

TORERO NSF/NCAR GV Chemical Tracers

- **CO**

VUV resonance fluorescence

Source wavelength: 151 nm

CO emission wavelength: 170-200nm

3 ppbv detection limit

.5-1 Hz freq response

5-10% accuracy



- **CO₂ and CH₄**

Wavelength-scanned cavity ringdown absorbance

5 Hz freq response

(presently sensitive to aircraft accelerations)

Precision specs:

250 ppbv CO₂ (1 σ , 0.2-sec average)

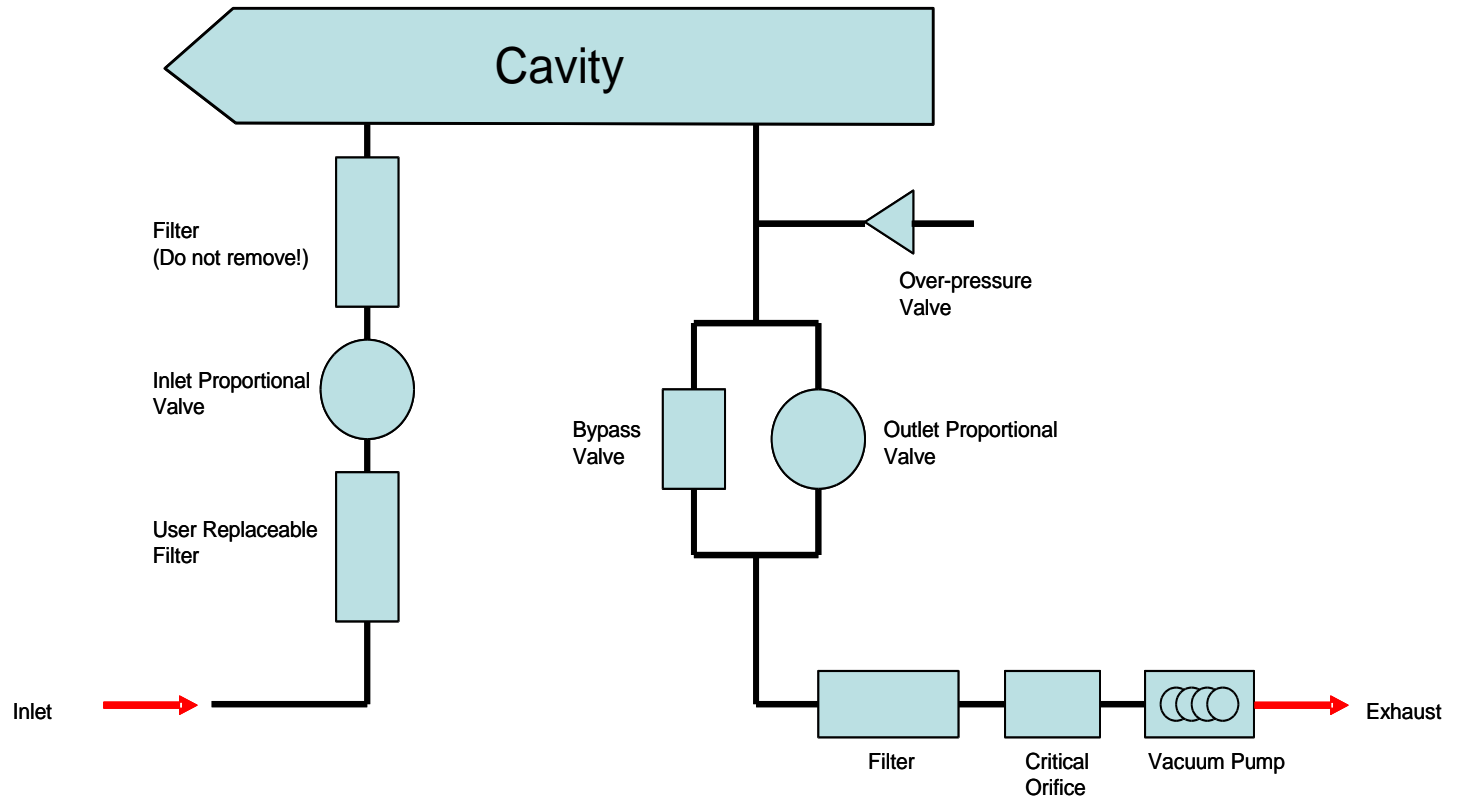
3 ppbv CH₄ (1 σ , 0.2-sec average)



- **Calibration plan**

- Both instruments will be calibrated 2/hr in-flight from the same cylinder, each with a 4 min duration.
- It is possible to alter this cycling if desirable
- Also have control of single-event cancellation

Normal Mode-Flight



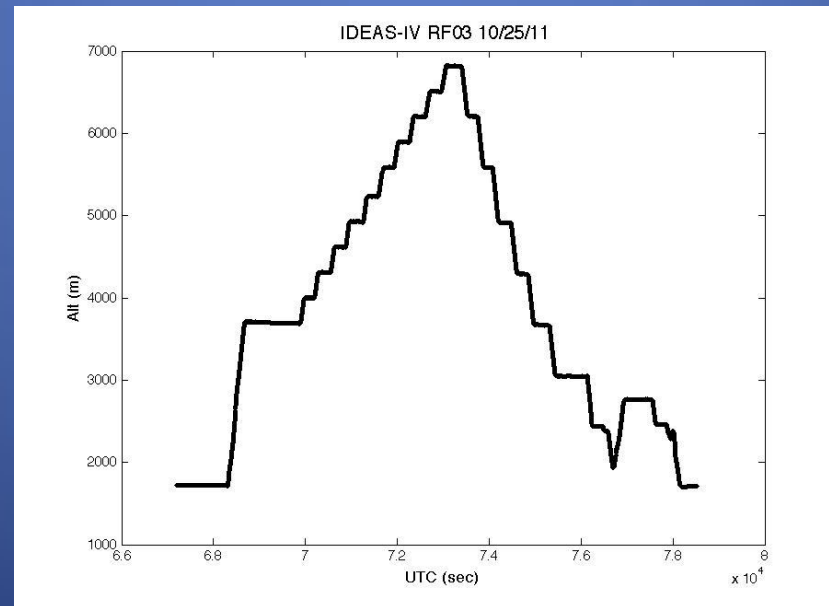
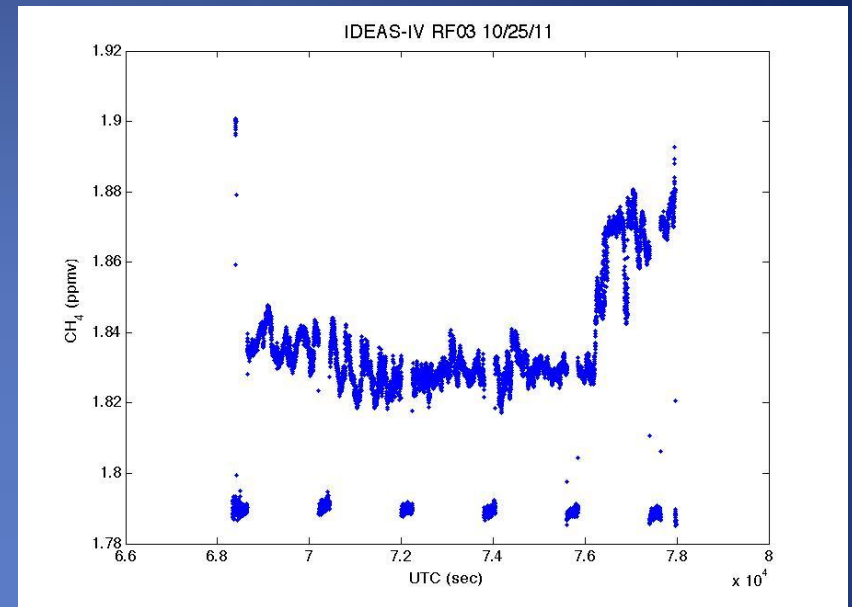
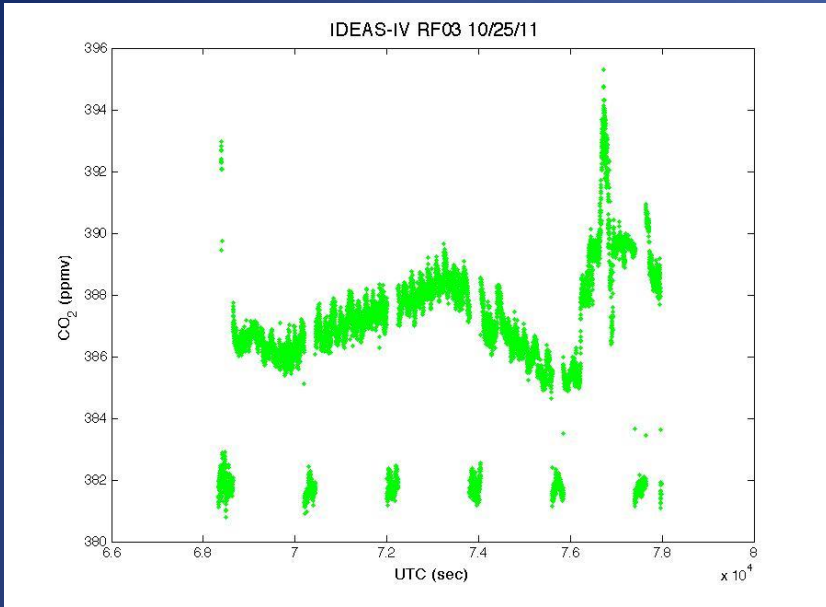
Sequence

1. All valve start closed. Pressure control set to outlet valve.
2. Outlet proportional valve opens until cavity pressure = 20 Torr.
3. Bypass Valve opens.
4. Outlet proportional valve set to max open.
5. Pressure control set to inlet valve.
6. Inlet valve opens until 140 Torr is reached.
7. Steady-state.

Initial Impressions of Picarro G1301 CO₂ and CH₄

Calibration stability during ~2.5 hours of an ICARE flight (2010)

UT (sec)	Alt (km)/ σ	CO ₂ (ppmv)/ σ	CH ₄ (ppmv)/ σ	n (sec)
71700	6.64 (.003)	389.56 (.09)	1.750 (8.3e-4)	150
75830	6.89 (.001)	389.45 (.07)	1.751 (5.5e-4)	100
80000	2.49 (.002)	389.52 (.16)	1.751 (8.4e-4)	150
80300	2.23 (.002)	389.51 (.14)	1.751 (8.4e-4)	100
80610	1.72 (.001)	389.57 (.11)	1.754 (1.2e-3)	50



Picarro Wavelength-Scanning Cavity Ringdown Spectroscopic Instrument for Airborne In Situ CO_2 and CH_4 Analysis:

