

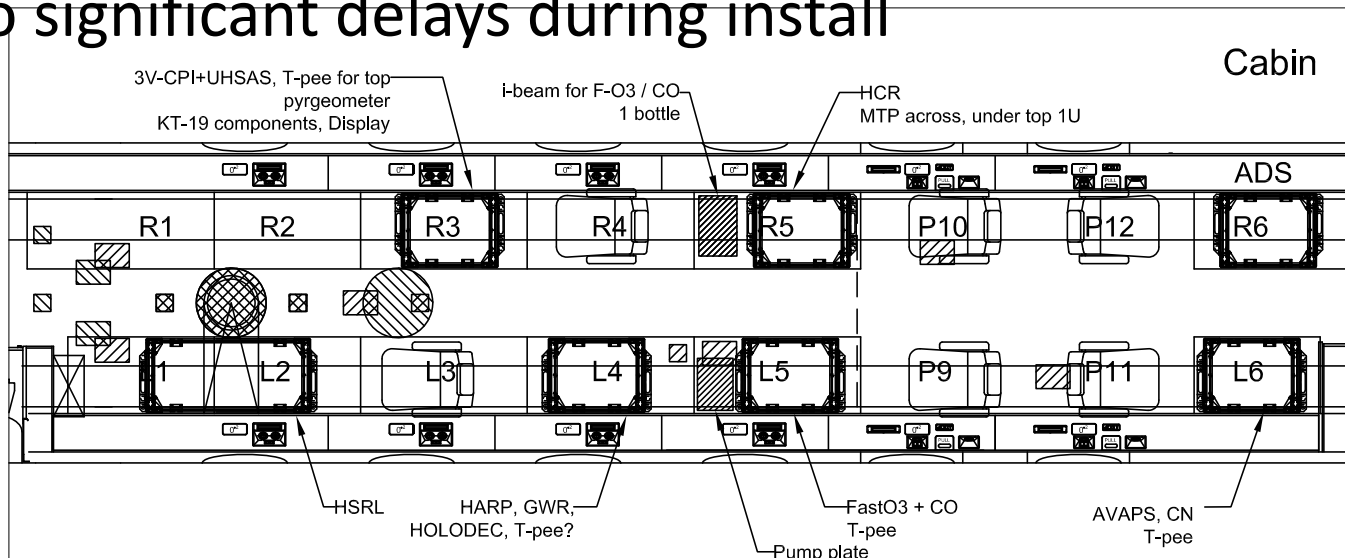
# CSET Operations Debrief

29 Oct 2015



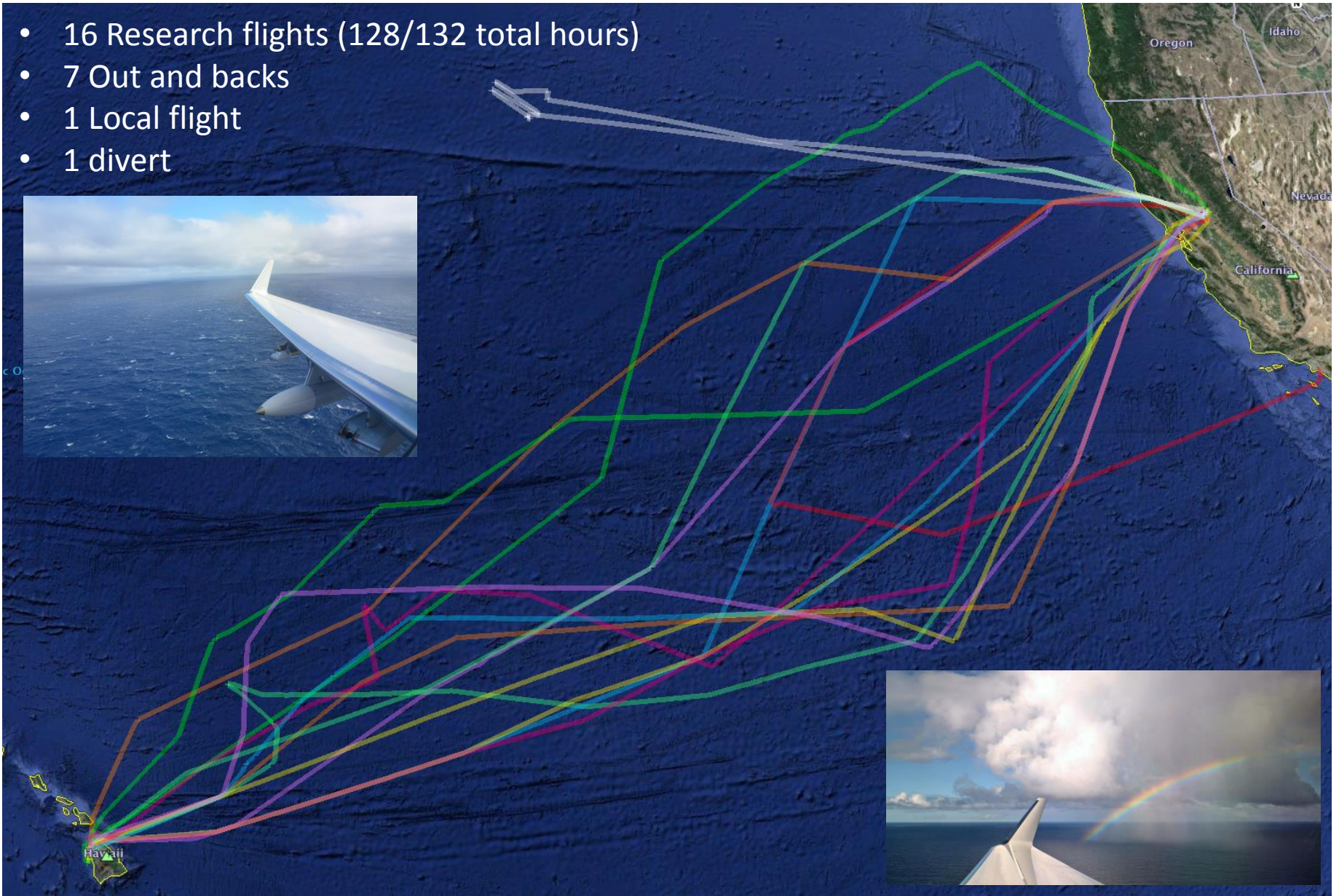
# Payload/Upload

- Upload scheduled for 7 weeks
  - Appropriate in times of limited resources
  - All instruments had flown previously
- Payload
  - HOLODEC repair
  - HARP stabilized platforms
  - HSRL
  - No significant delays during install

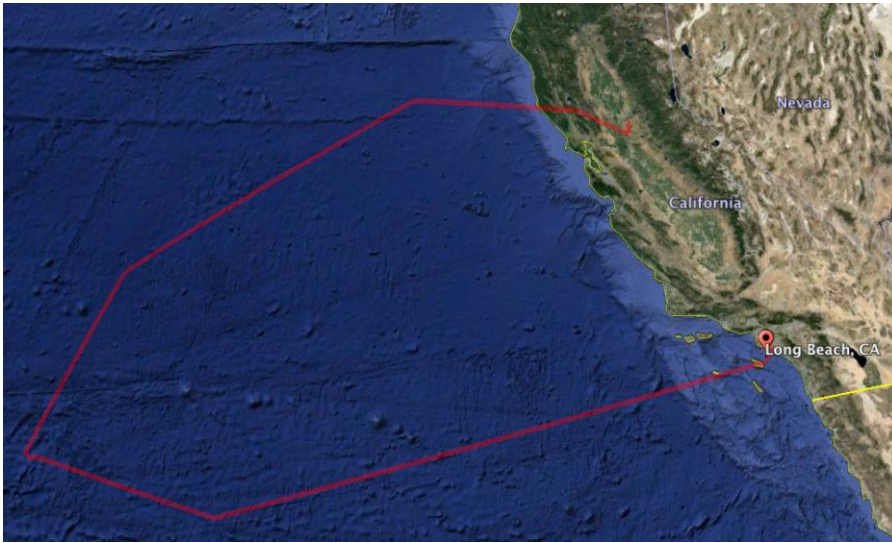


# Operations

- 16 Research flights (128/132 total hours)
- 7 Out and backs
- 1 Local flight
- 1 divert



# Operations (RF01)



- RF01: Divert to Long beach – GulfStream service center (1-6 Jul, Science crew returned to Mather on 3 Jul)
  - Right generator failed on startup and then descent
  - Significant effort by GulfStream to identify/repair
  - Would have been difficult to troubleshoot

# Operations

- EOL me support
- GV crew
- Limited support



CAR GV  
V & instrument support  
nnel



- Ops center
- Science/PI team
- EOL Field Catalog personnel



Kona



UW

Mather

Pacific Ocean

Queen Charlotte Sound

Vancouver Island

British Columbia

Rocky

Oregon

California

# Operations/Logistics

- Mather support
  - Typical GV support (GSE, hangar workspace for instrument teams, etc.)
  - Small scientist work space at hotel (primary data transfer location) – negotiated for more space
  - Workspace at airport – very basic facility, but worked
  - Schedule

	Jul							Jul							Jul						
	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
<b>Actual</b>	CA-HI	MX	MX	HDD	MX	MX	CA-HI	MX	HI-CA	HDD	MX	CA-HI	MX	HI-CA	HDD	MX	CA-HI	MX	HI-CA	HDD	MX
	RF01	GV Repair					RF02		RF03			RF04		RF05			RF06		RF07		



5-Day Cycle...

# Operations/Logistics

- UW Support
  - Ops center/daily planning meeting/weather forecasting & flight planning
  - PIs rotated from UW – Mather for GV support
  - Communications – 1-2 minor problems
  
- Kona support
  - Crew logistics seemed to work well
  - Very limited instrument support as planned



# Instrument Performance

- In-Situ/HAIS Instrumentation

- Satcom

- GPS

- State parameters

- Td behavior: Typical cold-soaking

- T, VCSEL, wind: No issues

- MTP: **Overheating** during extended low-level work

- In-flight shut off procedures established

- Aerosol Measurements

- UHSAS: **Overheating** during extended low-level work

- CN: First time flown on GV





# Instrument Performance

- In-situ/HAIS Instrumentation
  - 3V-CPI: Computer failure during RF10/11
    - Flew support to Sacramento
  - Cloud probes
    - HOLODEC – several failures early on
      - Team effort to repair: MT, RAF, RSF
  - HARP: Failure during RF07 – Repaired as soon as GV returned to CA
  - CO/O3: No issues
  - Data system
    - One flight with remote temperature failure / DSM reboot confusion

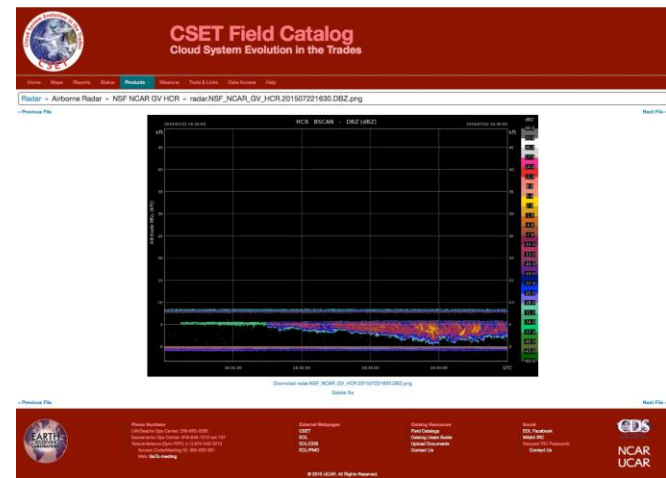


# HCR Operations

- One designated operator during CSET
- Initial tuning on operating limits for nadir ops (remove altitude limits)
- Total of 125 hours of time-series data was collected
- On-board, real-time radar display for scientists
- 5-minute quick-look images to field catalog
- Two Real-time synchronized USB drives - immediate data accessibility
- Effective model to data archive to NCAR's HPSS
- Provided preliminary copy of time-series data to PIs

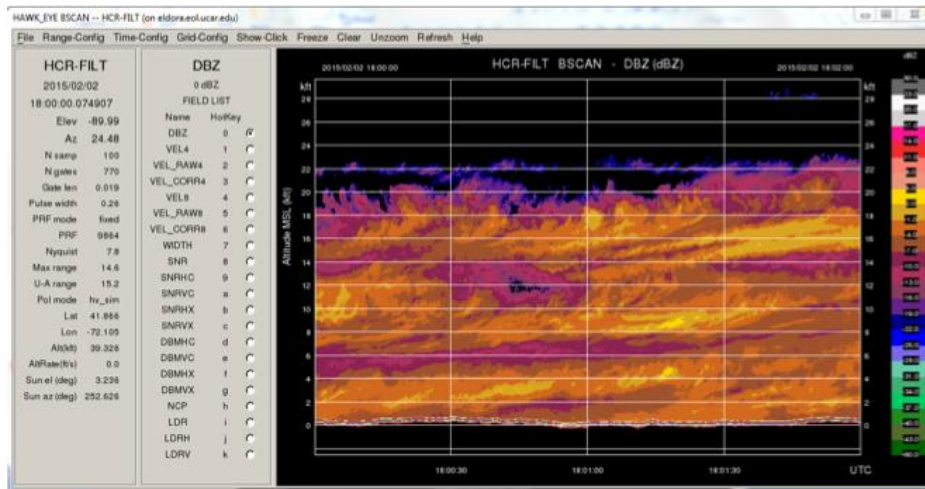


Courtesy of J. Emmett.



# HCR Operations

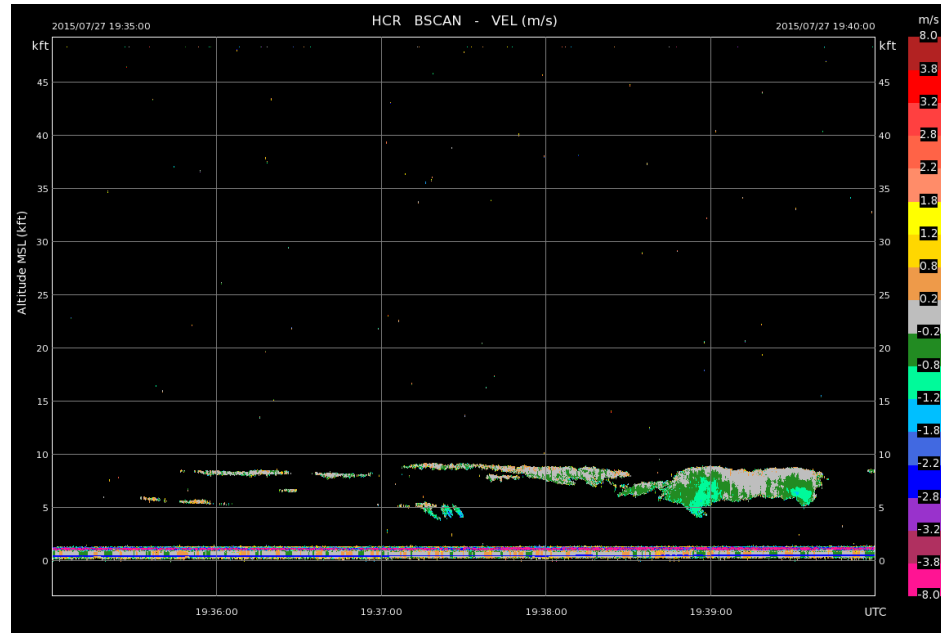
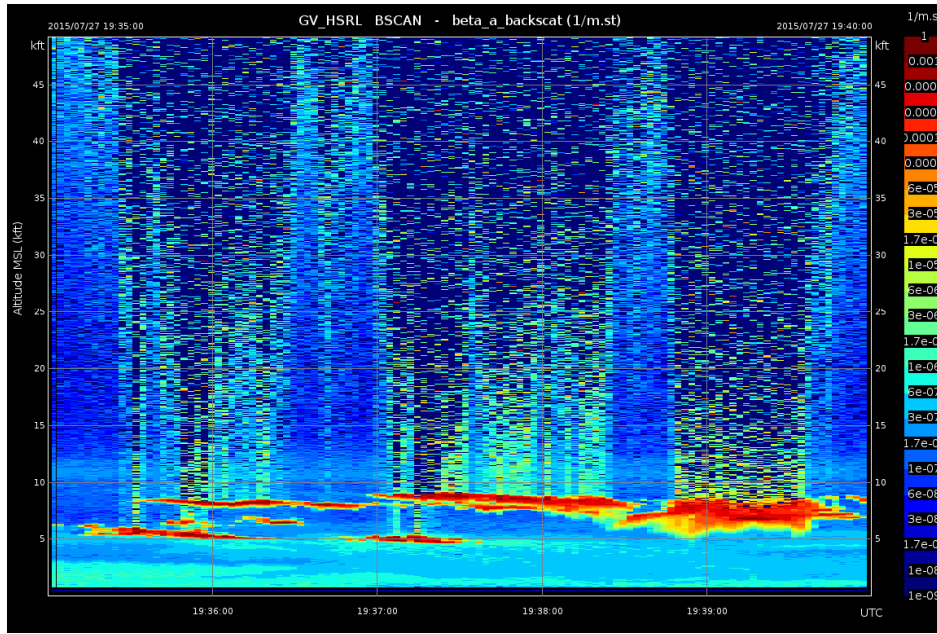
- HCR runs smoothly throughout the project with minor issues:
  - ➔ Slow drift from inertial navigation system - slow surface velocity drift
  - ➔ Three events of transmitter shutoffs and communication lost.
  - ➔ Occasional INS instability
  - ➔ Brief transmitter dropouts and communication loss (~5 minutes)
- Other accomplishments :
  - ➔ Ocean surface scans for overall system calibration
  - ➔ On-board receiver calibration every flight
  - ➔ Established standard calibration procedure and maneuver



# HCR/HSRL Observation

LIDAR

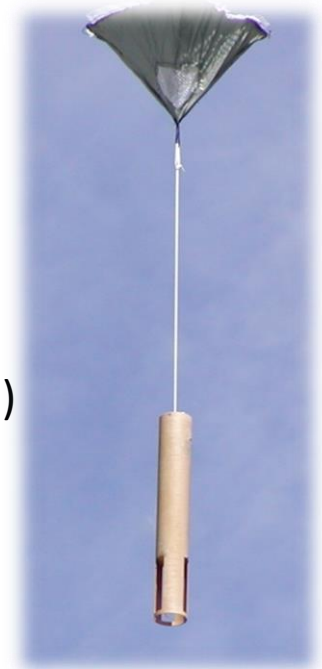
RADAR



multi-layer clouds

# CSET Dropsonde Summary

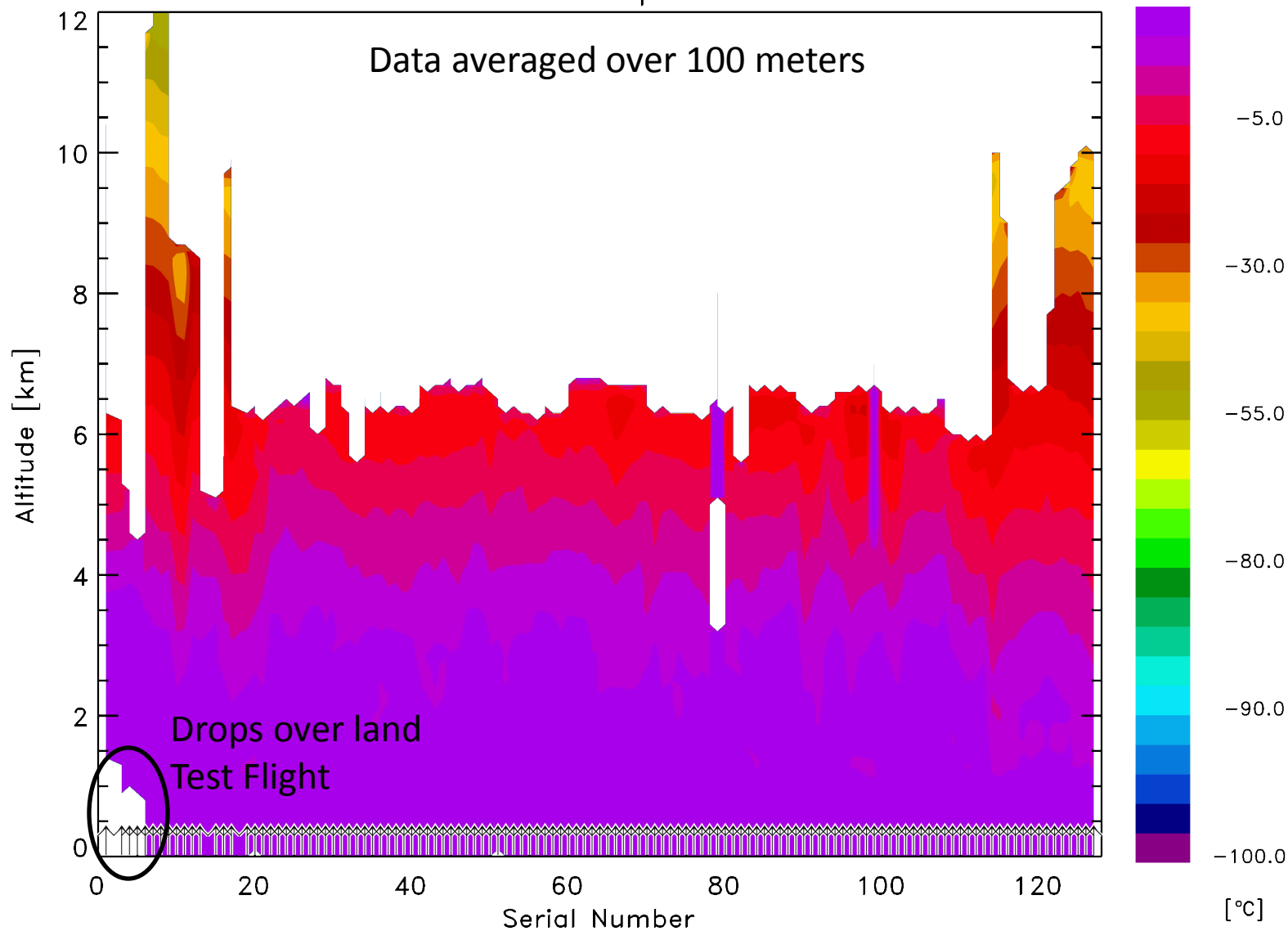
- 120 dropsondes requested
- 120 dropsondes deployed
- Sondes dropped on all flights RF01 to RF16
- Median of 8 sondes dropped per flight
- 112 Dropsondes with good PTH and wind data
- Preliminary Sonde data issues
  - 3 soundings (~1.5%) were fast falls (no usable PTH or wind data)
  - 1 damaged Temperature sensor
  - 2 poor winds near surface (950 mb to surface)
- Preliminary sounding success rate: 95% (114 of 120)
- All flights with remote control from ground, no dropsonde operator on G-V
- Aircraft System issues on three flights
  - RF03 one sonde was removed from launcher due to bad T-sensor
  - RF12 one sonde was removed from launcher due to no communications to sonde
  - RF15 one sonde did drop into the tube
- Final Post Data Quality Control to be completed in January



# CSET Preliminary Temperature

## All Soundings

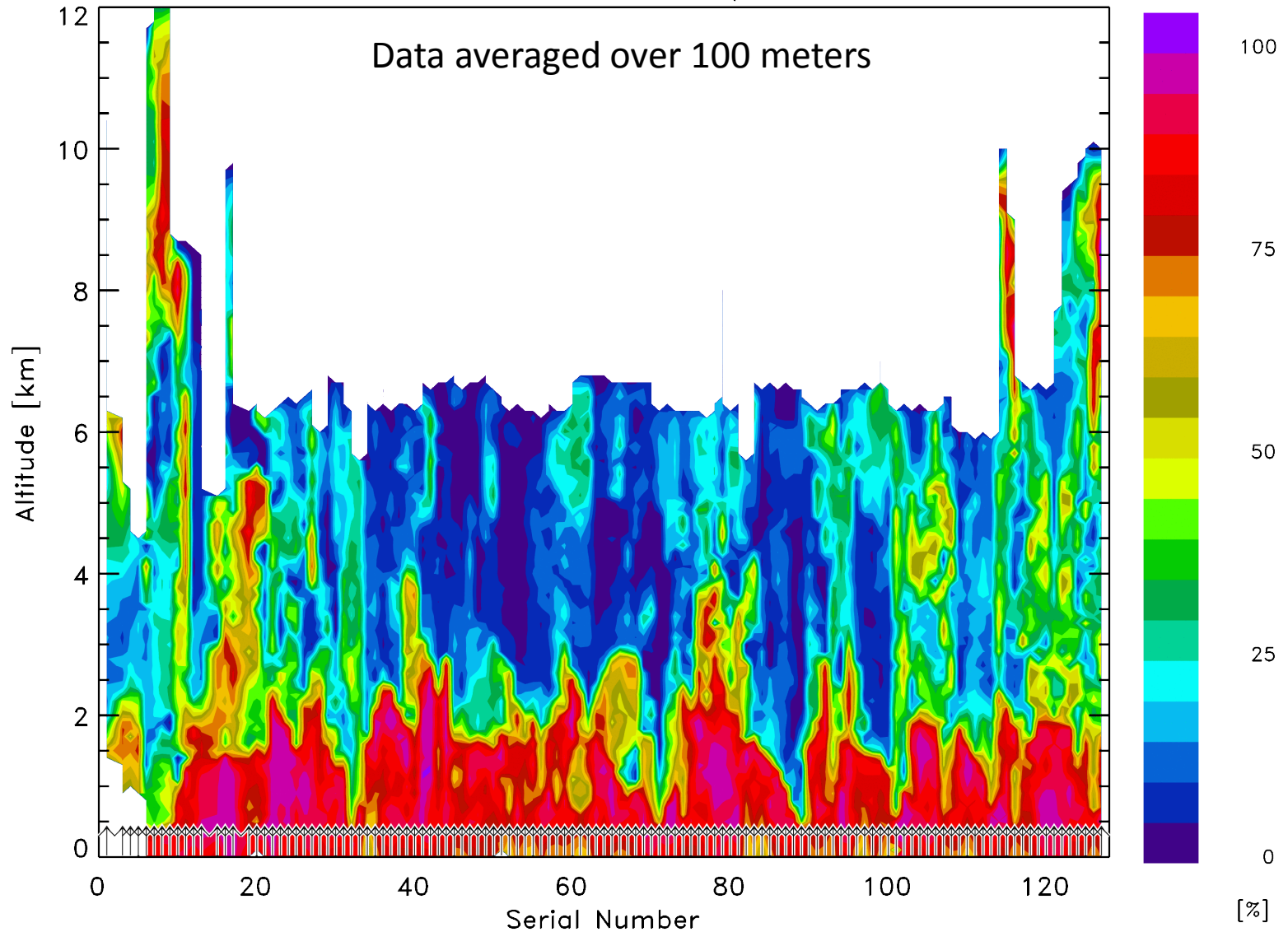
Ambient Temperature



# CSET Preliminary Humidity Data

## All Soundings

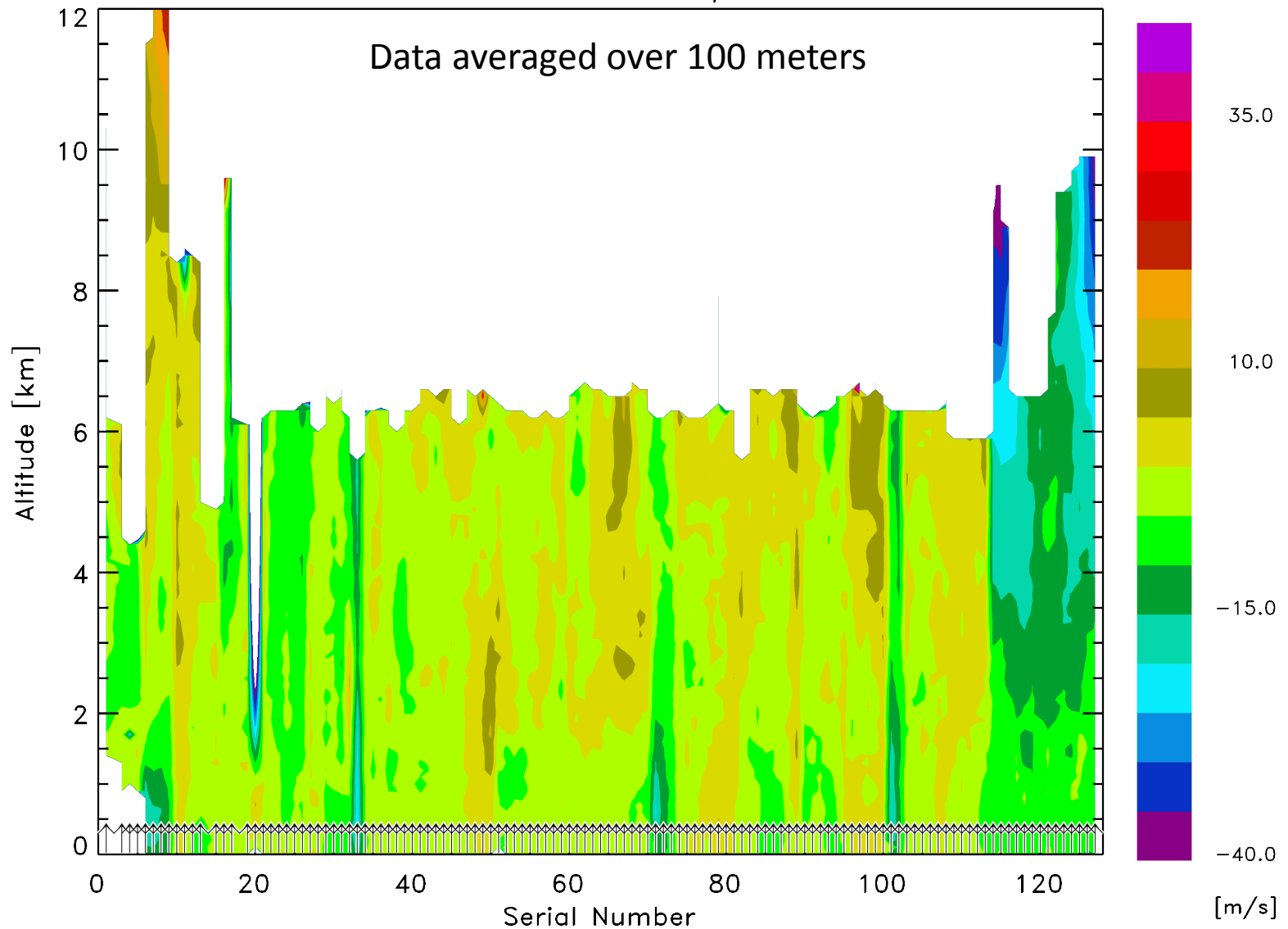
Relative Humidity



# CSET Preliminary Wind Data

## All Soundings

Meridional Wind Speed





# HSRL

CSET Operations

16 Research Flights

107+ Hours of data - no lost data

53 Gbytes of data

Near real-time 5 minute images of backscatter and depolarization data sent to the field catalog starting on July 7, RF02

Hour images of backscatter and depolarization added to field catalog after the GV returned to CA

# HSRL

## Pre-deployment hardware issues

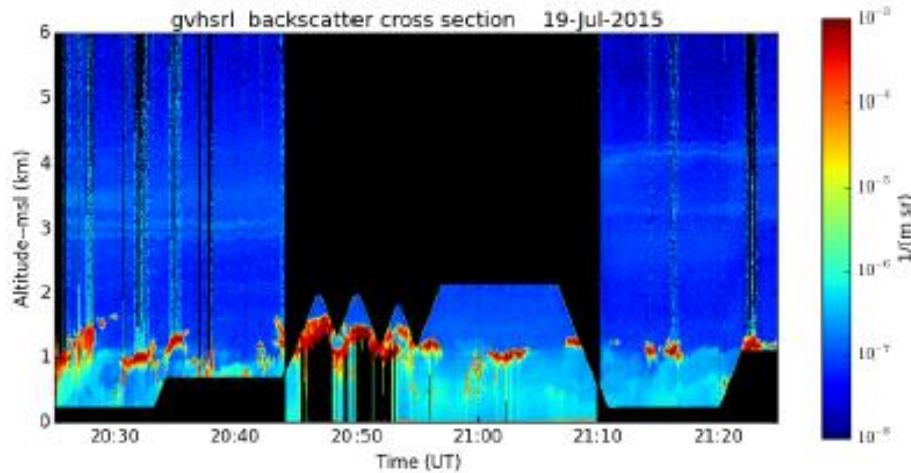
Laser chiller failed - chiller replaced with no issues for the rest of CSET

## CSET field deployment data quality

The molecular channel detector has a higher noise level than expected but this did not impact the data quality for this project. It could have an impact on the retrieval of weak aerosol backscatter at ranges greater than 15km.

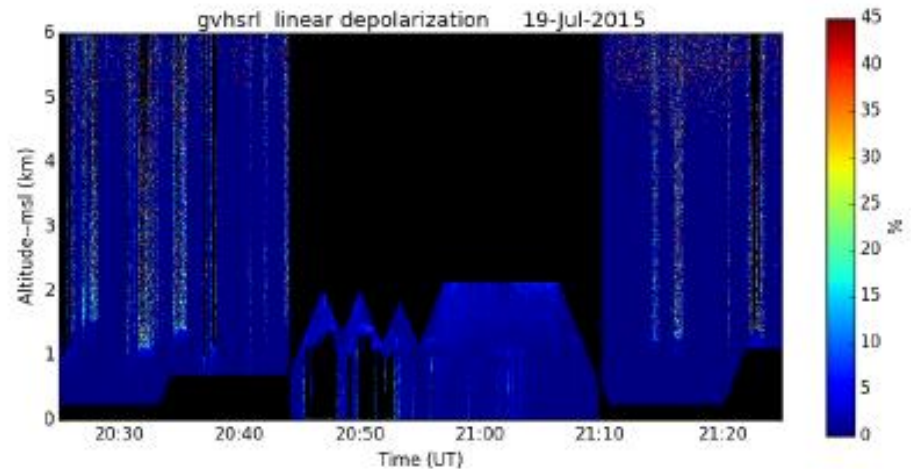
# HSRL

RF07 July 19, 2015  
Typical CSET  
sample profile



Depolarization

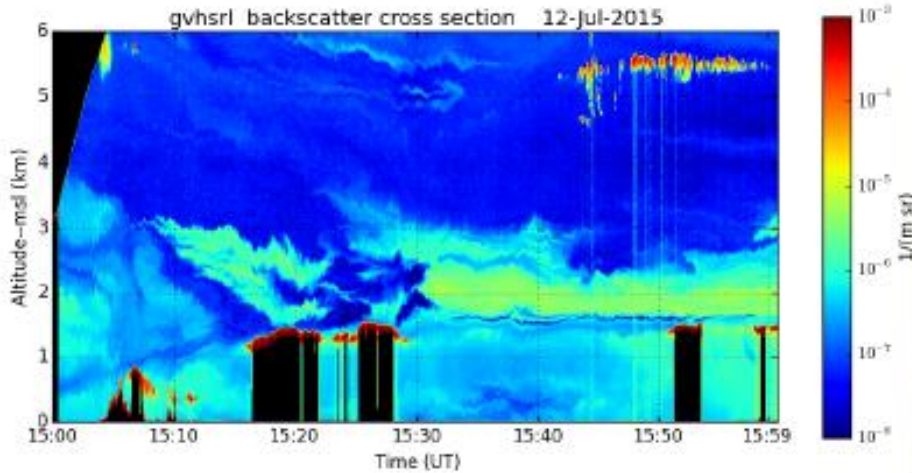
Backscatter cross  
section



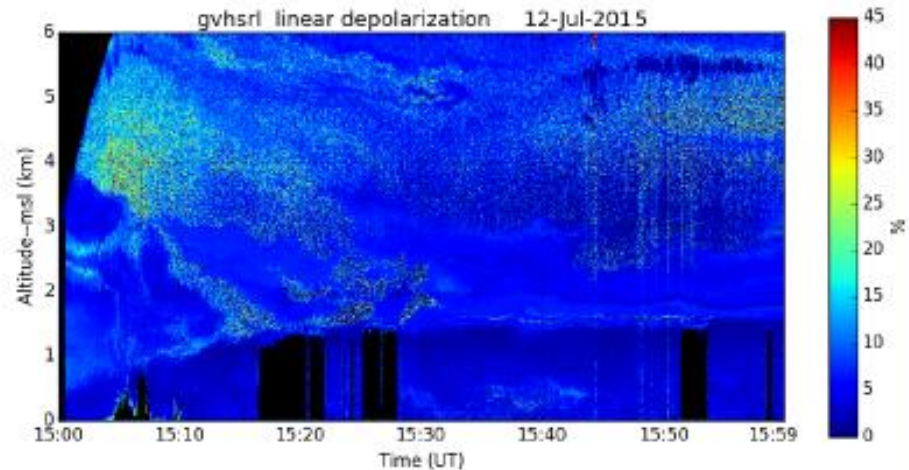
# HSRL

RF04 July 12, 2015  
Aerosol structure  
off the coast of CA

Depolarization



Backscatter cross  
section



# HSRL

Field catalog data access

Hour and 5-minute images

<http://catalog.eol.ucar.edu/cset>

University of Wisconsin- Madison

Data perusal web tool

[http://hsrl.ssec.wisc.edu/by\\_site/30/2015/07/07/pm/#GVHSRL](http://hsrl.ssec.wisc.edu/by_site/30/2015/07/07/pm/#GVHSRL)

# Lessons Learned

- Develop a detailed support plan for jointly supported instruments (i.e., HOLODEC)
- Mather is extremely easy to operate out of
- Continue to exploit outside expertise for resolving complex issues
- Potential model for remote ops center/multiple deployment locations
  - At least one PI/decision maker on site is essential
  - Expectations laid out beforehand (fully understand requirements) – instrument support/workspace/concept of operations

# Wrap Up

- Fairly straightforward/successful GV project
- Good teamwork/relationship between EOL facilities, PI team, and Universities
  
- Final thoughts
  - NSF
  - PI Team
  
- Other thoughts/questions?
  
- Thanks to Jonathan Emmitt, Rob Wood, John Allison, and Chris Bretherton for the photos!