Quantum Cascade Laser Spectrometer (QCLS) for ORCAS: CO_2, CH_4, CO, N_2O

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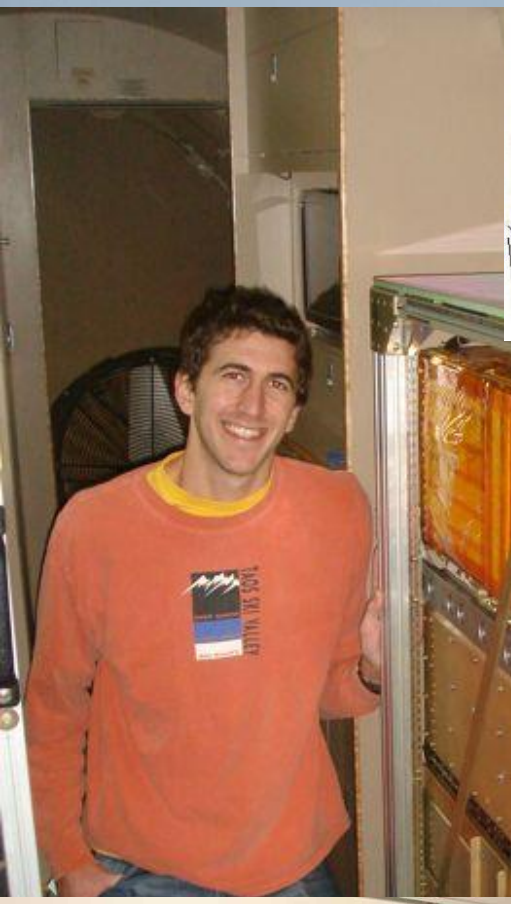
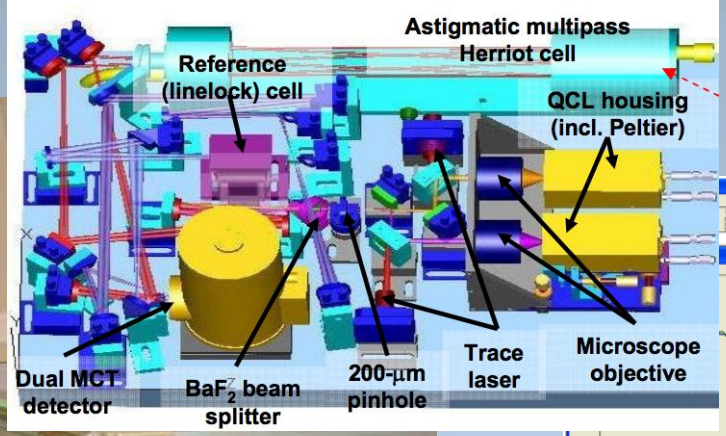
Et al.

QCLS

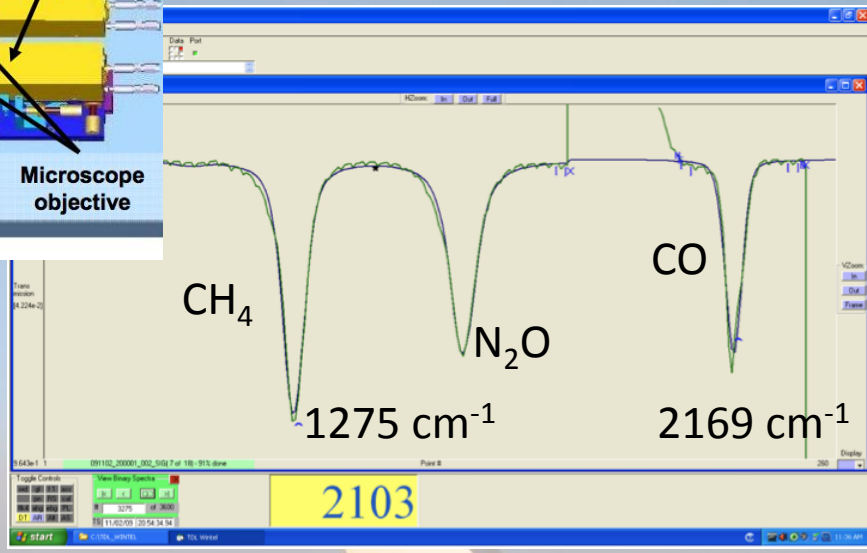




‘DUAL’

2 Lasers

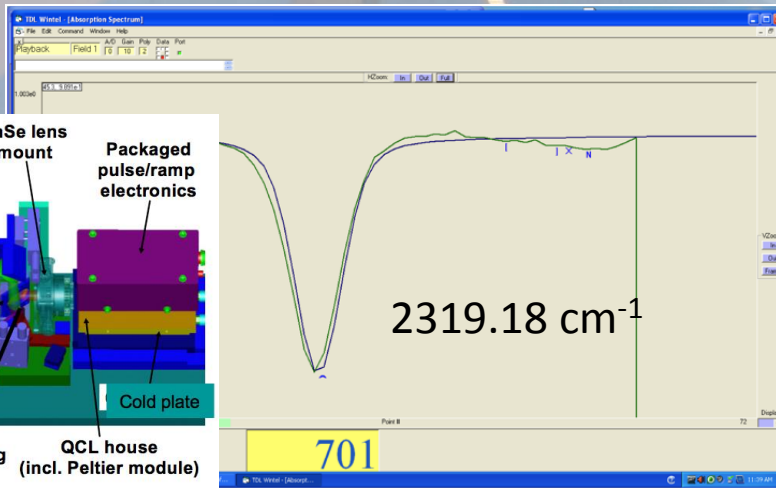
76m compact multi-pass cell

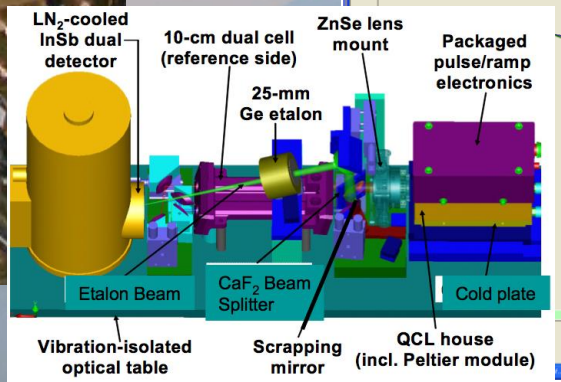


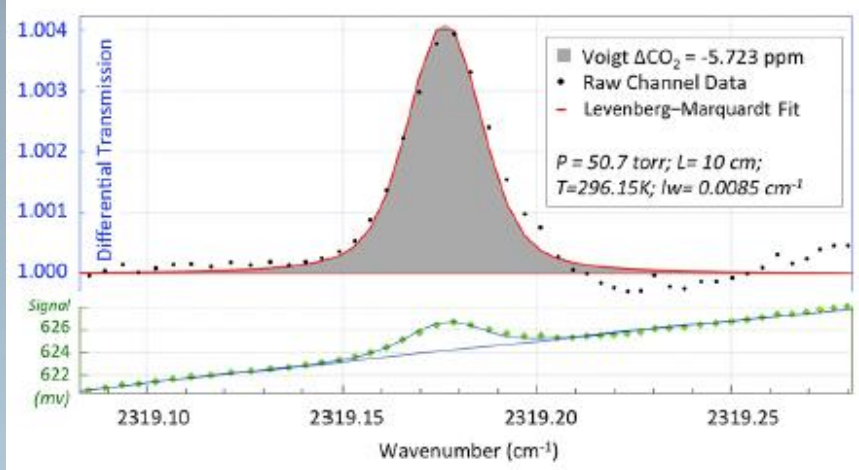
‘CO2’

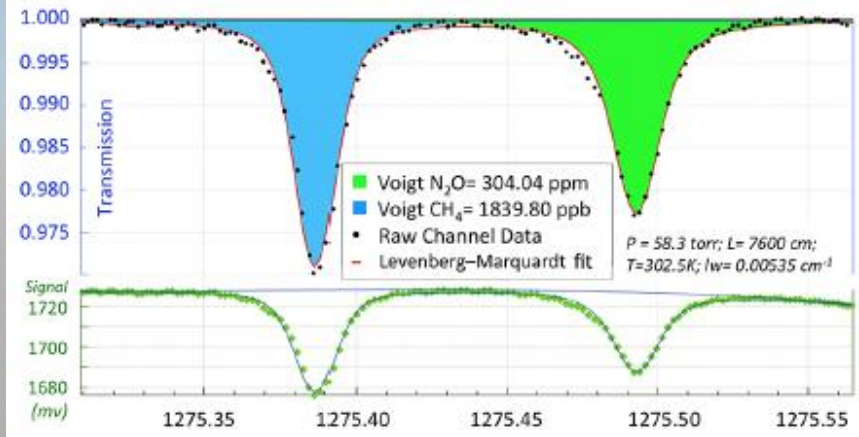
Differential Measurement

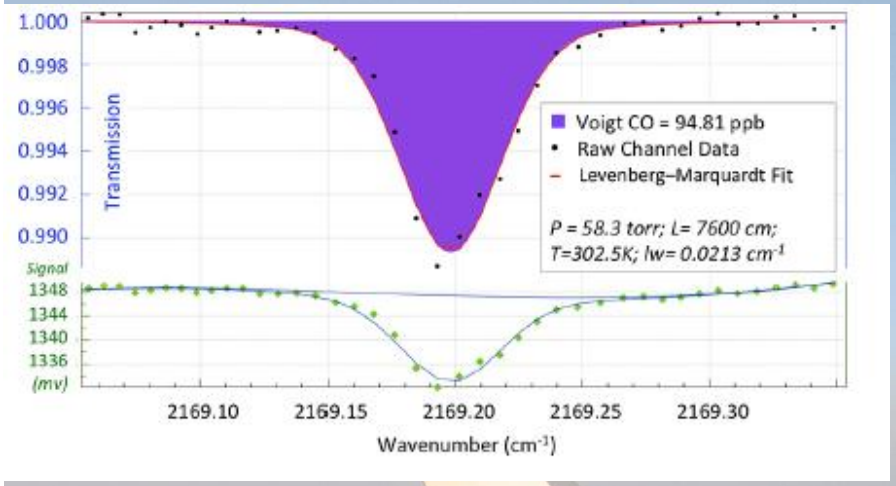
2- 10cm cells, sample and reference







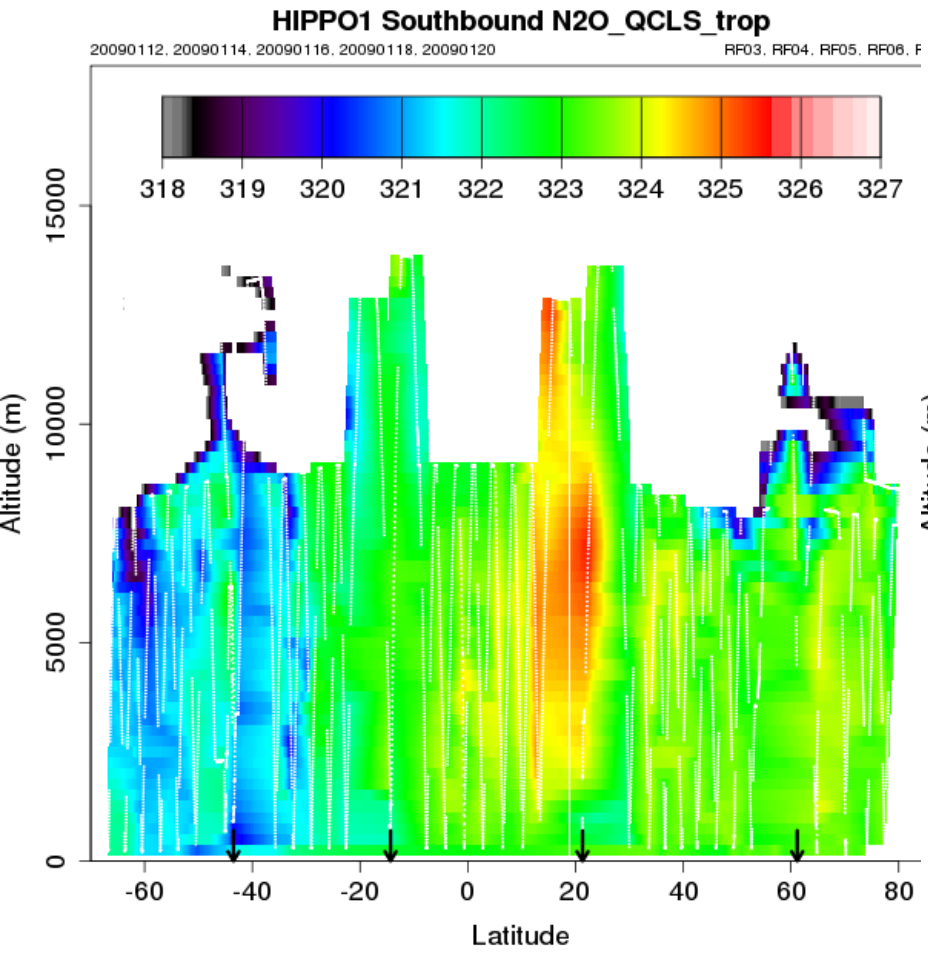


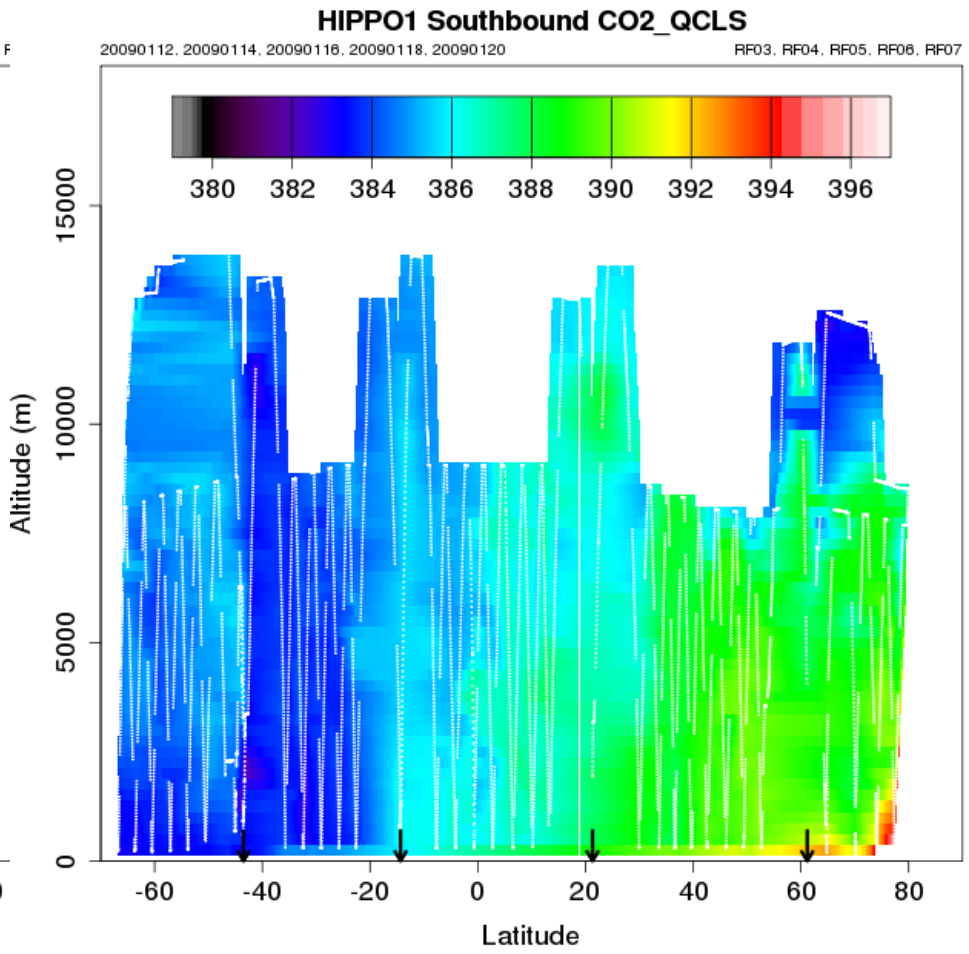


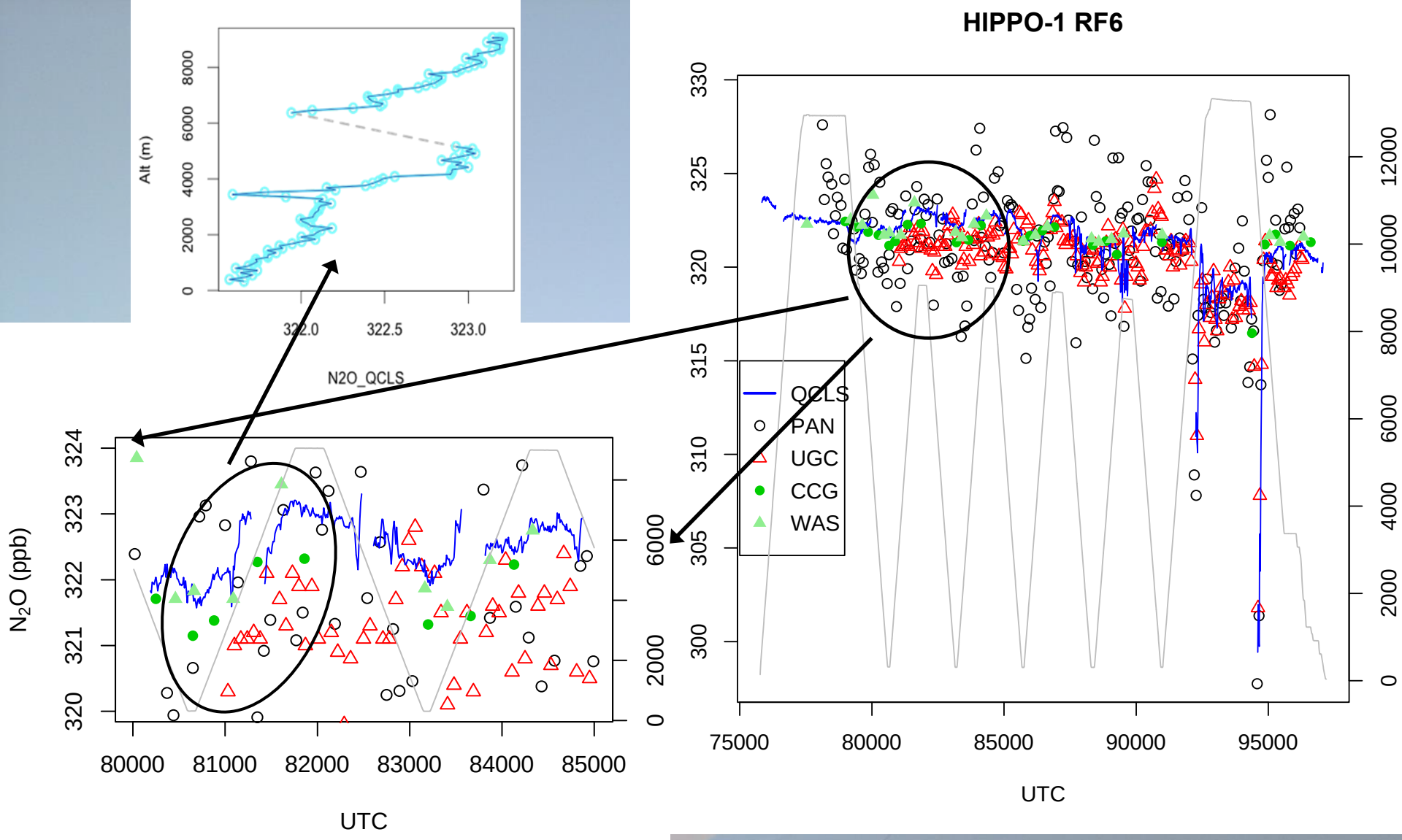
1σ Allan Precision (ppb)

	1 s		10 s		100 s		
Species	flight	lab	flight	lab	flight	lab	Accuracy (ppb)
CO_2	20.	13	20.	2.3	27	1.7	100
CH_4	0.52	0.50	0.28	0.18	0.47	0.09	1
N_2O	0.089	0.080	0.037	0.038	0.021	0.024	0.2
CO	0.15	0.15	0.15	0.041	0.24	0.018	3.5

Sample Data


HIPPO1 Southbound N2O_QCLS_trop
20090112, 20090114, 20090116, 20090118, 20090120
RF03, RF04, RF05, RF06, F
318 319 320 321 322 323 324 325 326 327
Altitude (m)
0 5000 10000 15000
-60 -40 -20 0 20 40 60 80
Latitude


HIPPO1 Southbound CO2_QCLS
20090112, 20090114, 20090116, 20090118, 20090120
RF03, RF04, RF05, RF06, RF07
380 382 384 386 388 390 392 394 396
Altitude (m)
0 5000 10000 15000
-60 -40 -20 0 20 40 60 80
Latitude



High precision

Deployment history

- START08; 2008
- Pre-HIPPO; 2008
- HIPPO1; 2009
- HIPPO2; 2009
- HIPPO3; 2010
- CALNEX; 2010
- HIPPO4; 2011
- HIPPO5; 2011

Upgrade/upkeep plans

- Get up and running again in lab
- Recertify gas cylinders
- Replace laser chiller flow detector
- Flush & test laser chiller
- Update windows computer & test
- Optical alignment (cell as well?)
- Calibrate new gases to NOAA/WMO standards
- Refresh pump

Mission specific

- Primary field needs:
  - Dry Ice
  - Liquid Nitrogen
- 1.5+ hr preflight (depending on aircraft temperature, climatological looks ok if we are parked on tarmac)