at 450 nm (mM-1)
0
20
40
60
80
100
120
140

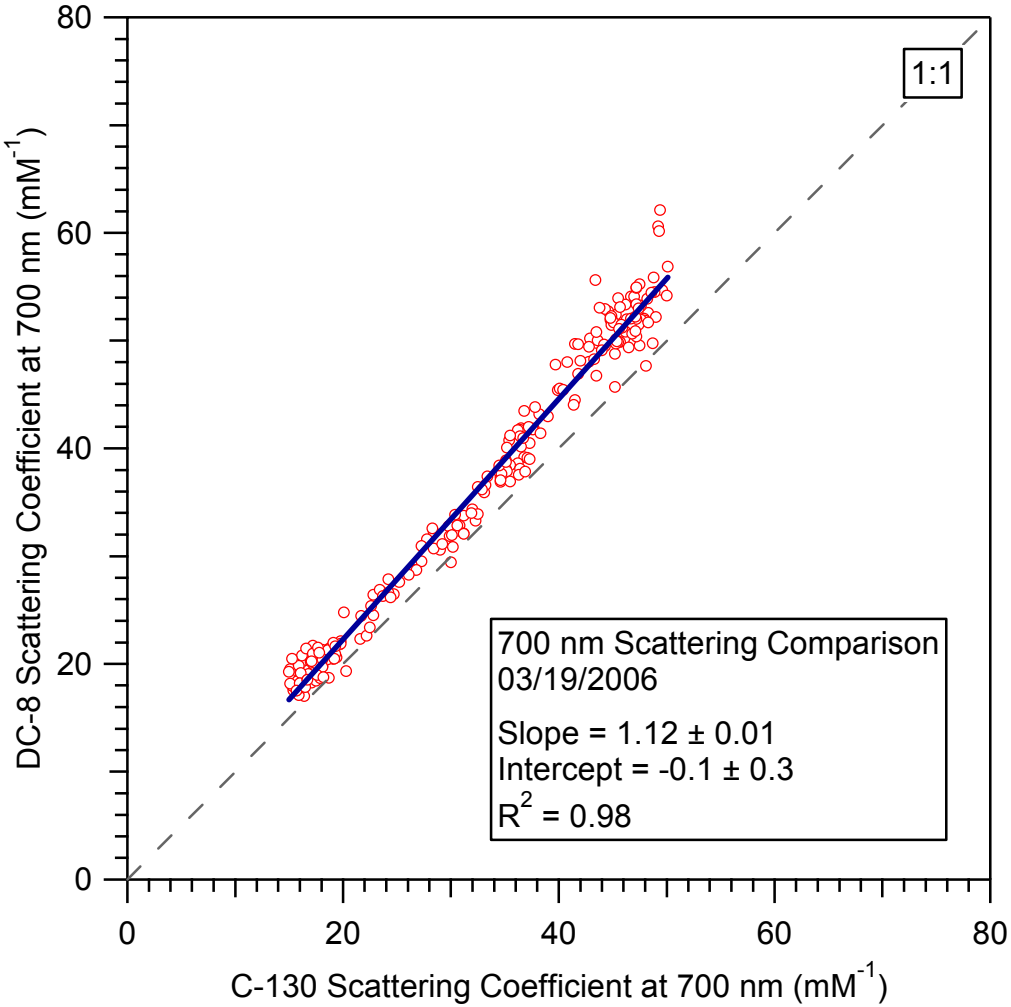

550 nm Scattering Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
Scattering Coefficient at 550 nm (Mm^{-1})
Altitude (km)
Time, GMT
120
100
80
60
40
20
0
4
3
2
1
0
18:30
18:45
19:00
19:15

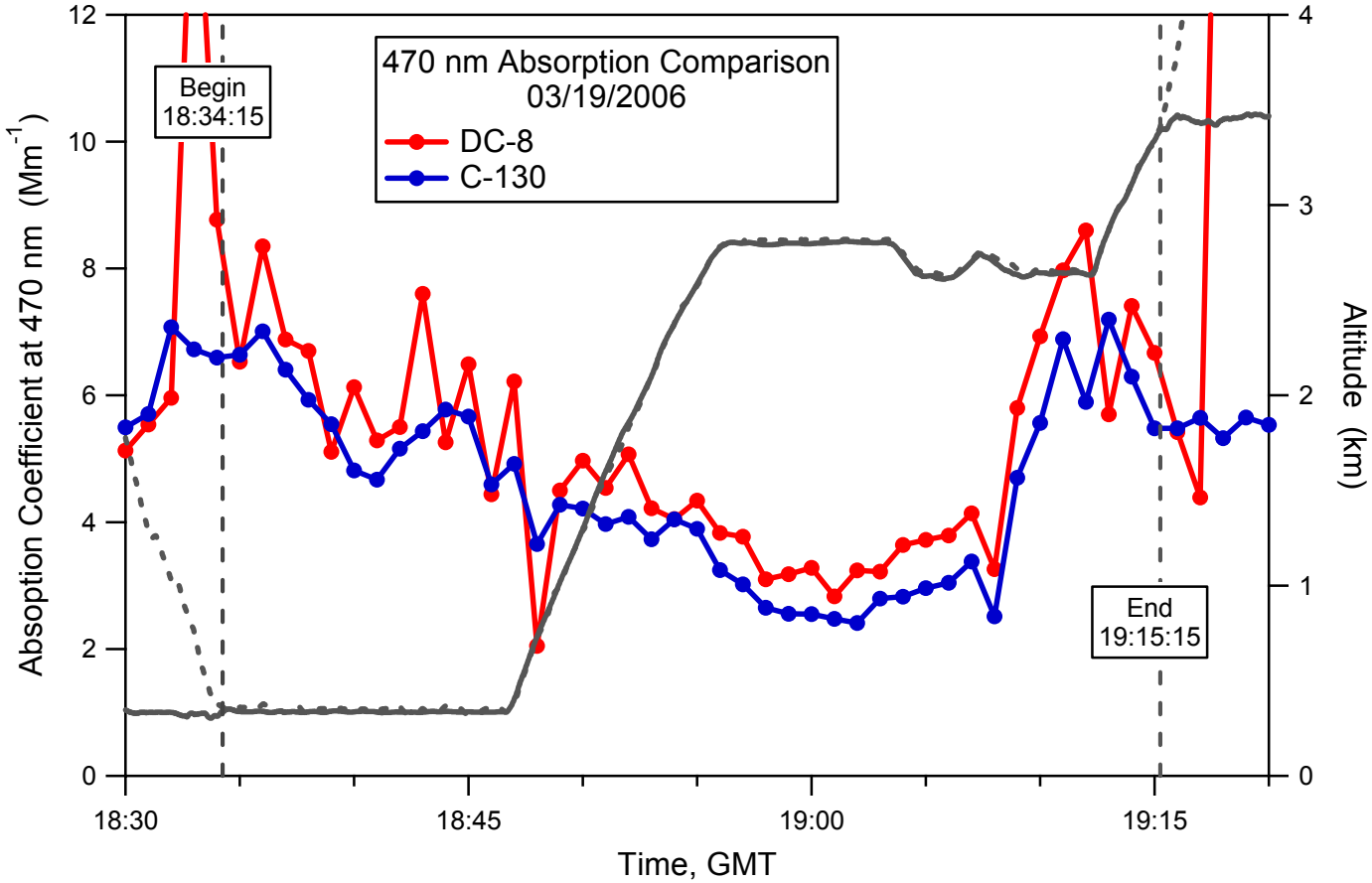

1:1
550 nm Scattering Comparison
03/19/2006
Slope = 1.08 ± 0.01
Intercept = 1.2 ± 0.5
R2 = 0.98
DC-8 Scattering Coefficient at 550 nm (Mm-1)
C-130 Scattering Coefficient at 550 nm (Mm-1)
0
20
40
60
80
100

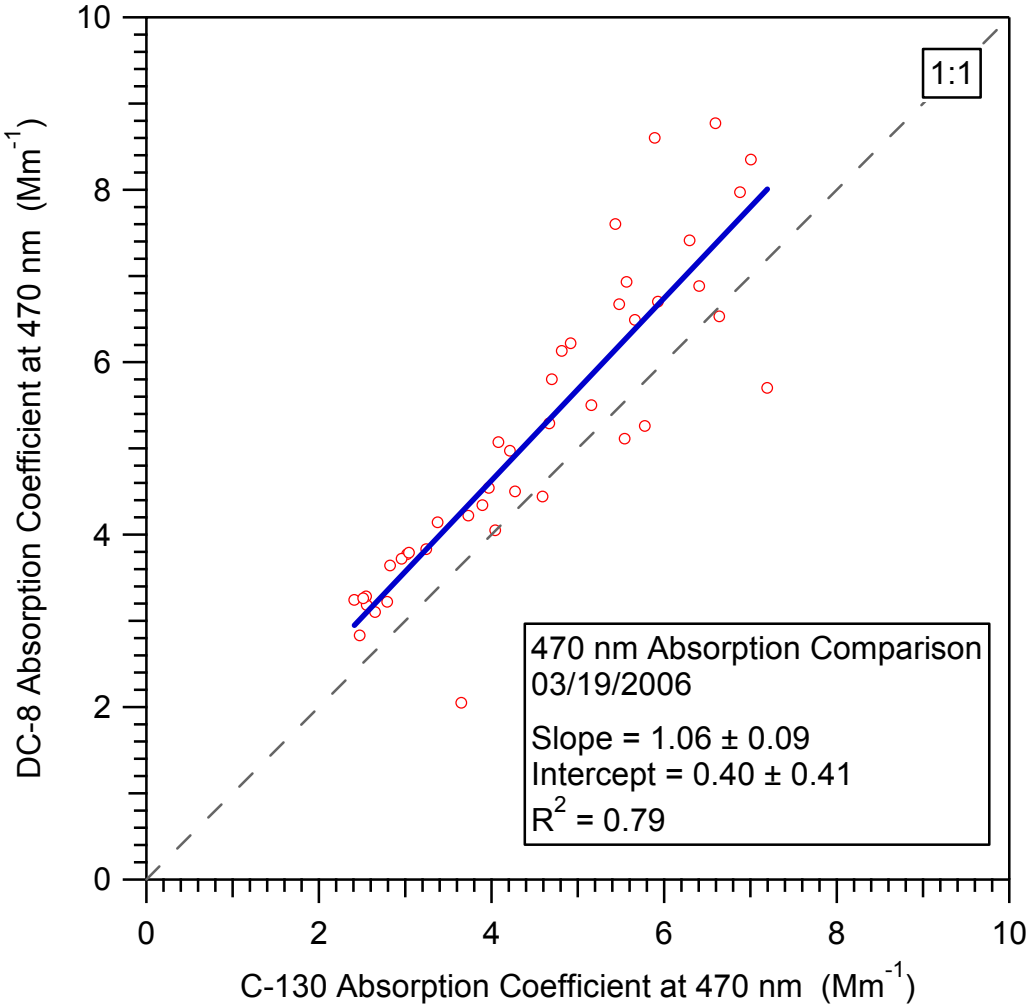

550 nm Scattering (< 1µm) Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
Submicron Scattering Coefficient at 550 nm (Mm^{-1})
Altitude (km)
Time, GMT
100
80
60
40
20
0
4
3
2
1
0
18:30
18:45
19:00
19:15

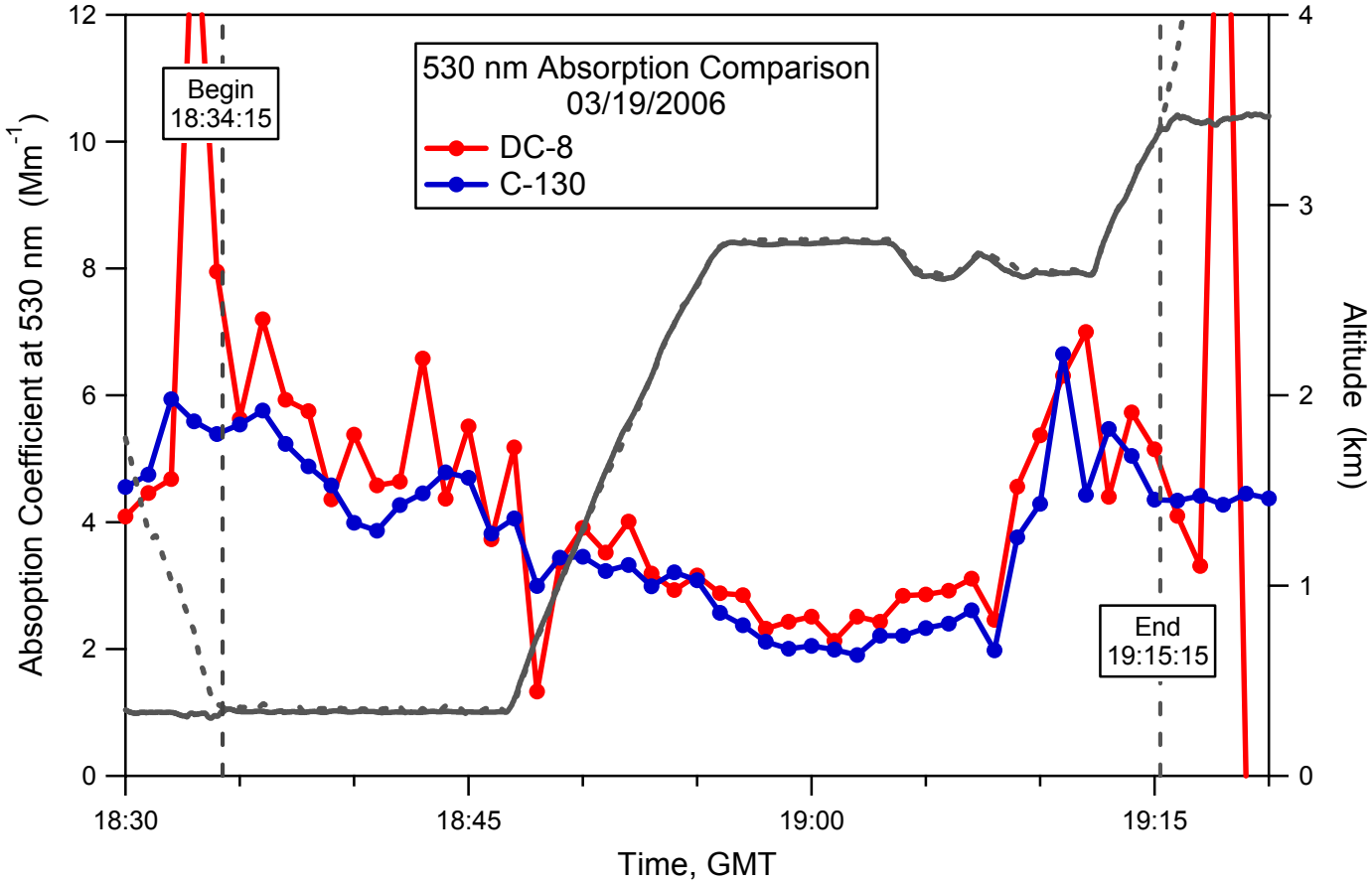

1:1
550 nm Scattering (< 1 µm) Comparison
03/19/2006
Slope = 1.32 ± 0.02
Intercept = 4.1 ± 0.7
R2 = 0.96
DC-8 Scattering Coefficient at 550 nm (Mm-1)
C-130 Scattering Coefficient at 550 nm (Mm-1)
0
20
40
60
80
100

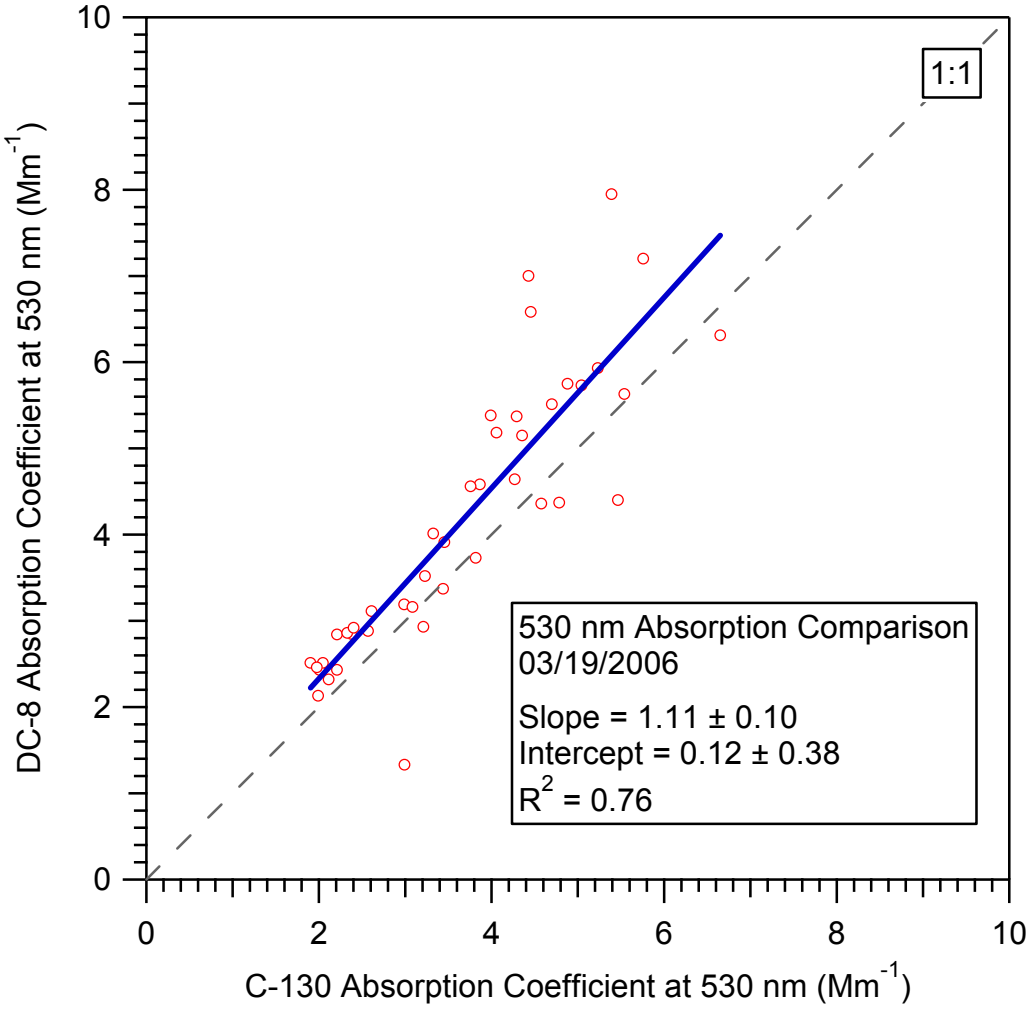

700 nm Scattering Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
Scattering Coefficient at 700 nm (Mm^{-1})
Altitude (km)
Time, GMT
100
80
60
40
20
0
4
3
2
1
0
18:30
18:45
19:00
19:15

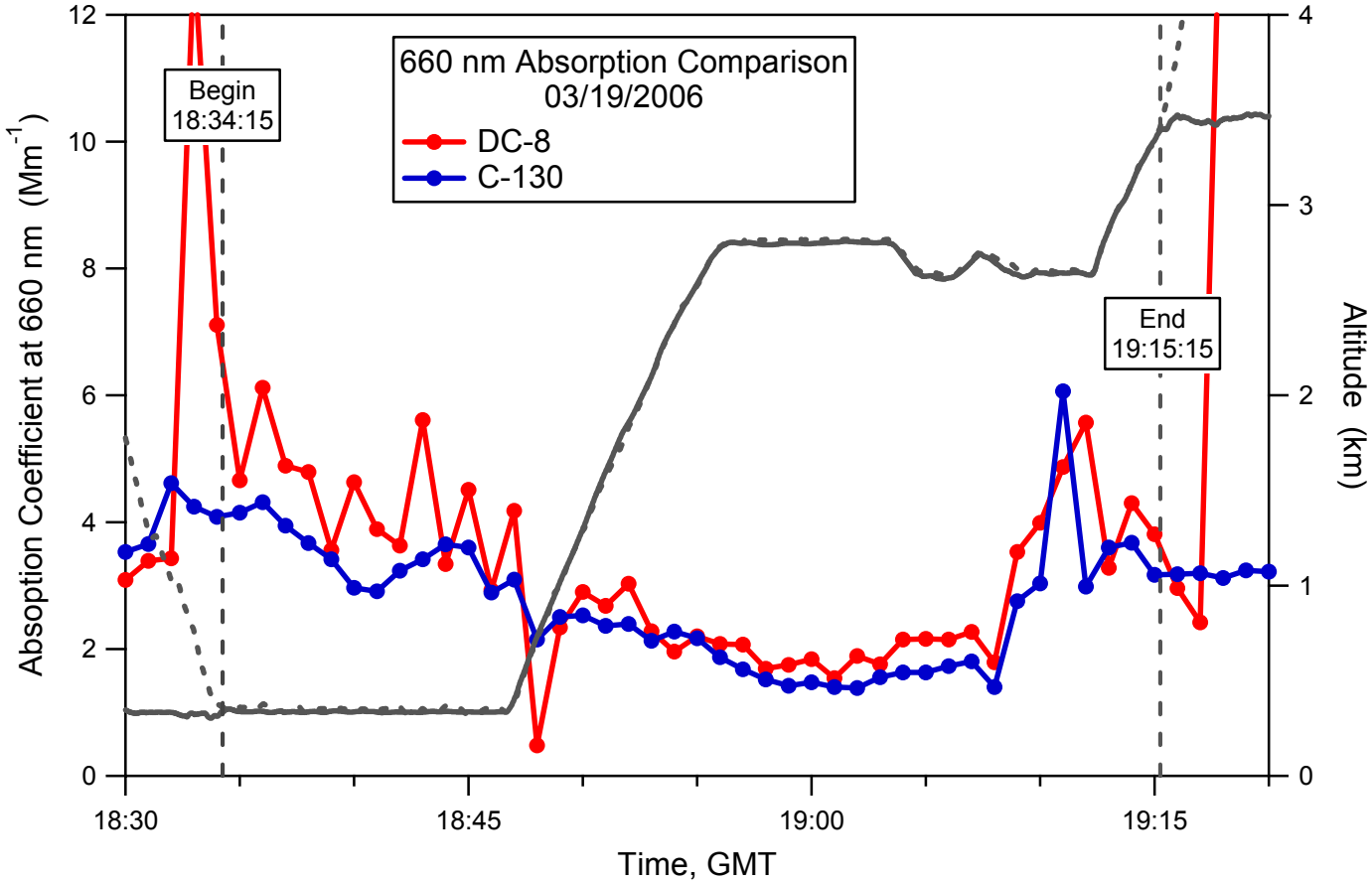

1:1
700 nm Scattering Comparison
03/19/2006
Slope = 1.12 ± 0.01
Intercept = -0.1 ± 0.3
R2 = 0.98
DC-8 Scattering Coefficient at 700 nm (mM-1)
C-130 Scattering Coefficient at 700 nm (mM-1)
0
20
40
60
80

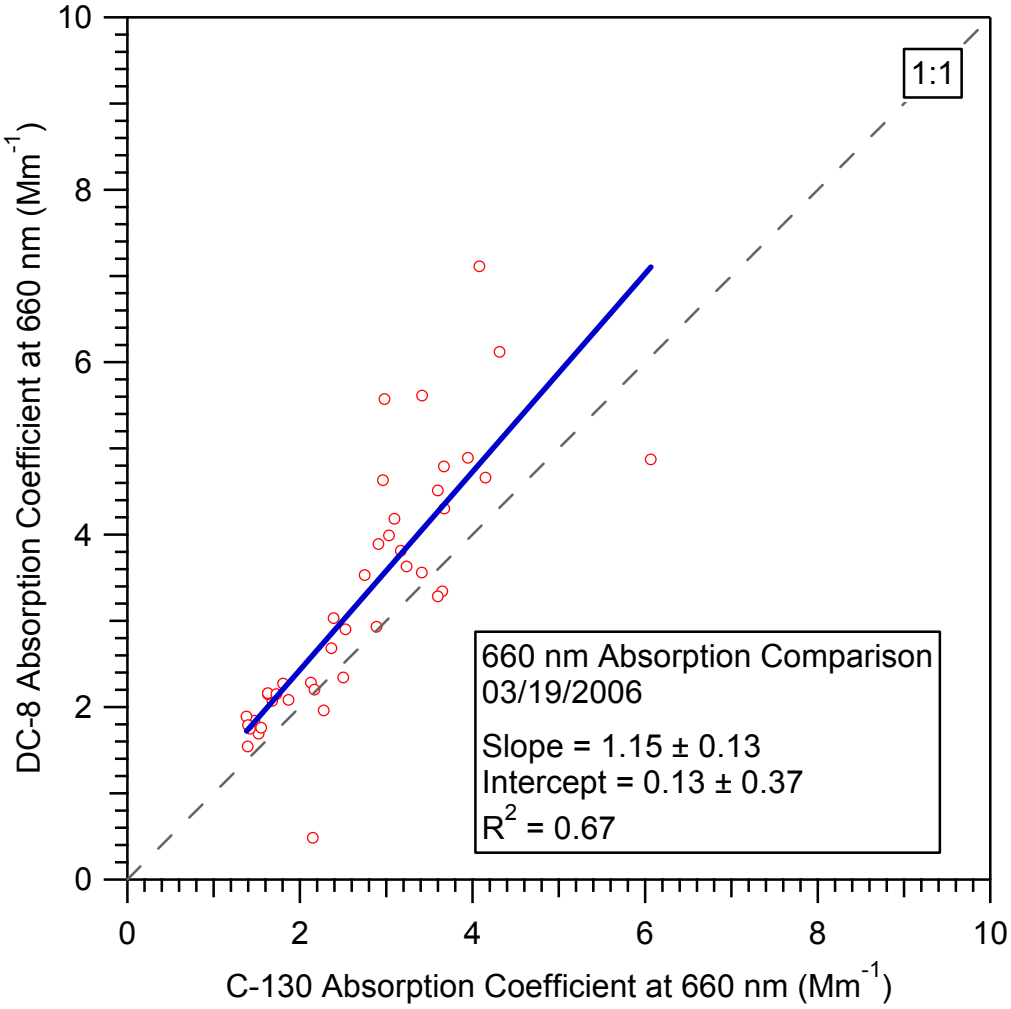

470 nm Absorption Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
Absoption Coefficient at 470 nm (Mm^{-1})
Altitude (km)
Time, GMT
18:30
18:45
19:00
19:15
0
2
4
6
8
10
12
0
1
2
3
4


1:1
470 nm Absorption Comparison
03/19/2006
Slope = 1.06 ± 0.09
Intercept = 0.40 ± 0.41
R2 = 0.79
DC-8 Absorption Coefficient at 470 nm (Mm-1)
C-130 Absorption Coefficient at 470 nm (Mm-1)
0
2
4
6
8
10


530 nm Absorption Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
Absoption Coefficient at 530 nm (Mm^{-1})
Altitude (km)
Time, GMT
18:30
18:45
19:00
19:15
0
2
4
6
8
10
12
0
1
2
3
4


1:1
530 nm Absorption Comparison
03/19/2006
Slope = 1.11 ± 0.10
Intercept = 0.12 ± 0.38
R2 = 0.76
DC-8 Absorption Coefficient at 530 nm (Mm-1)
C-130 Absorption Coefficient at 530 nm (Mm-1)
0
2
4
6
8
10


660 nm Absorption Comparison
03/19/2006
DC-8
C-130
Begin
18:34:15
End
19:15:15
Absoption Coefficient at 660 nm (Mm^{-1})
Altitude (km)
Time, GMT
18:30
18:45
19:00
19:15
0
2
4
6
8
10
12
0
1
2
3
4


1:1
660 nm Absorption Comparison
03/19/2006
Slope = 1.15 ± 0.13
Intercept = 0.13 ± 0.37
R2 = 0.67
DC-8 Absorption Coefficient at 660 nm (Mm-1)
C-130 Absorption Coefficient at 660 nm (Mm-1)
0
2
4
6
8
10