

# VCSEL Hygrometer



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# VCSEL Hygrometer



- Vertical Cavity Surface Emitting Laser
- Developed by Southwest Sciences: Mark Zondlo (now at Princeton), Mark Paige, Joel Silver.
- GV instrument since ~2008
- Typically on top right aperture plate



# VCSEL Hygrometer

- open path, multi-pass (375 cm) absorption cell.
- Two wavelengths (1853.3, 1854.0 nm), three operating modes.
- Mode changes at about  $-20\text{ }^{\circ}\text{C}$ ,  $-60\text{ }^{\circ}\text{C}$
- Typically lose a few seconds of data during mode change.



# VCSEL Hygrometer

- Dewpoint from  $-85\text{ }^{\circ}\text{C}$  to  $+20\text{ }^{\circ}\text{C}$
- Sensitivity  $\sim 0.1\text{ ppm}$  (SNR=1, 1 Hz)
- Sample rate 25 Hz
- Accuracy  $\sim 5\%$
  
- Maintenance: Cover between flights, mirror cleaning as needed.

# VCSEL Hygrometer



- Lower operating dew point ( $-85^{\circ}\text{C}$ ) than chilled mirror hygrometers ( $-65^{\circ}\text{C}$ ).
- Fast response (25 independent samples per second).
- Doesn't flood or overshoot.

# VCSEL Hygrometer

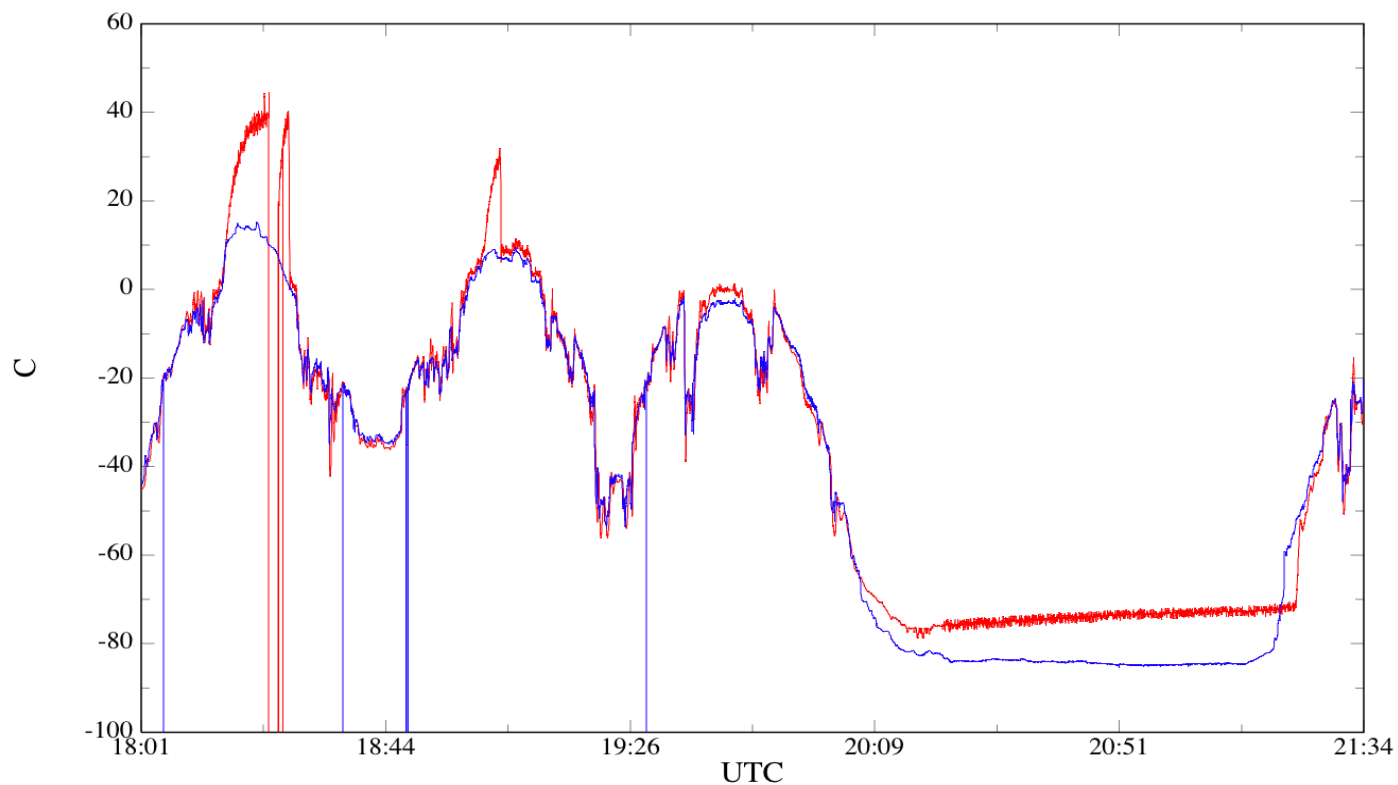


Stuart Beaton, Mon Oct 31 10:51:44 2011

### HIPPO-4, Flight #rf10

07/07/2011, 18:01:30-21:34:00

This plot contains preliminary data



— DP\_VXL ( C ), 1 s/sec  
— DPXC ( C ), 1 s/sec

	mean	sigma	min	max
DP_VXL ( C ), 1 s/sec	-40.24	34.53	-85.36	15.35
DPXC ( C ), 1 s/sec	-36.56	32.91	-78.78	44.61