In Situ Gas Phase Tracer Measurements During CSET

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Fast-Response In Situ O_3

	1 Hz, $\Delta t = 1$ sec	5 Hz, $\Delta t = 0.2$ sec
Sample flow (sccm)	180	500
Reaction Vessel Press, Temp	10 torr, 35°C	10 torr, 35°C
Plug flow "Flush" frequency	15 Hz	42 Hz
Pure NO flow (sccm)	1.5	4
Background (counts per Δt)	<500	<100
Sensitivity (counts per Δt per ppbv)	2000	400
Signal/Noise (S/N) at 20, 100 ppbv O_3	900, 4500	400, 2000
Precision	0.1 ppbv	0.2 ppbv

S/N = (signal-background)/2(background)$^{1/2}$

Accuracy and Overall Uncertainty:

- Multipoint calibrations
  - 5-7 repetitions over the course of the 6-week field phase
  - linear regression parameters have a 2% standard deviation normally distributed about their mean
- TEI UV absorbance calibrator
  - uncertainty of ±1 ppbv
- Overall uncertainty of fast-O_3 estimate:
  - ± (1 ppbv + 2% * O3MR)

In Situ Carbon Monoxide

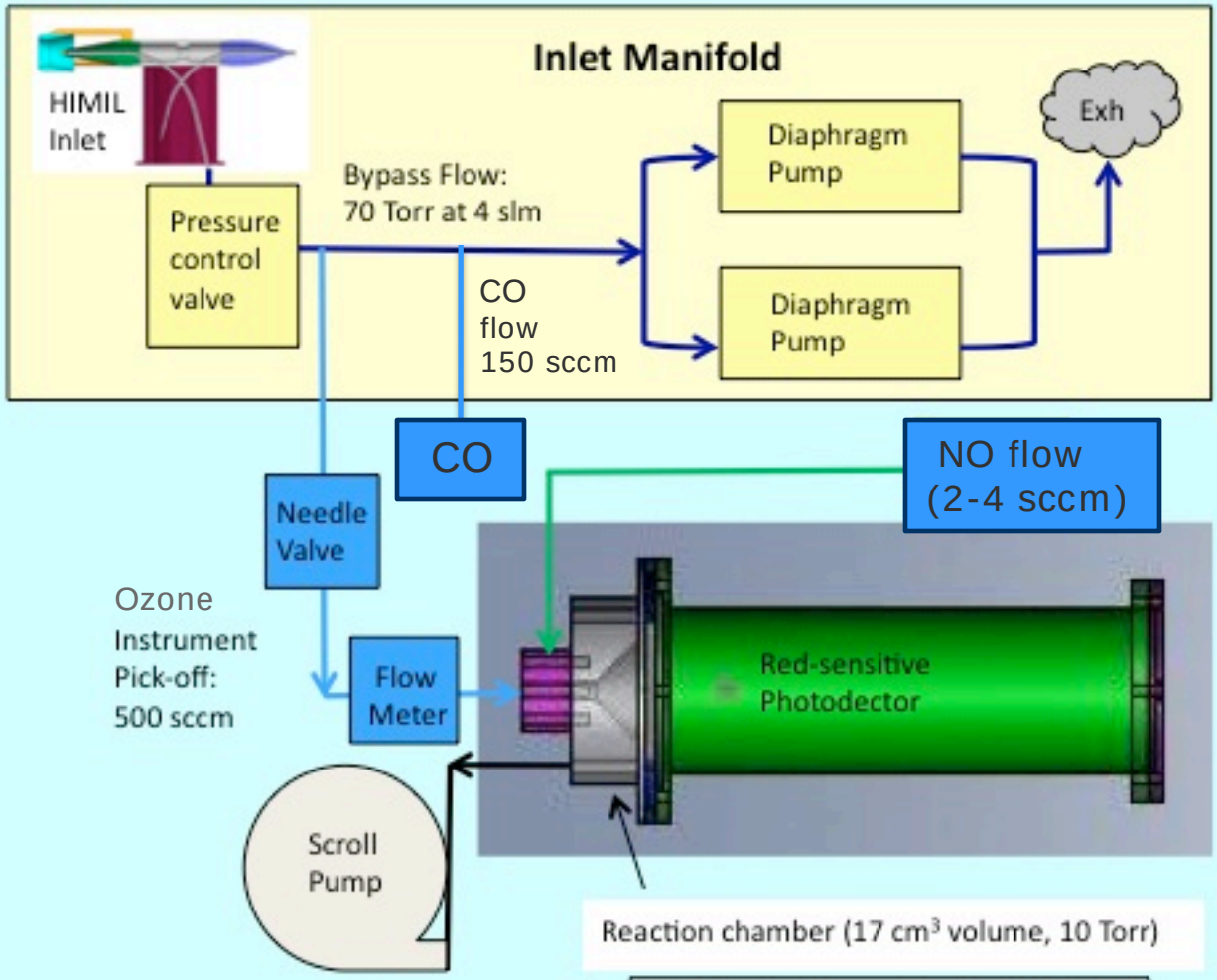
- Basic operating principle:
  - Aero-Laser vacuum UV resonance fluorescence
- Operating conditions:

Sample flow (sccm)	150
Reaction Vessel Pressure (torr)	10
Source wavelength (+/- 5 nm)	151
Emission bandpass (nm)	170 - 200
In-flight calibrations, 2-pt (duration/flight hr, mins)	2

- Performance specifications:

Frequency response (Hz)	0.5
Accuracy at 100 ppbv CO (ppbv)	2 ppbv ± 3%
Detection Limit (ppbv)	2
Linear range (ppbv)	2-10,000

Instrument Configuration



Relevant Chemical Reactions:

$O_3 + NO \rightarrow NO_2^* + O_2$

$\rightarrow NO_2 + O_2$

$NO_2^* \rightarrow NO_2 + h\nu$ (600 nm < λ < 2800 nm)

$NO_2^* + M_i \rightarrow NO_2 + M_i$