ICARTT Measurement Comparison
NASA DC-8 vs. NOAA WP-3D

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and INTEX-NA Science Team

Objective

To create a unified observational data set from multi-platforms (i.e., aircraft, ground, and ship) by establishing data comparability between the various platforms and verifying that different analytical techniques are mutually consistent within quantifiable uncertainties.

DC-8 Intercomparison Flights

- July 15, 2004 DC-8 vs. Cobra King Air
- July 22, 2004 DC-8 vs. WP-3D
- July 28, 2004 DC-8 vs. BAE 146
- July 31, 2004 DC-8 vs. WP-3D
- August 7, 2004 DC-8 vs. WP-3D

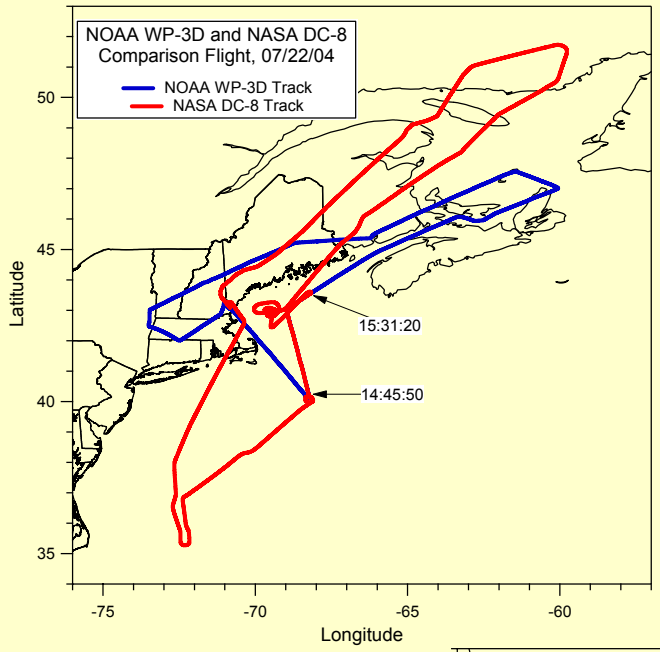
Approach

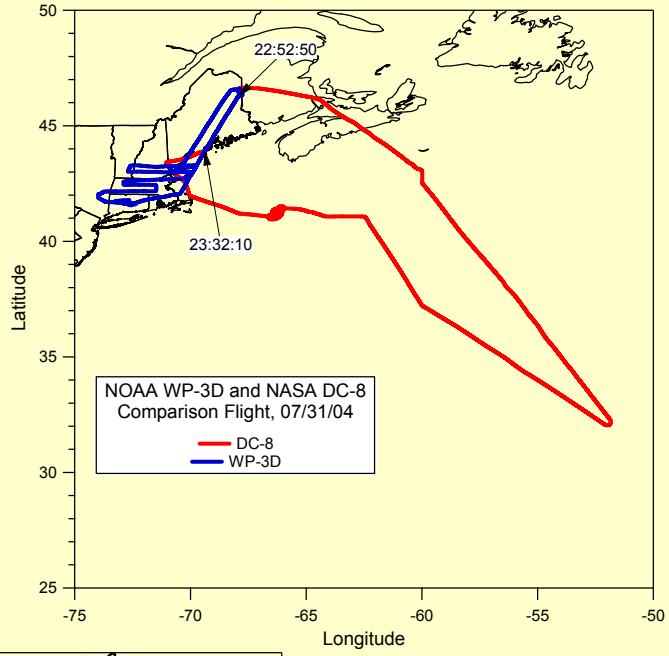
- Field Data Comparison
  - Double-Blind comparison.
  - Results presented in time series and x-y plots posted at:

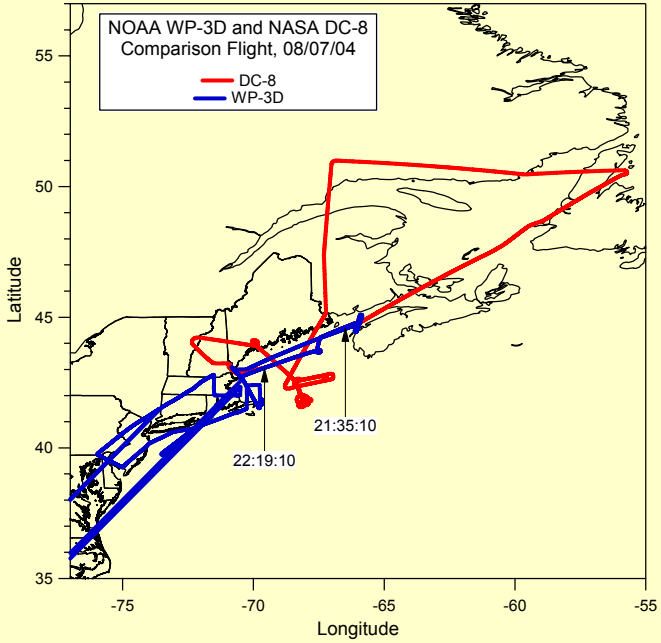
  http://www.al.noaa.gov/ICARTT/FieldOperations/FOMC.shtml

  Standard INTEX access user name and password.
- Final Data Comparison
  - On-going.
  - Available plots will be distributed in pdf files.
  - Final results will be posted on the ICARTT website.
  - Paper (TBD).

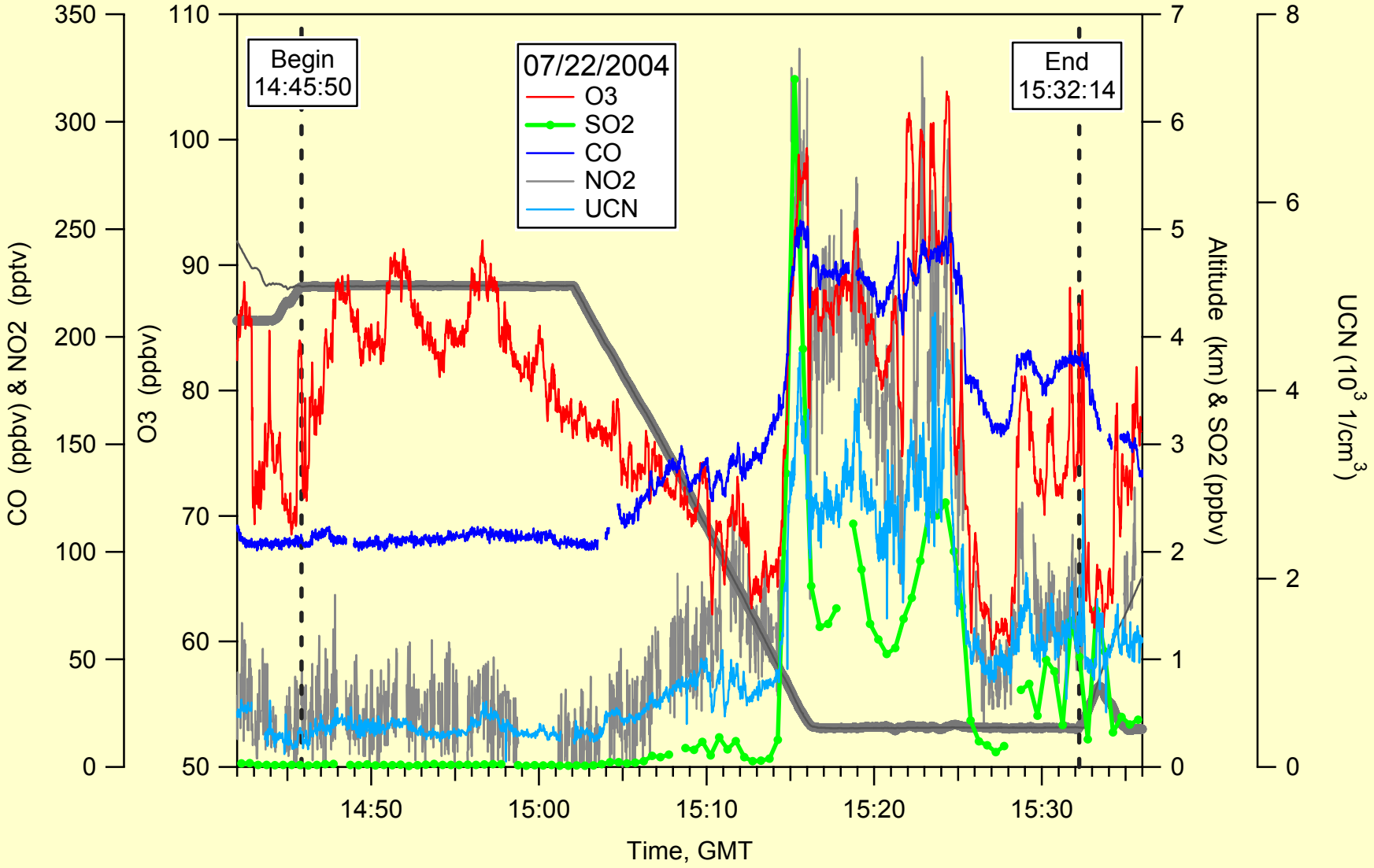
Comparison Locations/Periods



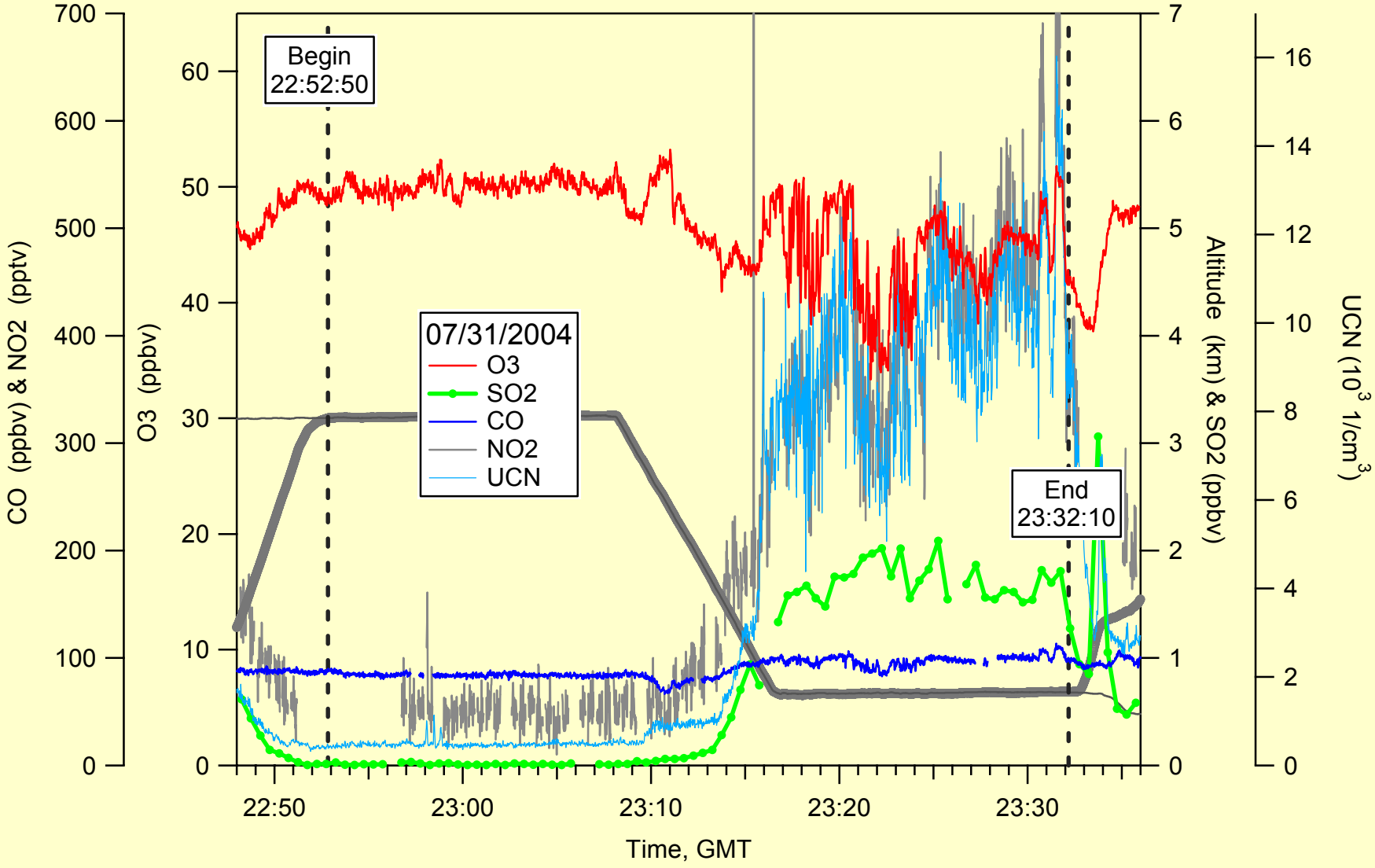




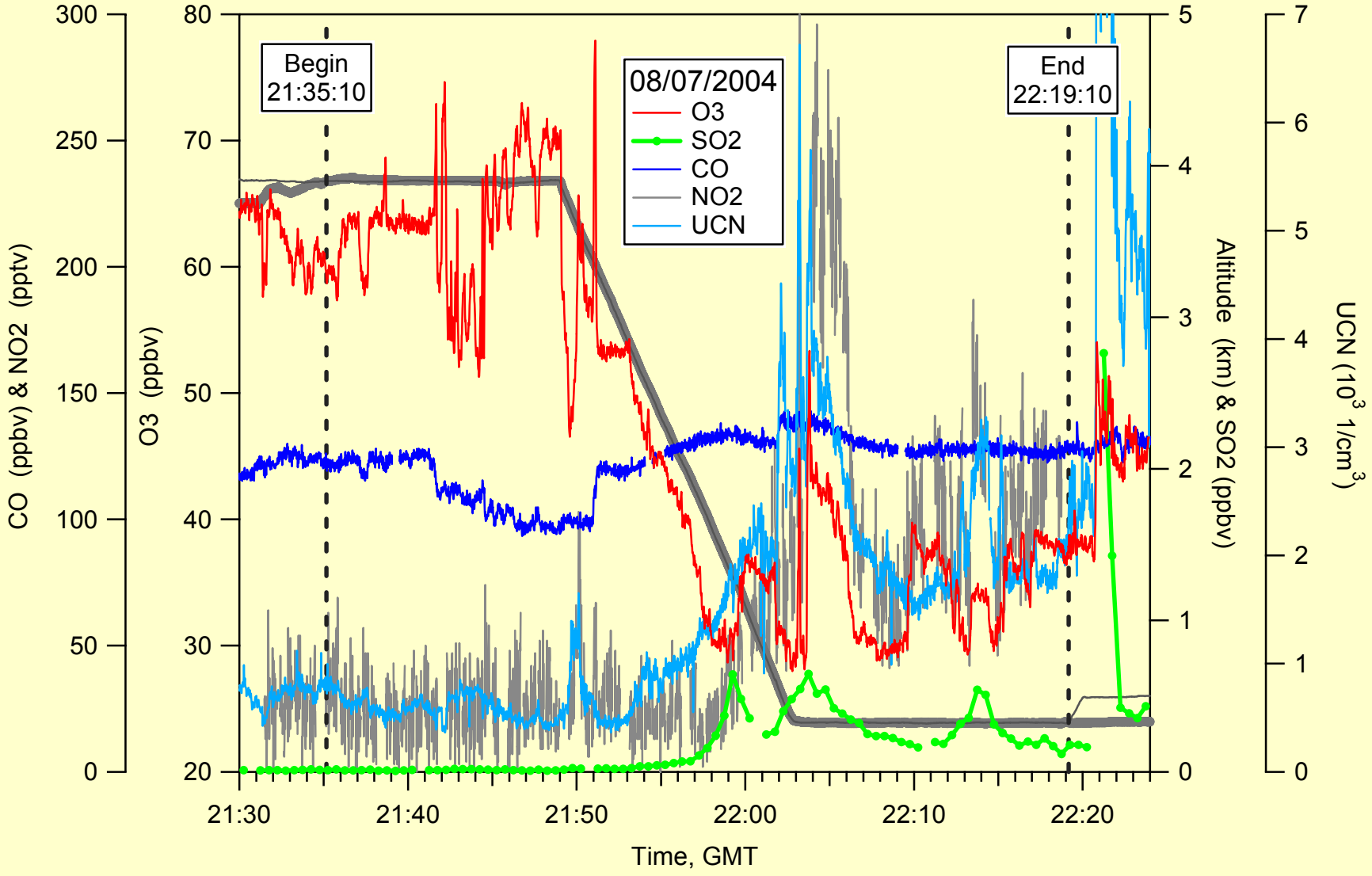
Chemical Overview: Intercomparison 1



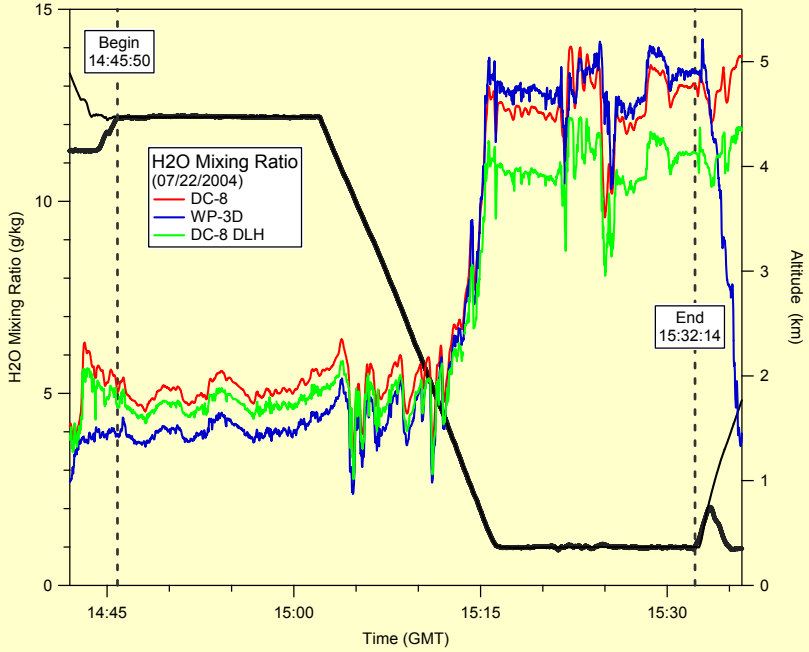
Chemical Overview: Intercomparison 2

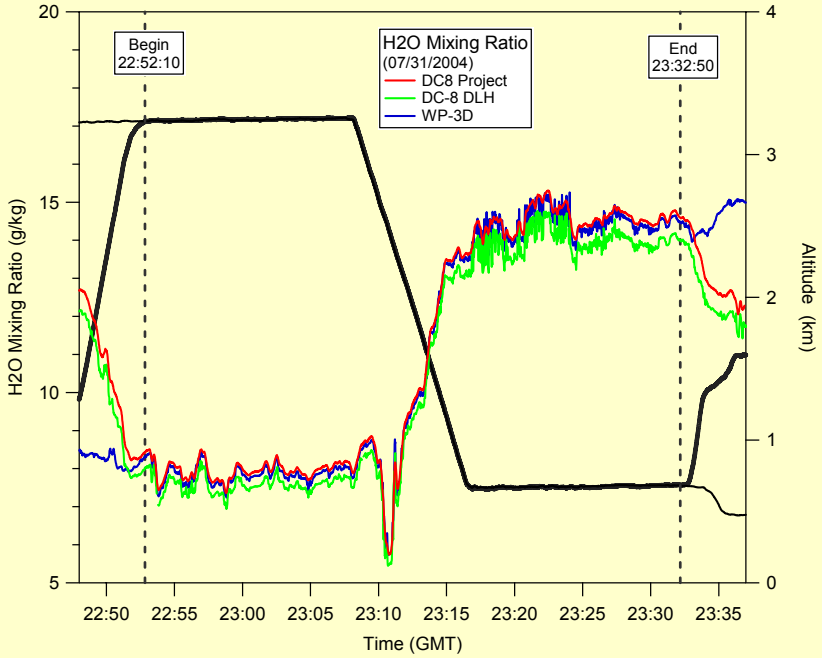


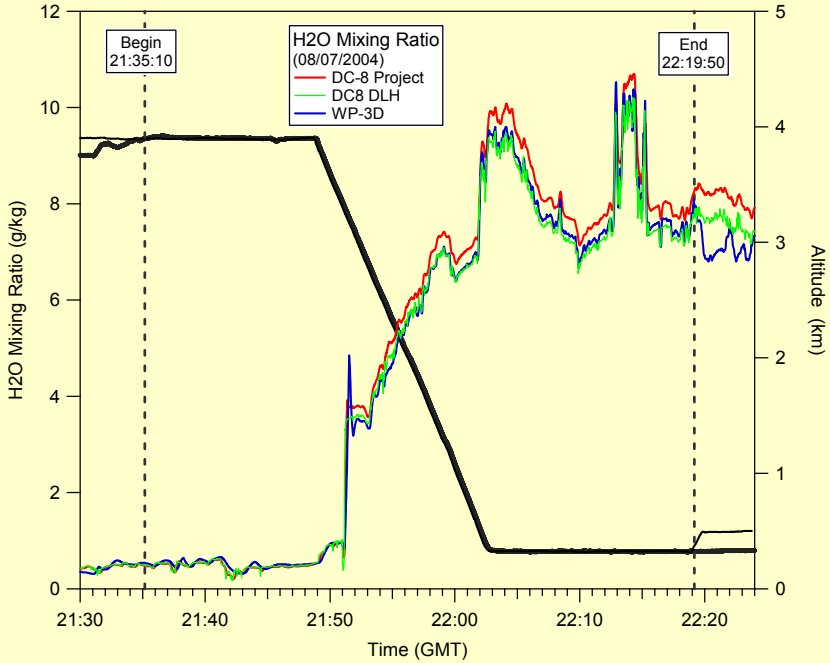
Chemical Overview: Intercomparison 3



H_2O Comparison







R^2 values: 0.99

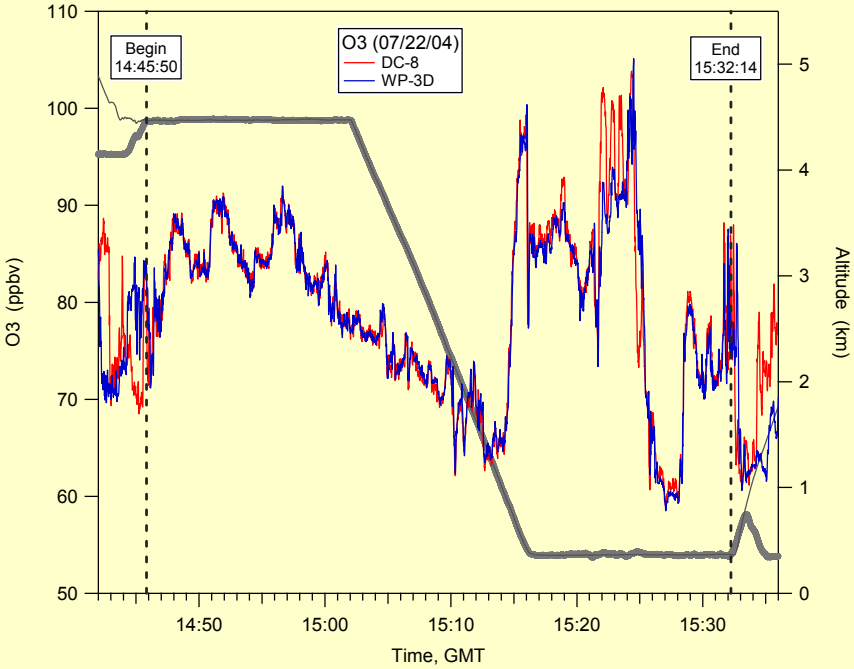
DC-8 DLH vs. WP-3D Slope:

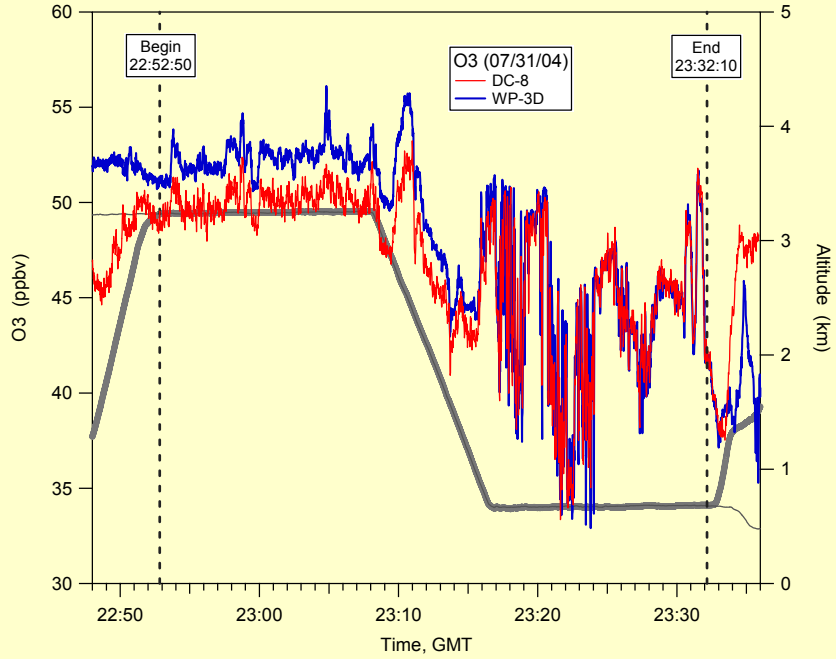
0.70 – 0.97

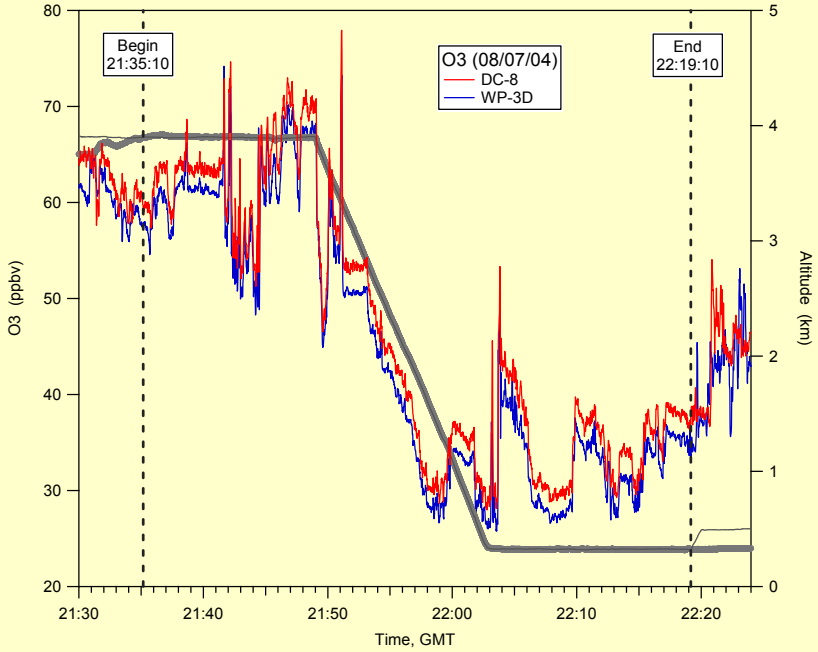
DC-8 Project vs. WP-3D Slope:

0.84 – 1.05

O_3 Comparison







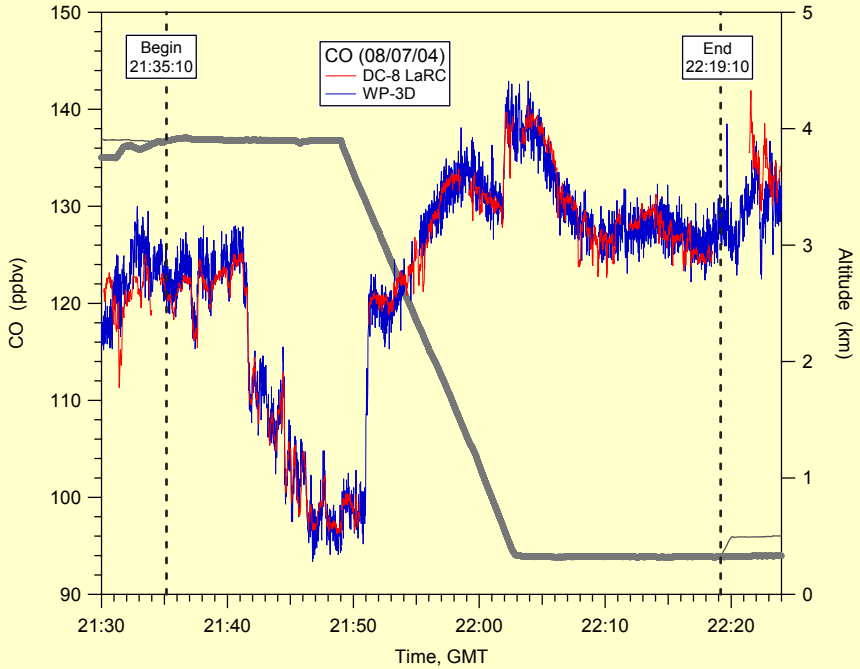
DC-8 vs. WP-3D Regression

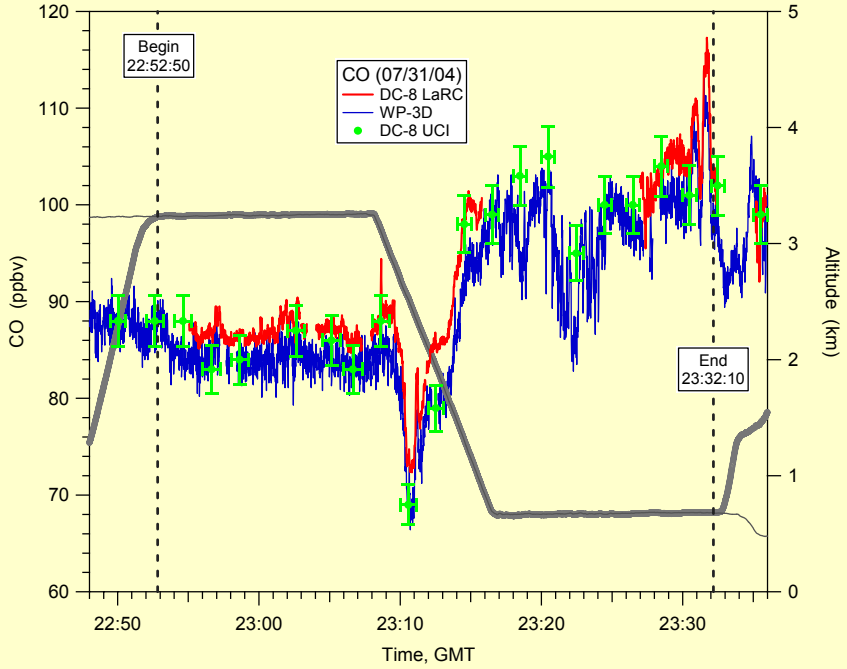
Flight	Slope	Intercept	R^2
11	1.01	-0.71	0.92
14	0.79	8.8	0.92
17	1.00	2.4	0.99

CO Comparison

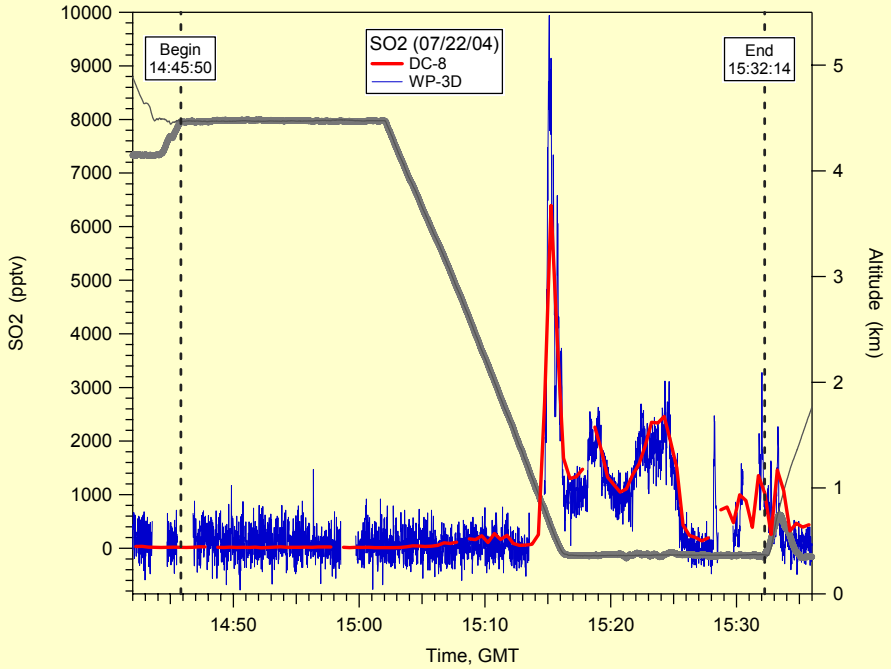
DC-8 vs. WP-3D Regression

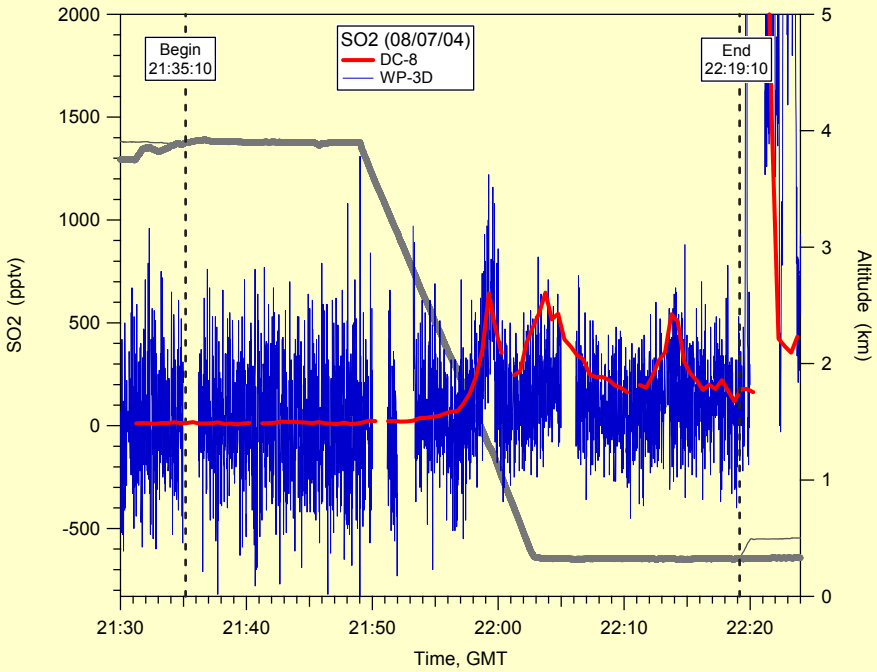
Flight	Slope	Intercept	R^2
11	1.02	-1.25	0.99
14	1.01	2.60	0.96
17	0.97	3.01	0.97

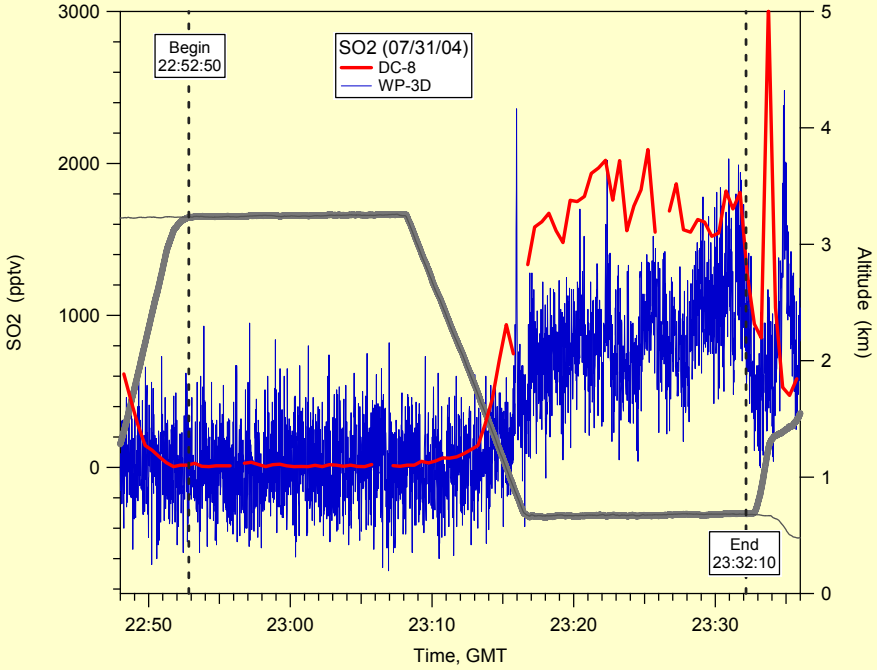




SO_2 Comparison



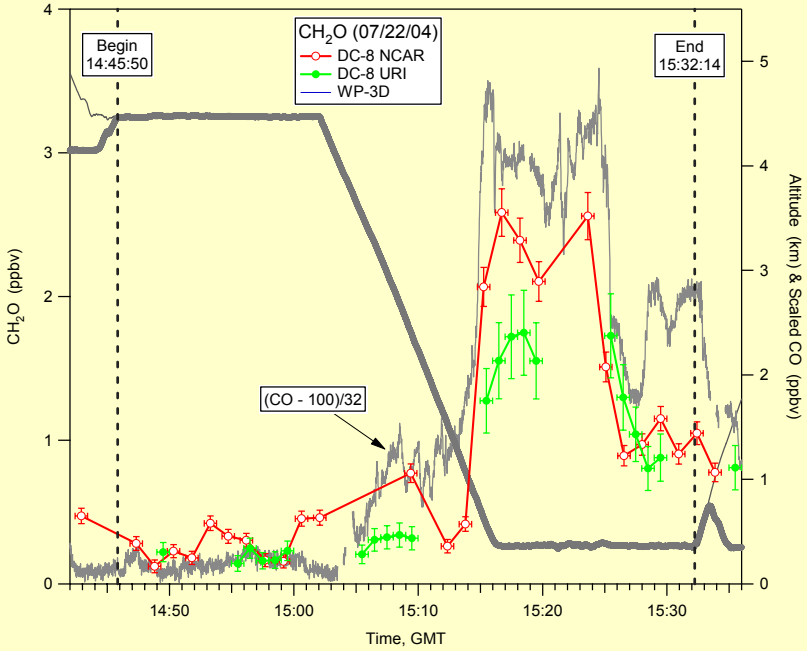


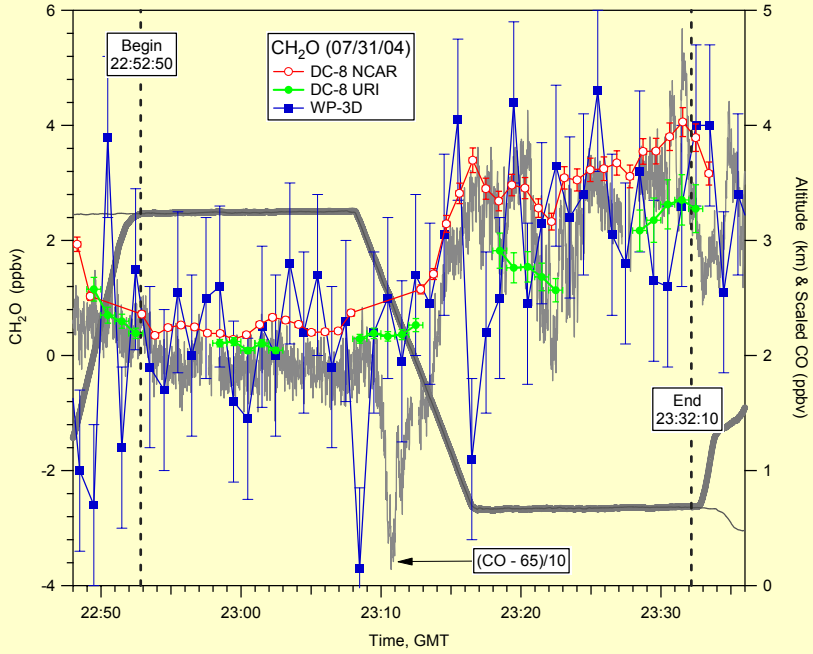


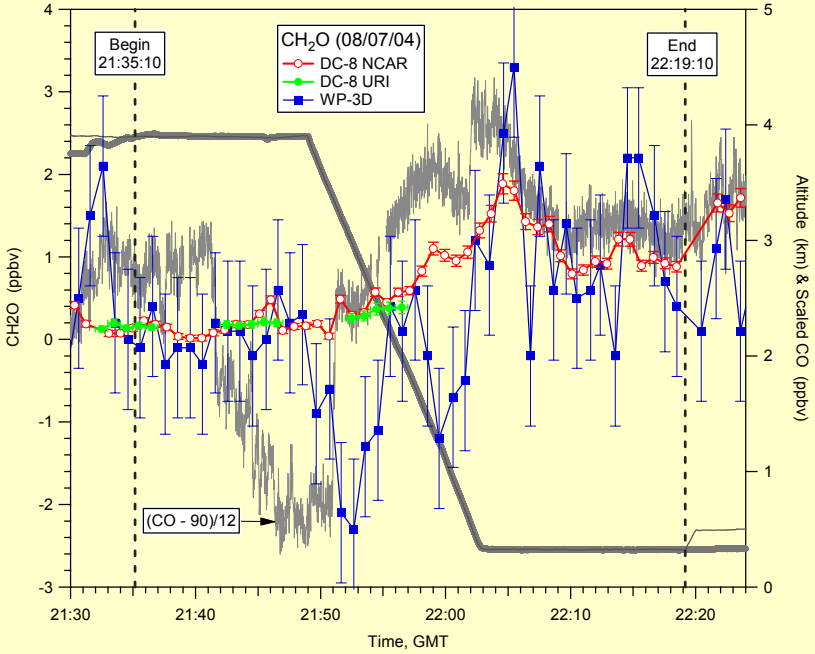
DC-8 vs. WP-3D Regression

Flight	Slope	Intercept	R^2
11	0.95	59	0.96
14	1.75	115	0.88
17	1.23	59	0.56

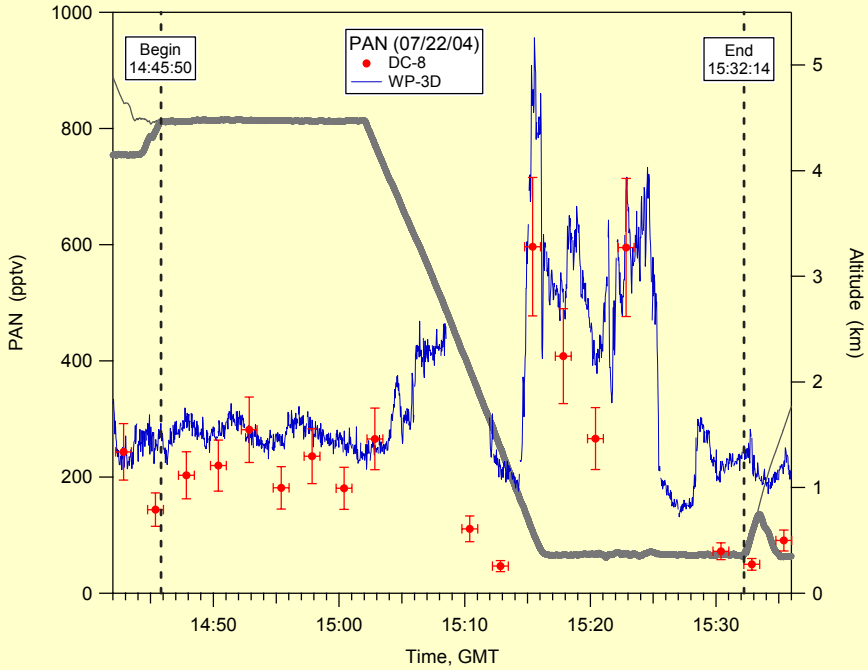
CH_2O Comparison

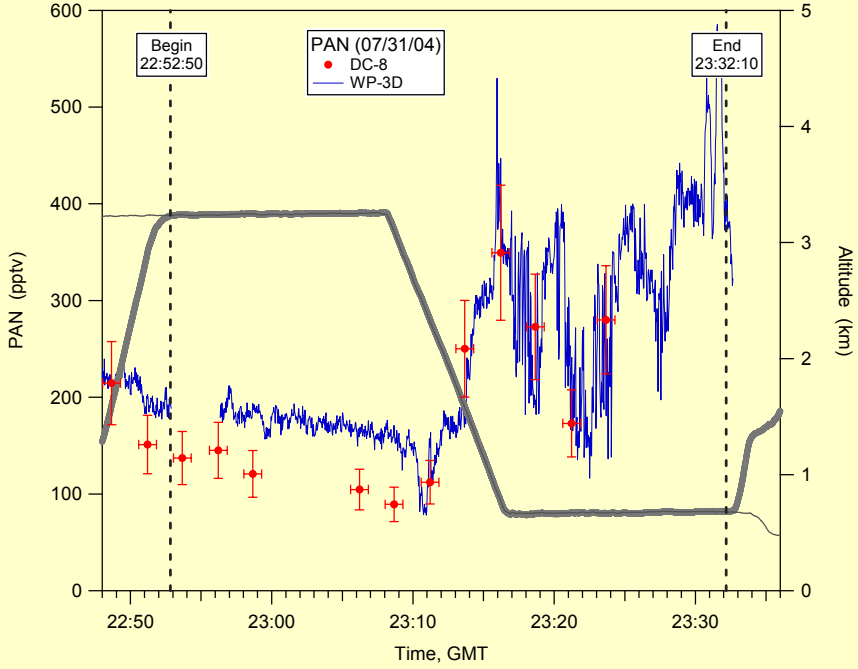


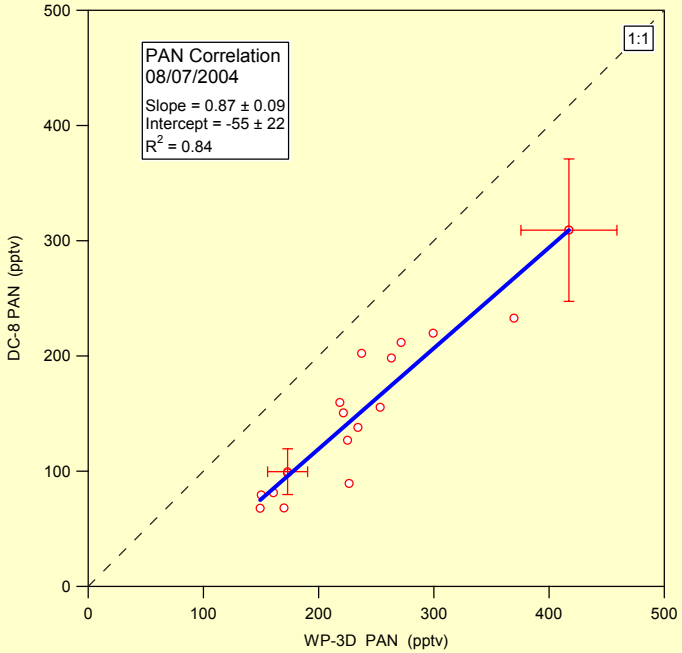




PAN Comparison







DC-8 vs. WP-3D Regression

Flight	Slope	Intercept	R^2
11	0.94	-61	0.84
14	1.17	-58	0.80
17	0.87	-55	0.84

Total Peroxynitrates Comparison

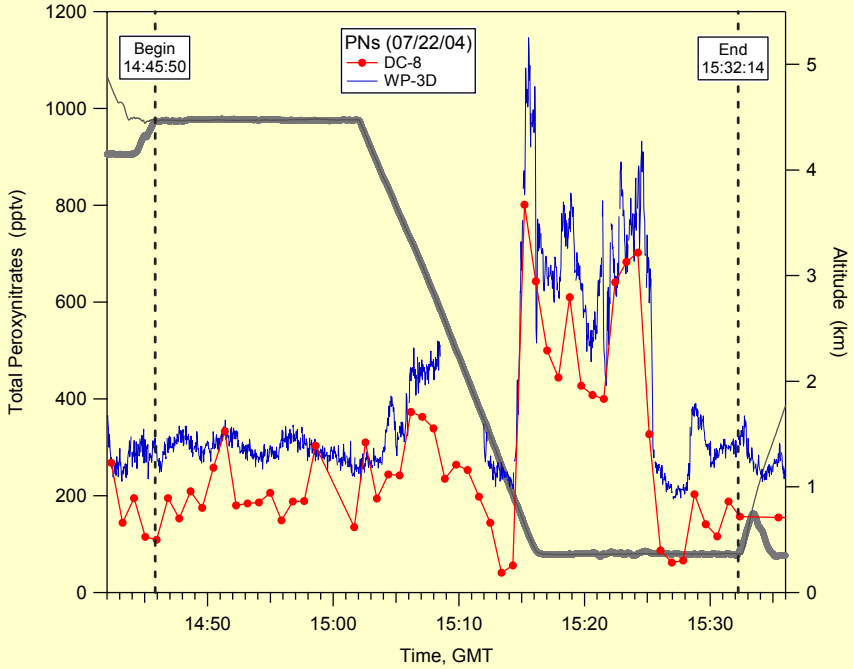
DC-8 vs. WP-3D Regression

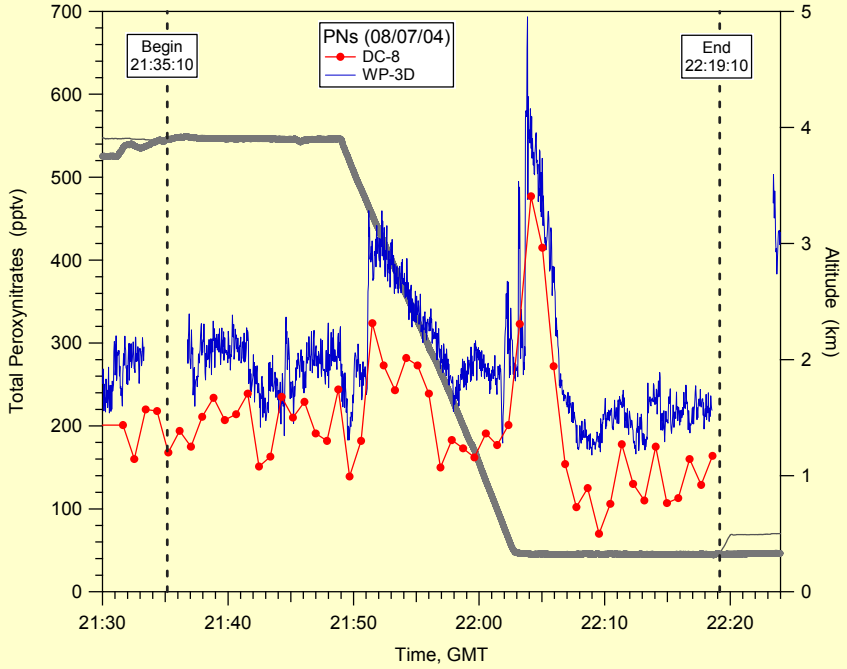
Flight	Slope	Intercept	R^2
11	0.96	-103	0.88
14	0.93	-26	0.91
17	0.94	-64	0.86

WP-3D PNs = PAN + PPN + others

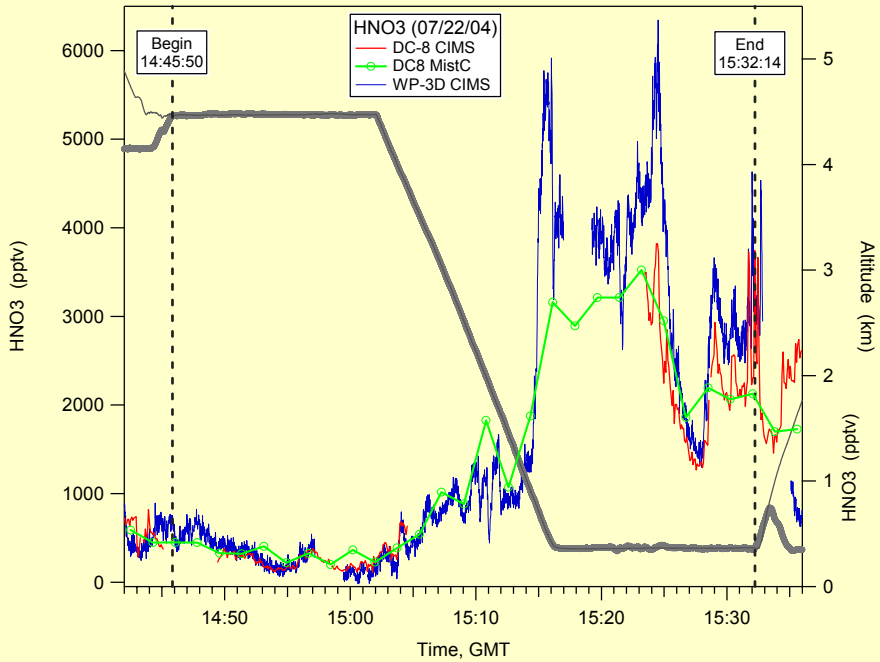
Including, PBN, APAN, MoPAN, PBzN, MPAN, PPeN

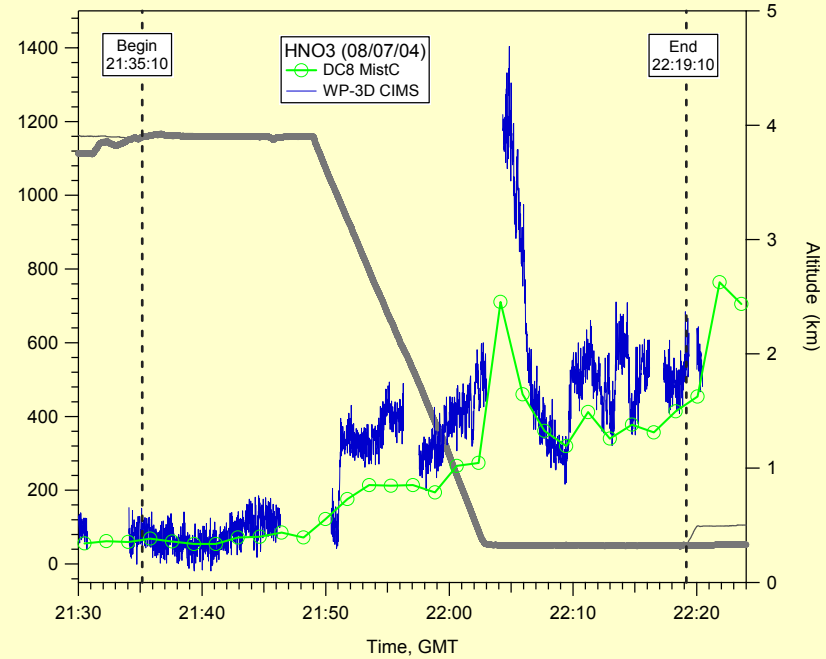
DC-8 PNs = 200°C channel - unheated channel

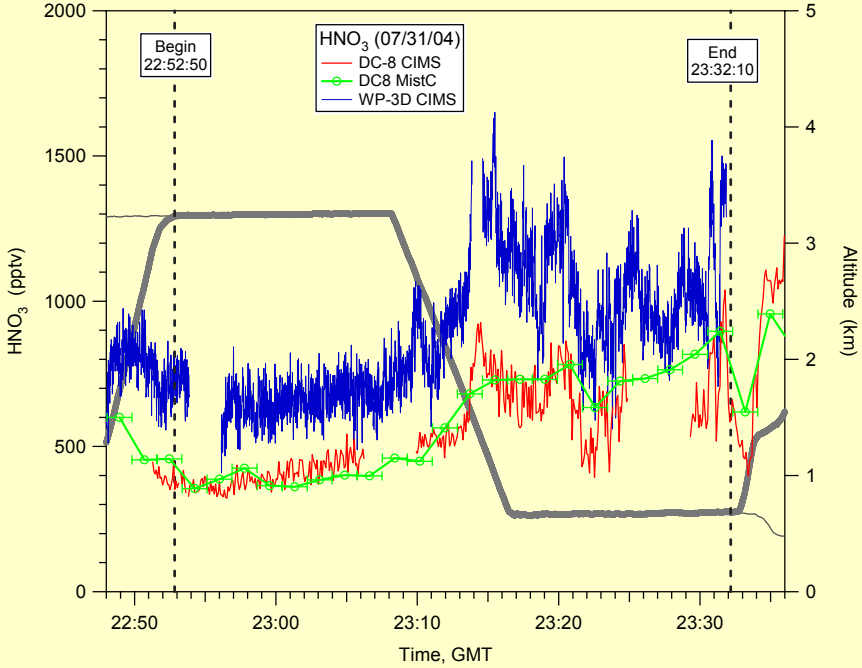




HNO_3 Comparison







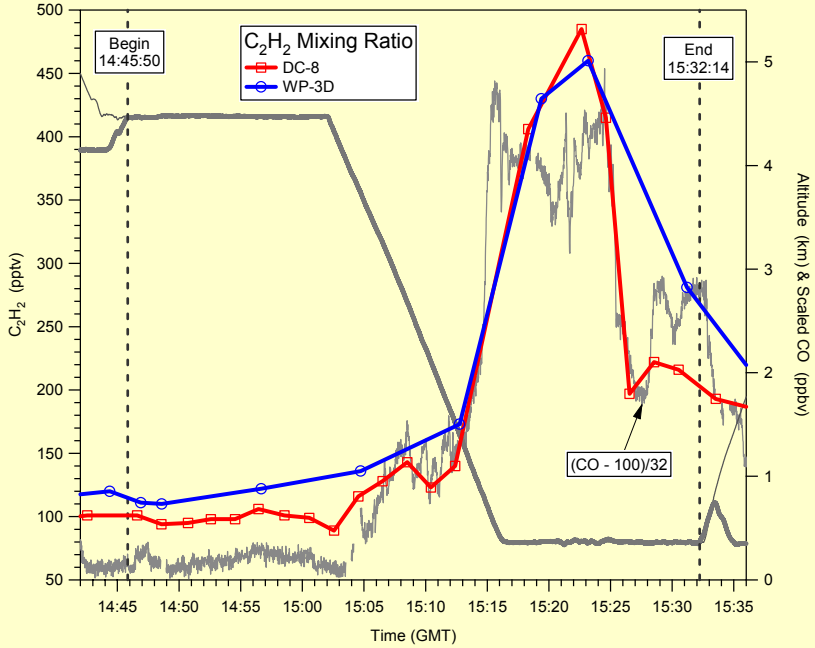
DC-8 CIMS vs. WP-3D CIMS:

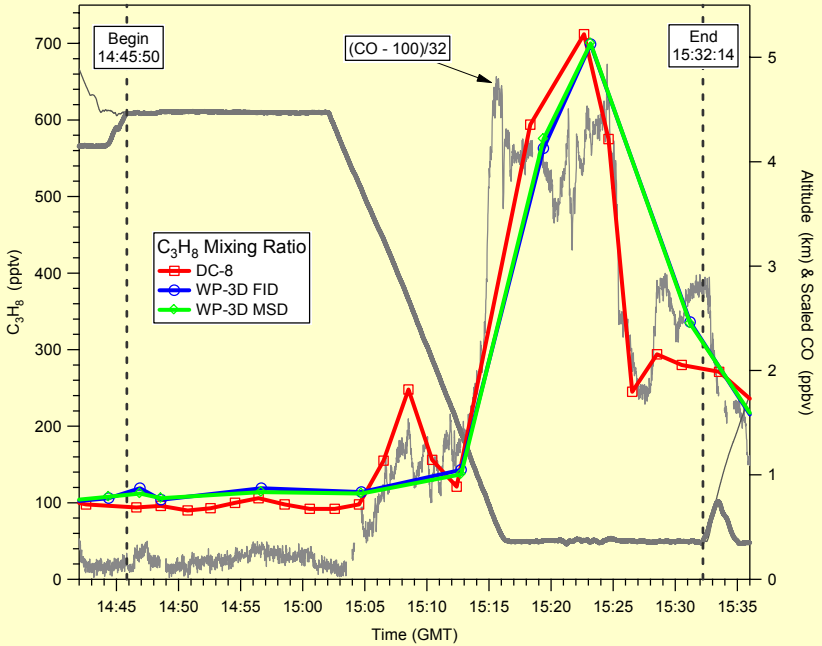
R^2 = 0.8 – 0.95, slope = ~0.6

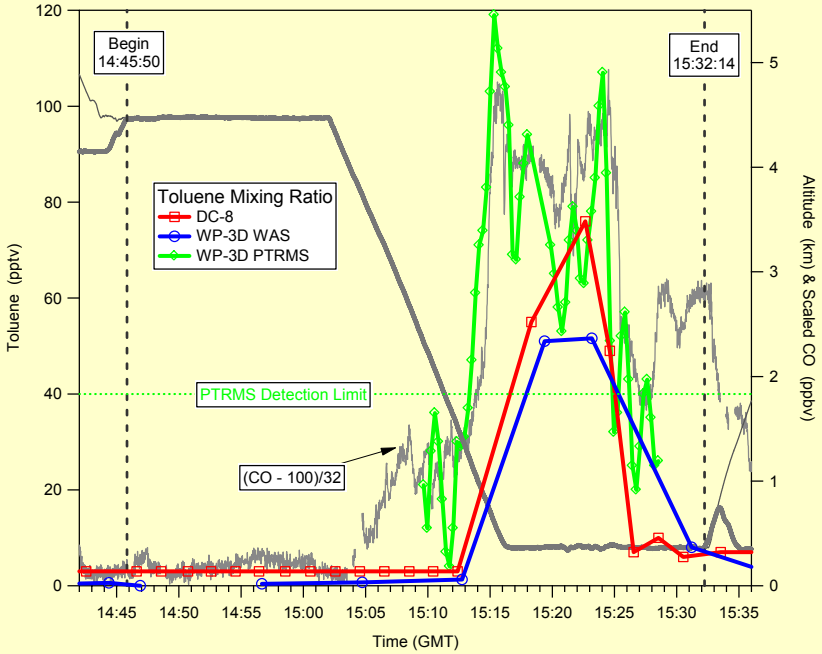
WP-3D CIMS vs. DC-8 MC:

R2 = 0.8 – 0.94, slope = 1.1 – 1.6

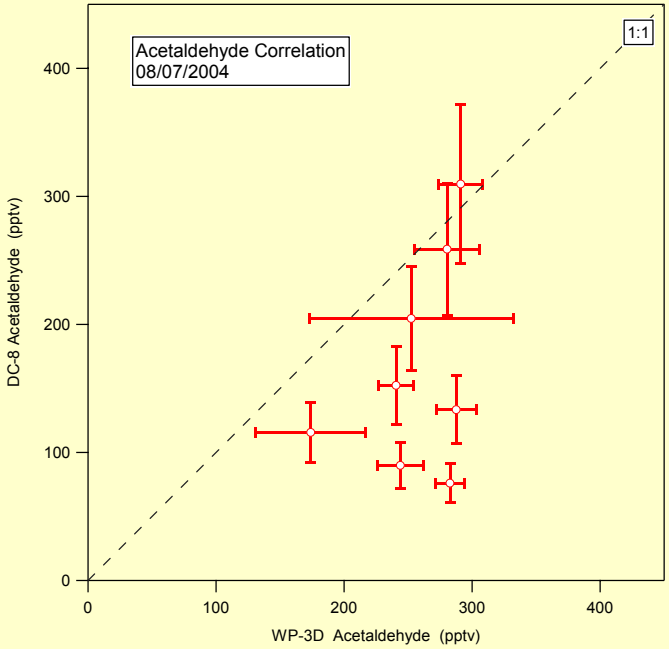
NMHC Comparison 07/22/2004

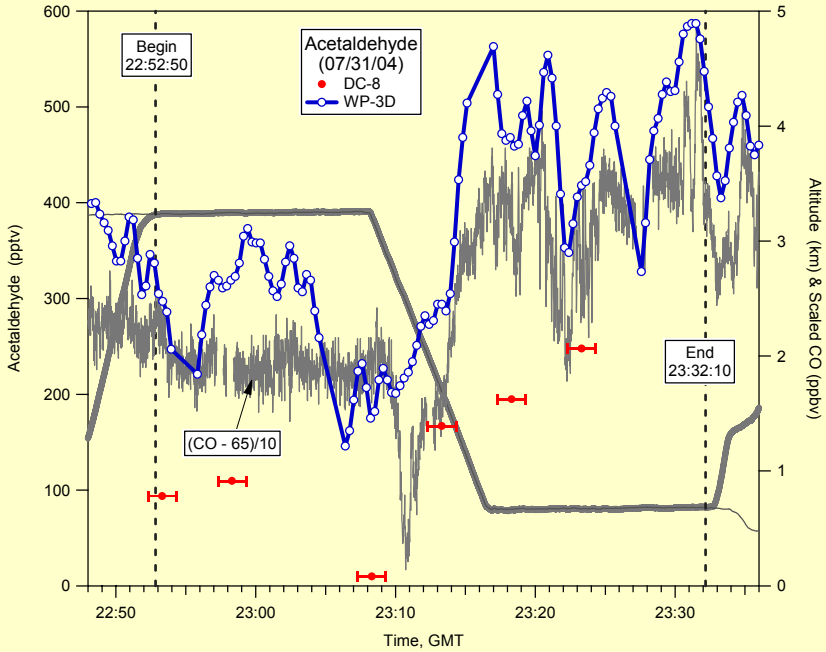


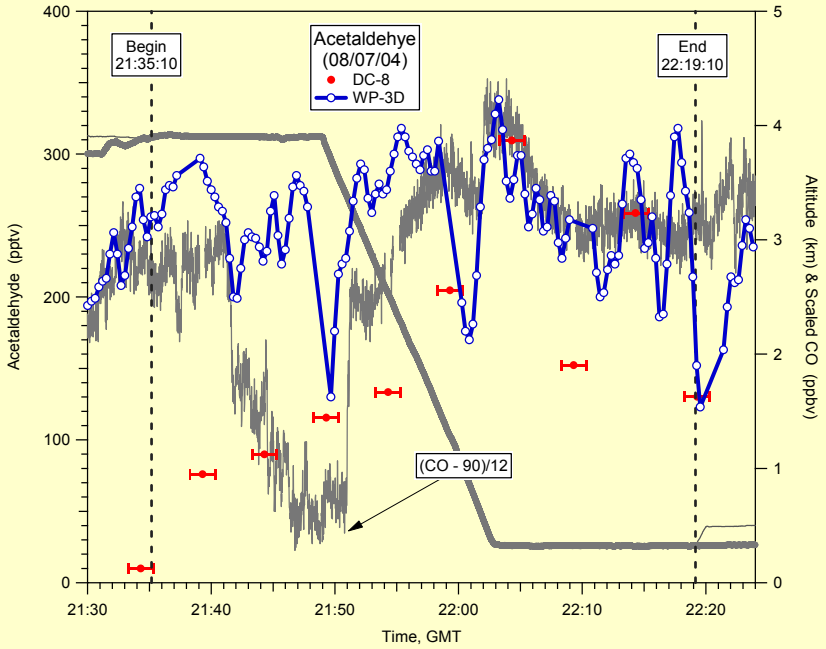




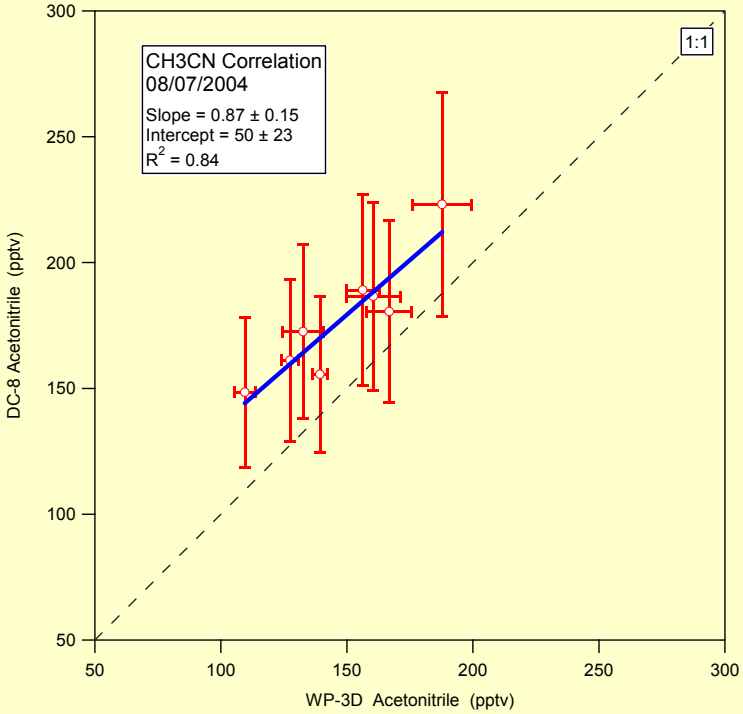
Acetaldehyde Comparison

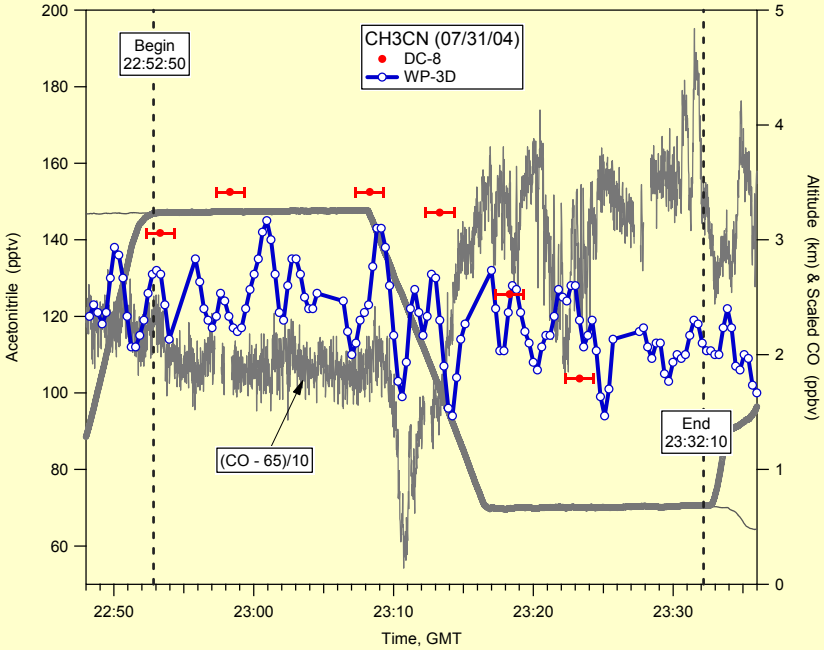


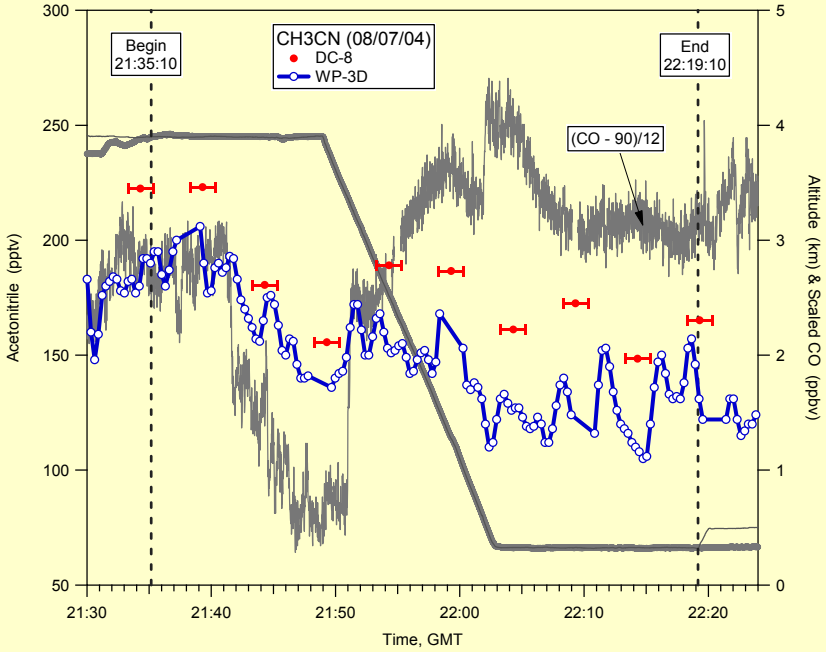




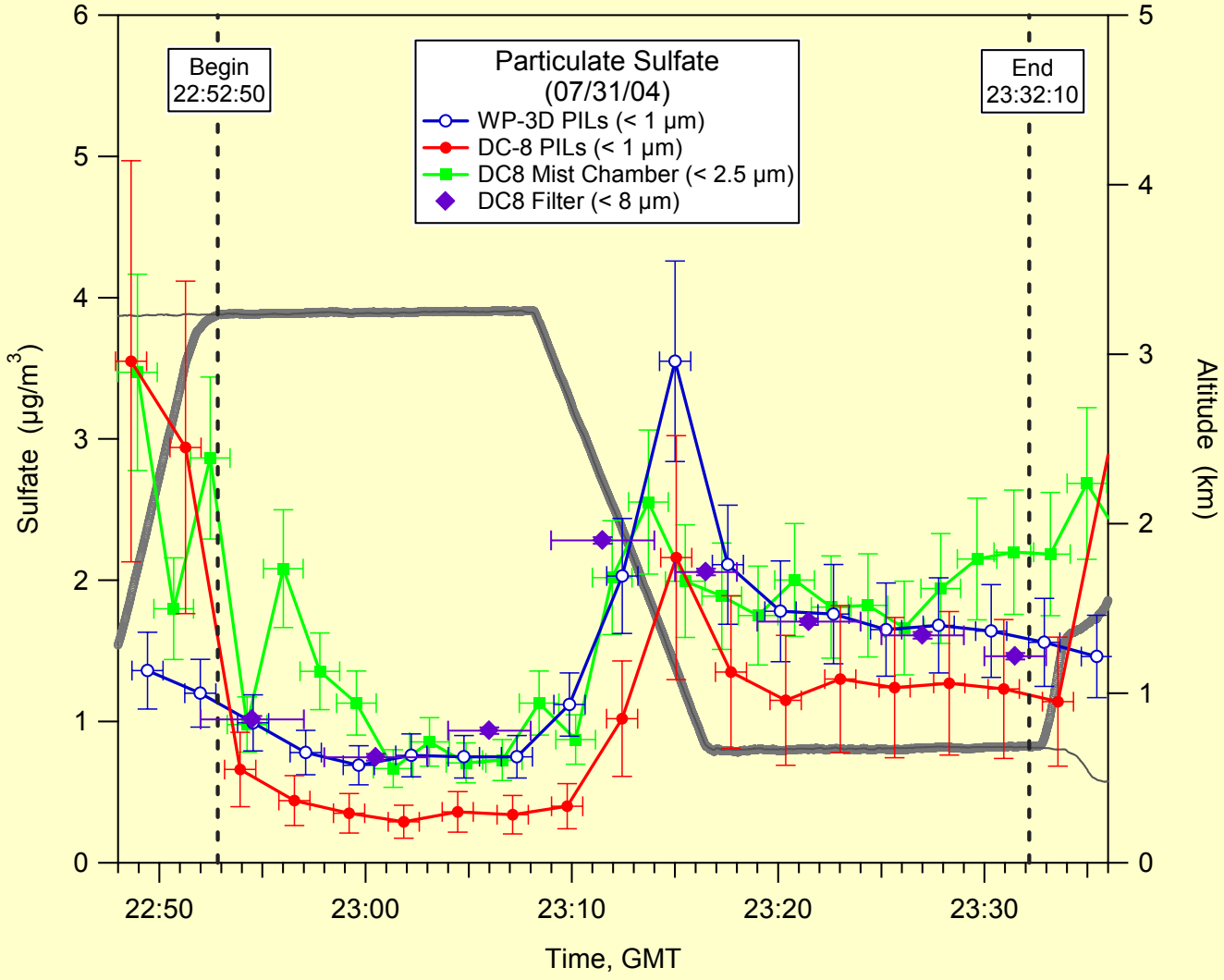
Acetonitrile Comparison



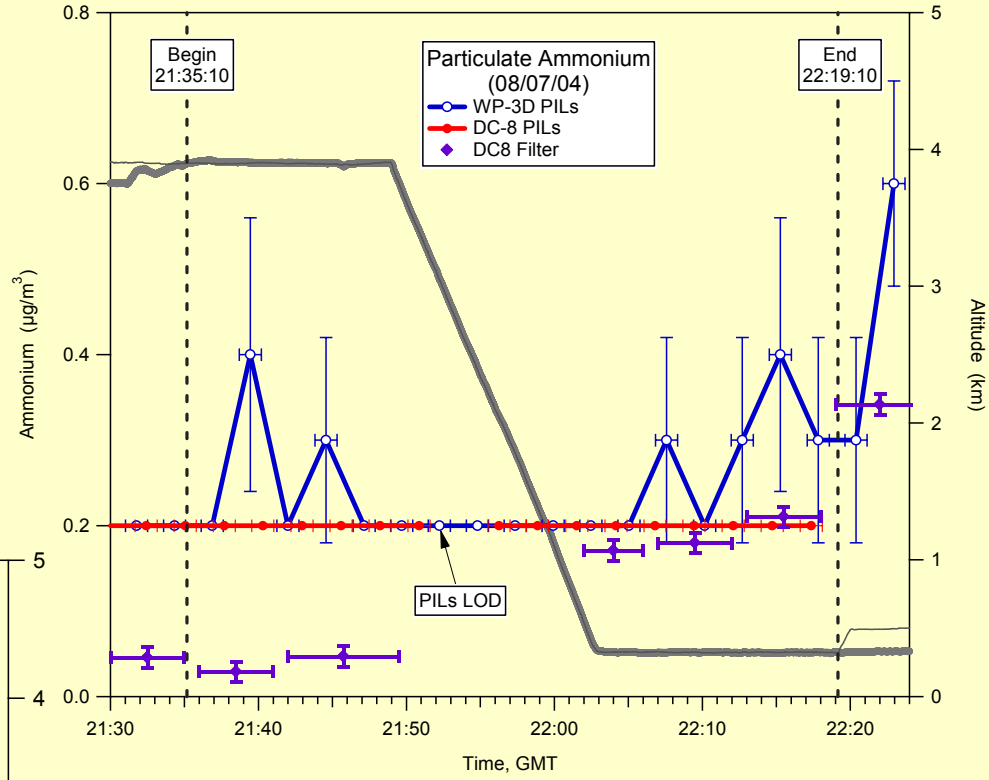


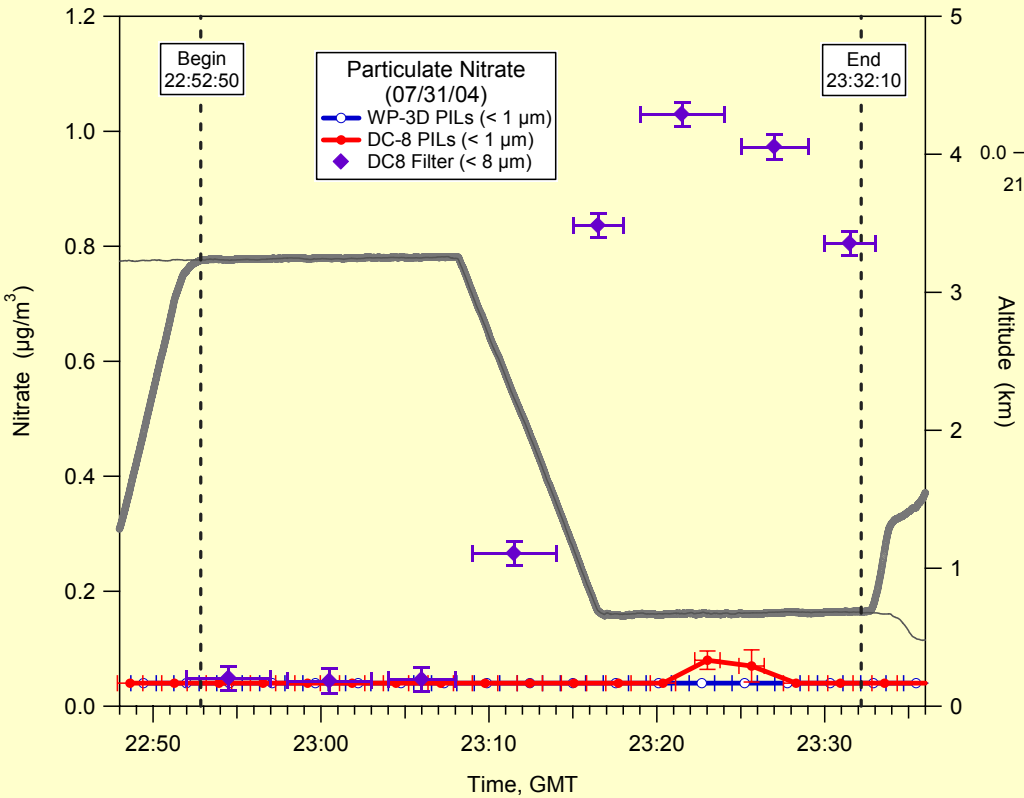


Particulate Sulfate Comparison 07/31/2004



Comparison of Particulate Ammonium and Nitrate





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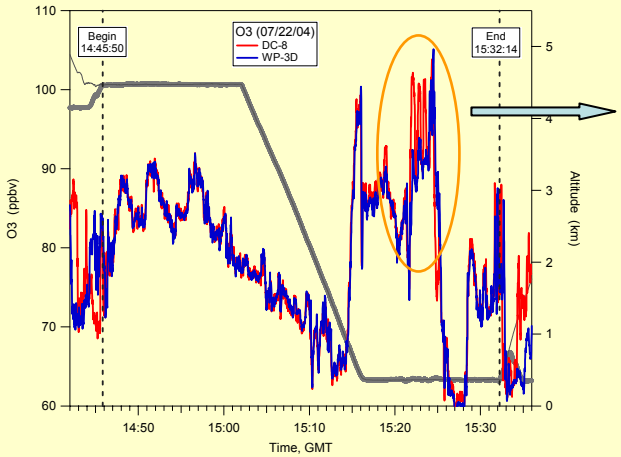
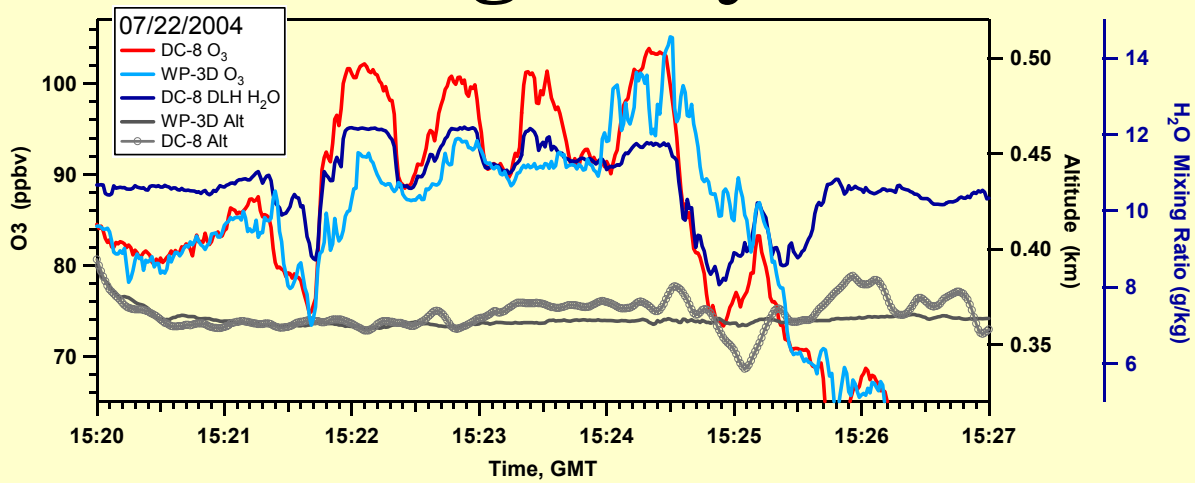
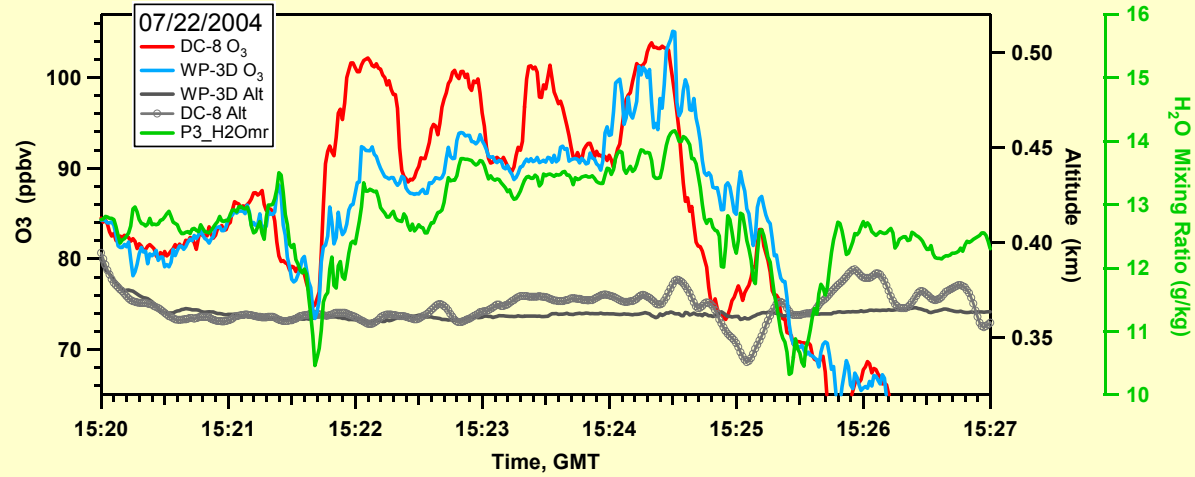
Filter Sampling Size Cut: < 8 µm

Effect of Inhomogeneity

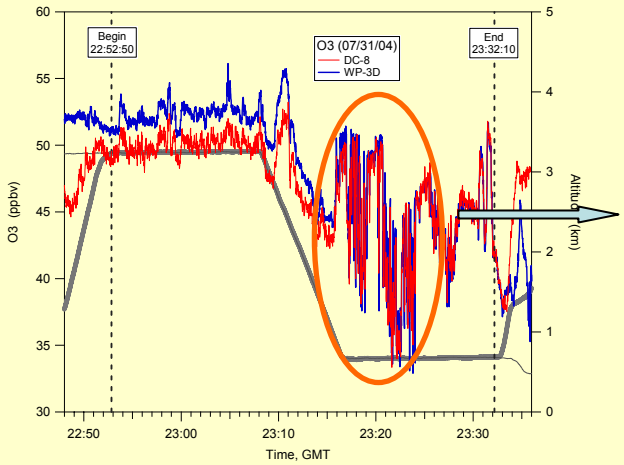


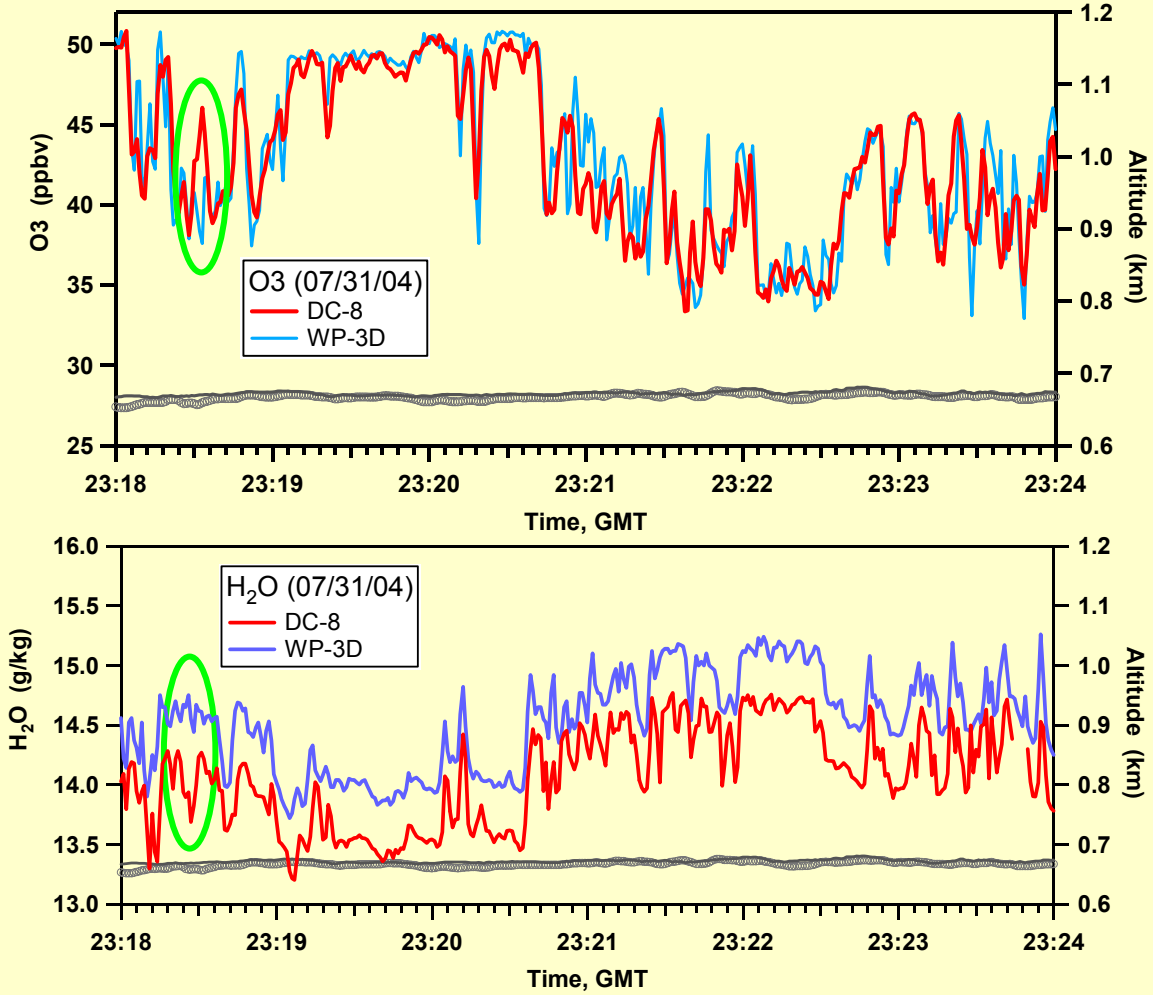




- DC-8 O_3 is highly synchronized with fast DLH H_2O observations; While WP-3D O_3 is correlated with WP-3D H_2O.
- The difference between DC-8 and WP-3D may be largely due to the inhomogeneity in the airmass.

Airmass Inhomogeneity ?





Summary

- Intercomparison process is still on-going, some final data are not submitted yet.
- High level of consistency is seen for many species with respect to their uncertainties.
- Some of the differences likely reflect airmass inhomogeniety and/or difference in sampling frequency and integration time.
- Intercomparisons are useful and necessary for future field mission involving multi-platforms.