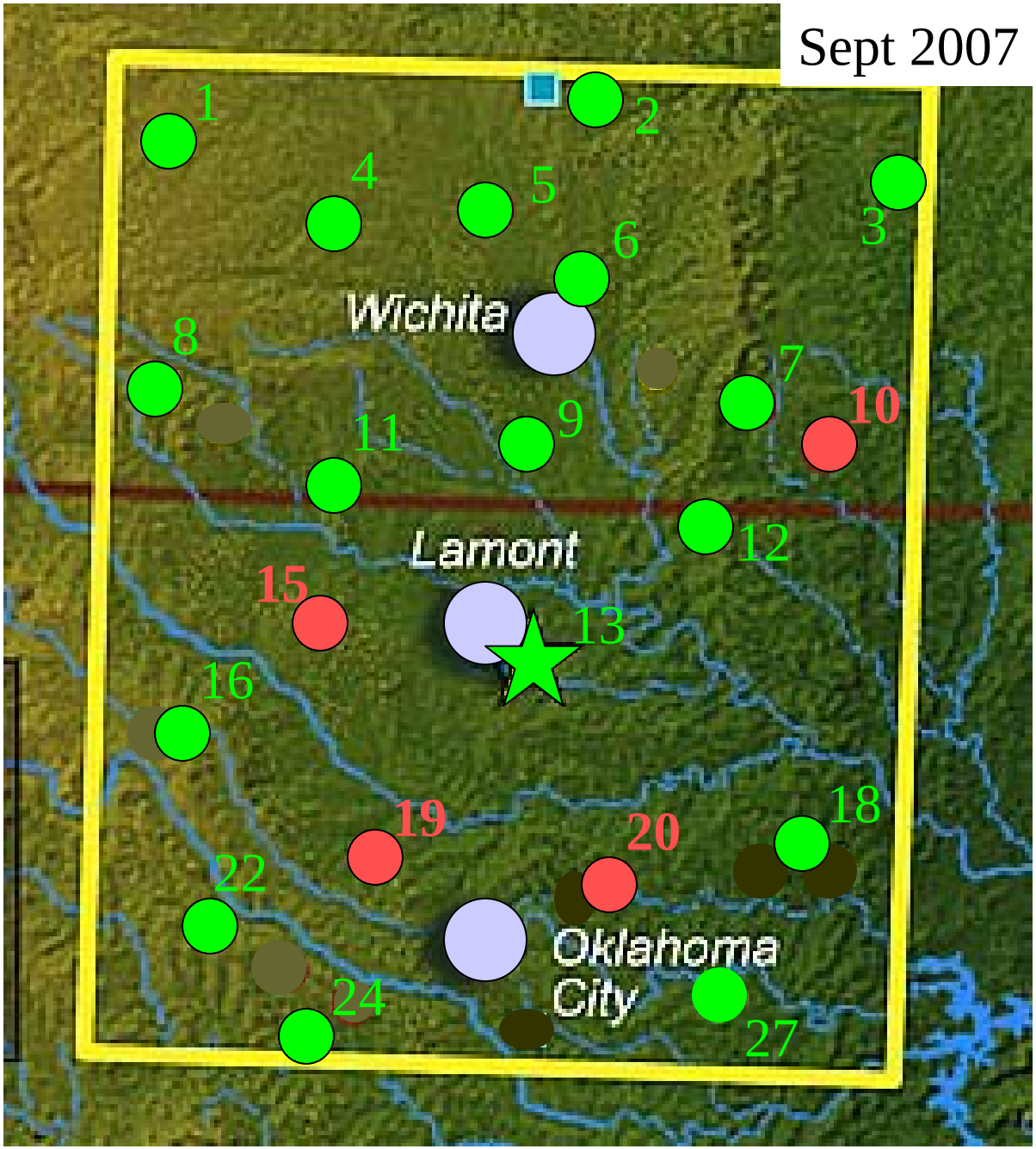
Gary Hodges

MFRSR – Multi-Filter Rotating Shadowband Radiometer

MFR – Multi-Filter Radiometer
NIMFR – Normal Incidence Multi-Filter Radiometer
NFOV – Narrow Field-Of-View


Sept 2007
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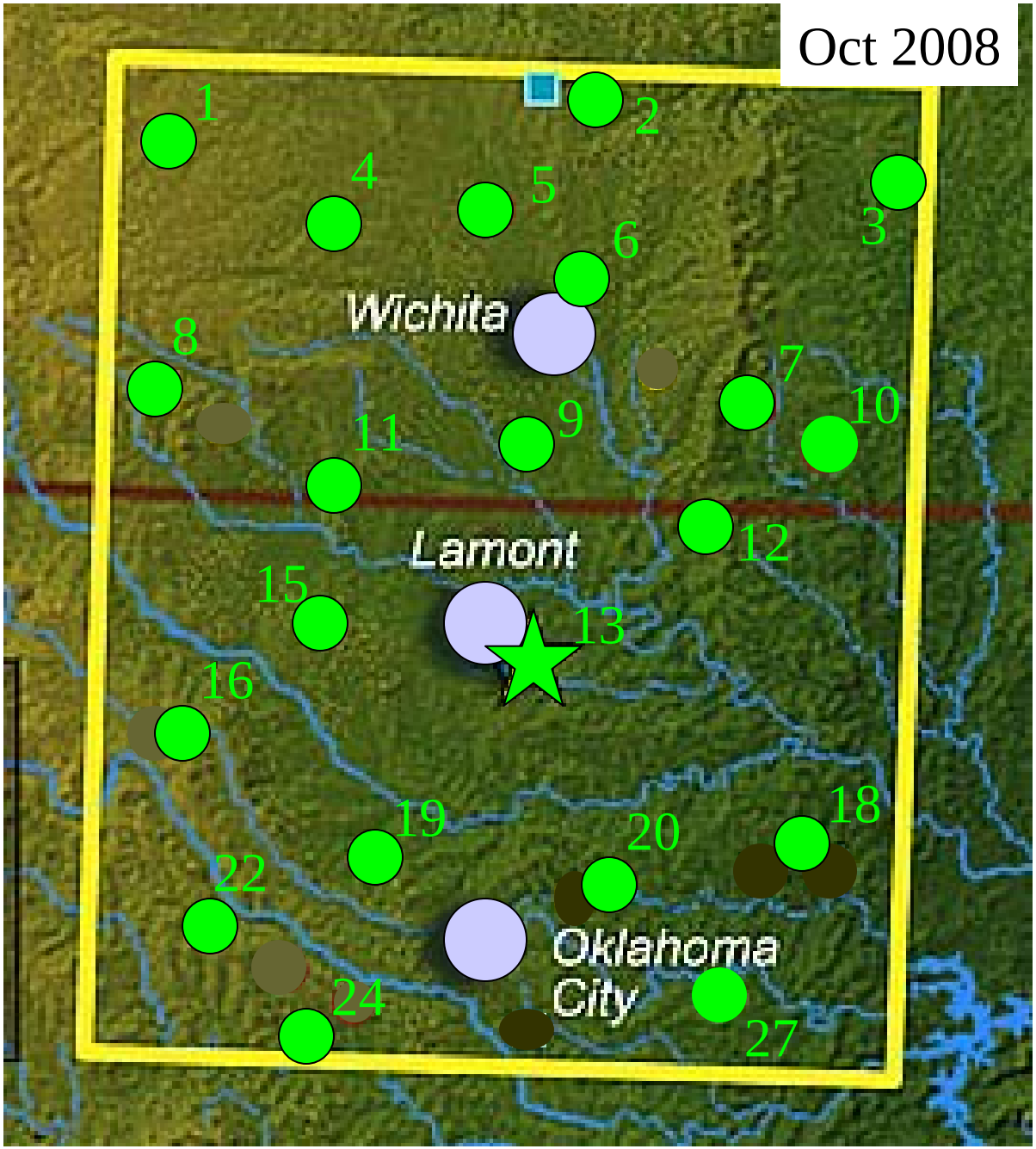
Wichita
Lamont
Oklahoma City


Oct 2008
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Lamont
Oklahoma City

Data System View - Firefox

File Edit View Go Bookmarks Tools Help

http://c1.dmf.arm.gov/ds/dsview/gui/processing.php

Go :ons linux mx1100

Gmail CL-Den CL-Bou FedEx M-W definr SRRB Slashdot Digg MapQuest Glossary News Wiki WX

Summary | Snapshot | Processing | Datastreams | Disk | Plots | STS* | Docs* | Log out

Data Processing Status **Username: guest** **Roles: none** **Tue Nov 4, 2008 18:08:06 GMT**

Refresh Data **Data Last Refreshed at: 18:07:44 pm, Tuesday 04 Nov 2008 GMT**

hfeM1
hfeS1
nsaC1
nsaC2
nsaS01
nsaS02
nsaX1
sgpB1

Select All Clear

hfeM1.1290rwp
hfeM1.aeri
hfeM1.aos
hfeM1.csphot
hfeM1.ecor
hfeM1.gndrad
hfeM1.irt
hfeM1.met

Select All Clear

Legend

- Missing
- Active
- *Inactive*
- ***Trouble***
- C Collection
- I Ingest

☐ Hide Processing Controls ☐ Hide Processing Legend

Change Selection

Facility	C	I	Source	C	I	Source	C	I	Source	C	I	Source	C	I	Source	C	I	Source	C	I	Source	C	I	Source	C	I	Source
sgpC1			50rwp			915rwp			aeri01			aos			brs			csphot			disdrometer			irt			irt10m
sgpC1			irt25m			mfr10m			mfr25m			mfrsr			mmcrmom			mmcrspec			mplpol			mwr			mwrhf
sgpC1			nfov			nfov2ch			nimfr			org			rain			rl			rss			sirs			sonde
sgpC1			surthref			sws			thwaps			tsi			twr10x			twr25m			twr60m			vceil25k			wacr
Facility	**C**	**I**	**Source**	**C**	**I**	**Source**	**C**	**I**	**Source**	**C**	**I**	**Source**	**C**	**I**	**Source**	**C**	**I**	**Source**	**C**	**I**	**Source**	**C**	**I**	**Source**	**C**	**I**	**Source**
sgpE1									ecor						mfrsr						sirs			smos			swats
sgpE2						ebbr									mfrsr						sirs						swats
sgpE3									ecor						mfrsr						sirs			smos			swats
sgpE4						ebbr									mfrsr						sirs			smos			swats
sgpE5									ecor			irt			mfrsr						sirs			smos			swats
sgpE6									ecor			irt			mfrsr						sirs			smos			swats
sgpE7						ebbr						irt			mfrsr						sirs			smos			swats
sgpE8						ebbr						irt			mfrsr						sirs			smos			swats
sgpE9						ebbr						irt			mfrsr						sirs			smos			swats
sgpE10									ecor			irt			mfrsr						sirs						swats
sgpE11												irt			mfrsr						sirs			smos			swats
sgpE12						ebbr									mfrsr						sirs						swats
sgpE13						ebbr						irt			mfrsr						sirs			smos			swats
sgpE14			aeri						ecor									mwr									
sgpE15						ebbr						irt			mfrsr						sirs			smos			swats
sgpE16									ecor			irt			mfrsr						sirs						swats
sgpE18						ebbr									mfrsr						sirs						swats
sgpE19						ebbr						irt			mfrsr						sirs						swats
sgpE20						ebbr						irt			mfrsr						sirs			smos			swats
sgpE21									ecor												sirs			smos			
sgpE22						ebbr									mfrsr						sirs						swats
sgpE24									ecor						mfrsr						sirs			smos			swats
sgpE26						ebbr																					
sgpE27						ebbr									mfrsr						sirs			smos			swats

Last modified: Jul. 26th, 2007, 22:17:34, GMT

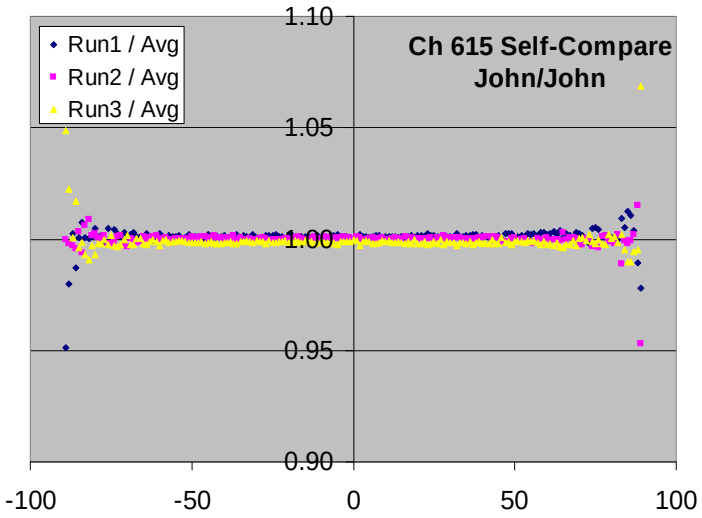
Done Tor Disabled

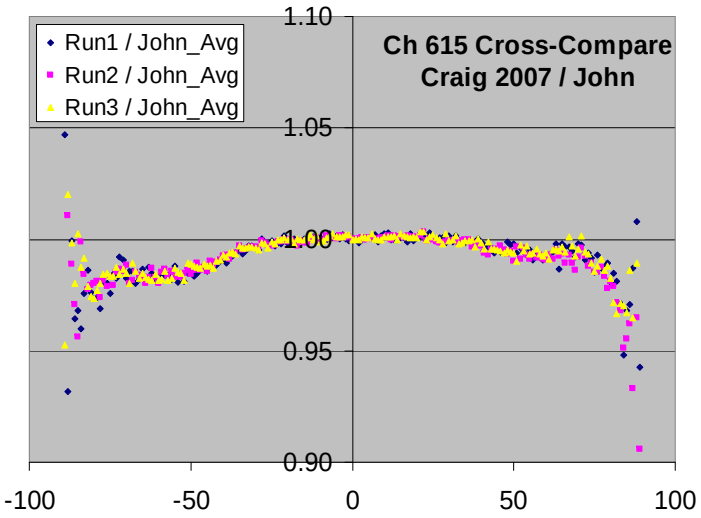
Problems Encountered

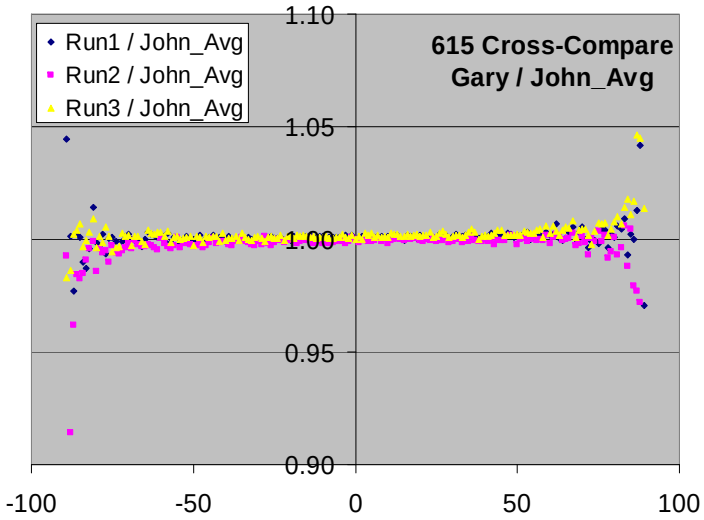
- Communication problems – Solved
- Discovered an issue with some band motors – Solved
- Heater board failures (Pt. 1) – Solved
- Heater board failures (Pt. 2) – Investigating
- Reading the head ID – Investigating

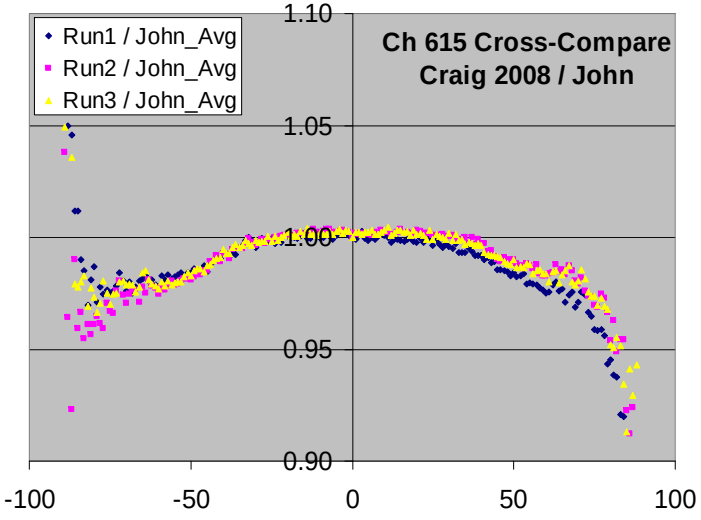
Cosine Bench

Comparisons before and after move to SGP

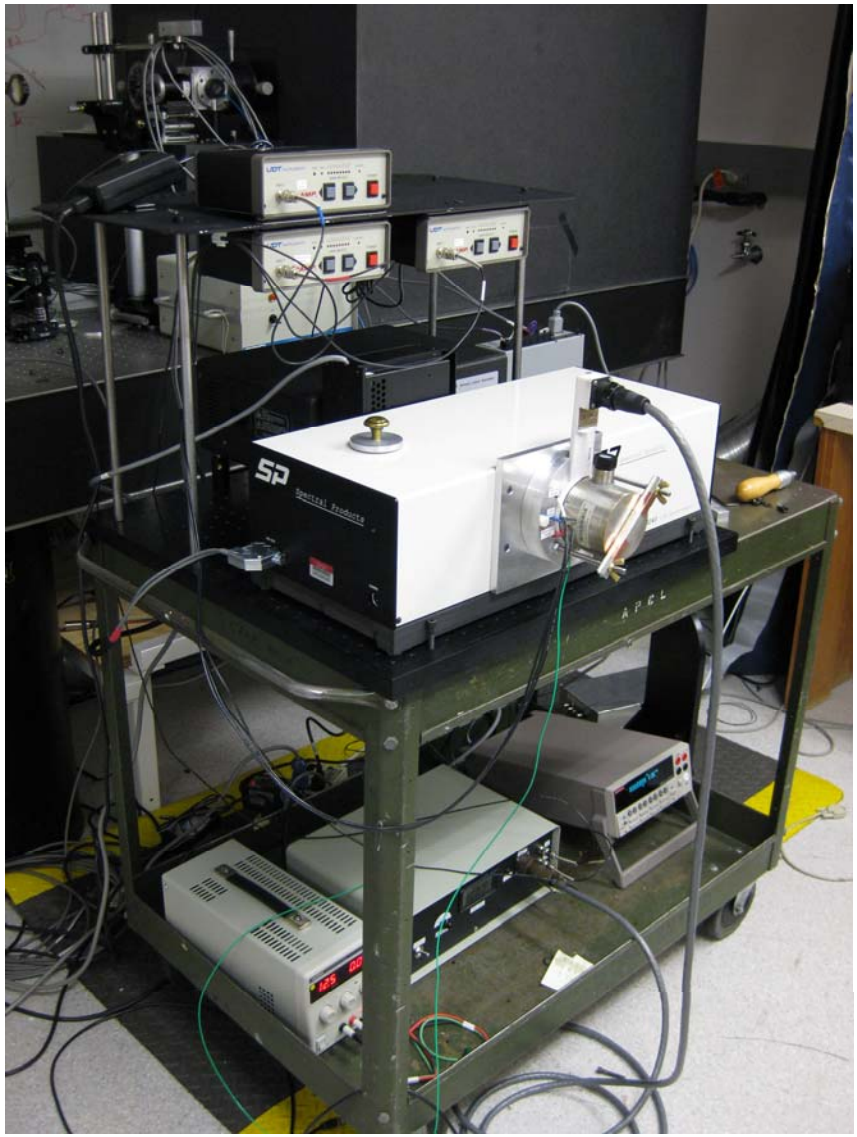




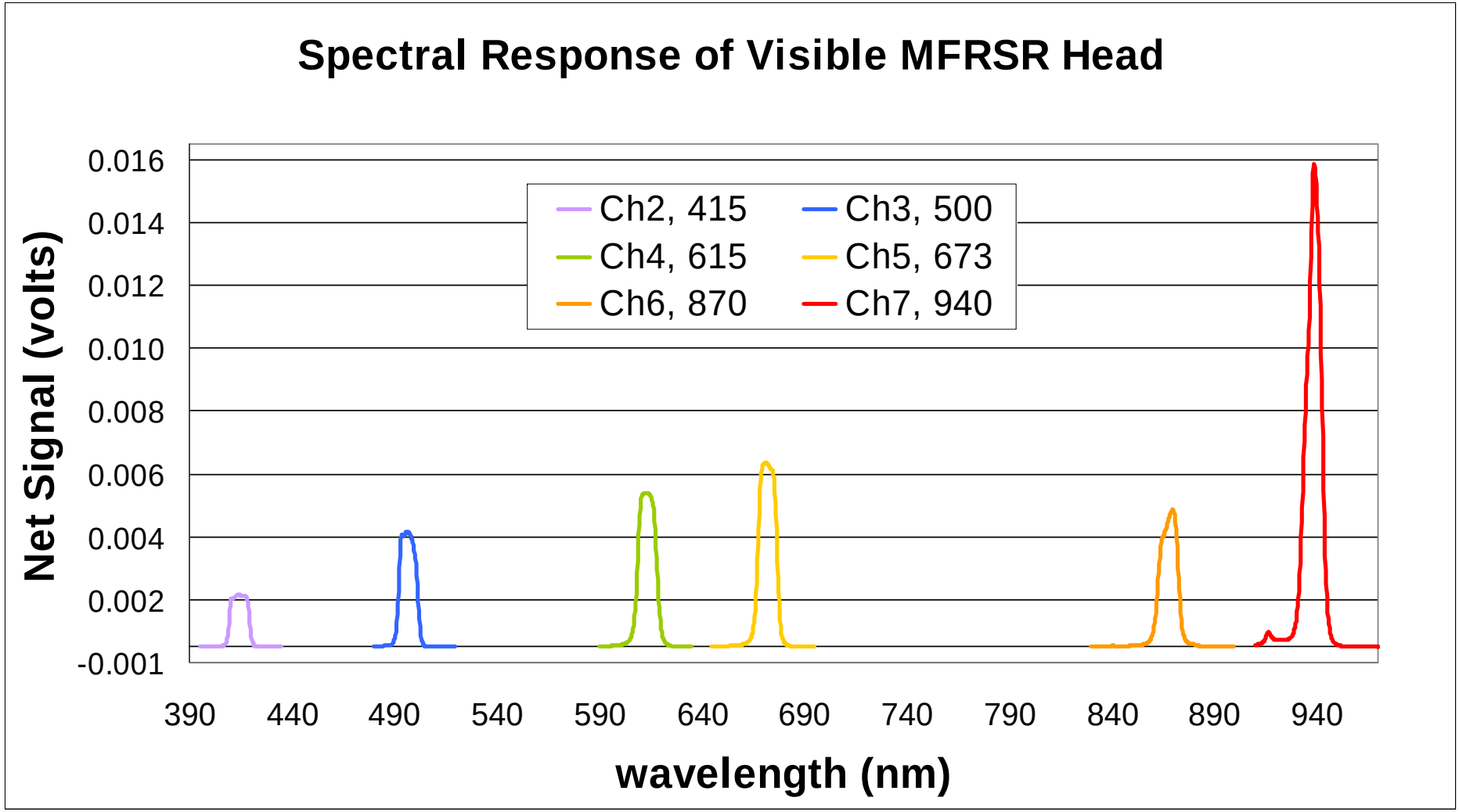




Visible MFRSR Spectral Bench



- ¼ m monochrometer by Spectral Products
- 175 W xenon arc lamp
- Scans between 390 nm and 1000 nm
- Data acquisition with Keithley DMM 2000-20
- Automated computer controlled operation


Spectral Response of Visible MFRSR Head
Net Signal (volts)
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
-0.001
Ch2, 415
Ch3, 500
Ch4, 615
Ch5, 673
Ch6, 870
Ch7, 940
390
440
490
540
590
640
690
740
790
840
890
940
wavelength (nm)

Calibration and Data Hierarchy Summary

- a0: Raw data. No corrections, calibrations, etc.

- b1: Nominally calibrated. These are lamp calibrated data. Cosine corrections and nighttime offsets have been applied, as well as diffuse corrections.

- c1: Langley calibrated data. Continuously calibrated using Gueymard extra-terrestrial spectra. Available on an approximately month-delayed basis.

Continuing with c1 data

- Filename format is *xxx*mfrsraod1mich*yy*.c1
- Copious data are included in each file, e.g.,
  - Calibrated Data
  - AOD
  - Rayleigh Optical Depth
  - Ozone Information
  - Cosine Corrections
  - Filter Function Information
  - Nighttime Offset Information
  - Diffuse Correction
  - …And the list goes on

Historical Data

- Gets same treatment as current, with one main difference. Lamp (dark) data are used instead of actual nighttime measurements.

- Have currently processed:
  - TWP (C1, 2 and 3)
  - NSA (C1 and 2; NIMFRs C1 and 2)
  - SGP (EF1, 2, 3, 4, 5, 6, 13 and C1)

Maintenance Effort

20080601 - 20081028

System	Regular Maintenance (minutes)	Corrective Maintenance (incidents)
EBBR	25	67
ECOR	20	20
SIRS	20	65
SMOS	20	7
SWATS	5	5
MFRSR	5	4

Inventory

Equipment	Quantity	Notes
Completed Heads	2	
Empty Heads	10	Low estimate
Cubes w/detectors	60	Need some assembly
Heater Boards	13	10 need assembly
Motor Controllers	11	
Data Loggers	9	
MFR Heads	7	At least 2 are complete
NIMFR Heads	8	With tubes

What’s Left?

- Upgrade the TWP, NSA and AMF sites
- Add high latitude functionality
- Add “stutter” mode to improve large particle retrievals. Being addressed in ECR-00688.
- If approved, Patrick Disterhoft will update the code.
- Add MFR (upwelling) to AMF
- MFRSR and NFOV for AMF2
- NFOV Spares?

Summary

- The SGP EF sites have all been completed
- All are currently functioning
- Effort to maintain network going forward is relatively low
- Will upgrade TWP and AMF next, and NSA if code is modified

Comments on Proposed Reduction of EF MFRSR Network at the SGP

Study Group

- **Mikhail Alexandrov**, Gary Hodges, Joe Michasky, Peter Keidron, Qilong Min, Evgeni Kassianov, and Connor Flynn
- Unique 2D-Instrument Network
    - Aerosol Optical Depth
    - Cloud Optical Depth
    - Precipital Water Vapor
- Provides measurements of temporal and geographic variability
    - Comparable with MODIS satellite products
    - Good agreement with CIMEL retrievals
    - Agreement with GPS/MWR retrievals
    - 30 km box size
- Keep boundary EF's, 5-6 systems could be removed from more concentrated clusters

Talking Points on Gary Hodges' WG08 PowerPoint Slides

Slide 1; **Title**:

Slide 2; **Overview of network Sept 2007**:

- Green: Functioning site; Red: Non-Functioning site
- Deployment of new systems had just begun
- EF2, 5, 8, 13 and 22 have refurb head & Campbell logger

Slide 3; **Overview of network Oct 2008**:

- Deployment of refurbished heads and Campbell loggers is complete.
- Finished Sept 08.
- All sites are functioning. Every site originally intended to have a MFRSR now has one.
- John Schmelzer can't remember the last time the entire network was operating. Maybe have to go back to late 90s.

Slide 4; **Snapshot of current collection activity. From Nov 4**:

- Middle row, under 2nd blue bar is MFRSR
- Column "C" is collection; "I" is ingest
- Site com was down for E3, 6, 7; Entire site, not just MFRSR
- Every MFRSR is collecting and ingesting. No more sneakerneting data.

Slide 5; **Problems Encountered**:

- ARM had to write com software as CSI doesn't sell Linux version. Some sites had problems. Resulted in sneakernetting data from a few sites for a short time. Sutanay at PNL wrote the code and resolved the bugs. All sites communicating properly now.
- Unrelated to the deployment, but a significant issue nonetheless, Dan Nelson found a design problem with some band motors. The optical stop could potentially move when the motor cable was connected or disconnected. This problem likely contributed to the persistent shading problems at some sites. All motors have been checked and fixed as necessary.
- Initially we were frequently losing heater controller boards. Attributed to incorrect voltage to the boards. All systems have been checked and adjusted as necessary.
- Some components on each heater board are operating above specified ambient temp. This may have contributed to one heater board failure. Currently investigating. We may need to ventilate the logger box, either passively or actively if necessary.
- Each head has an internal ID chip. If the logger is loaded with the most current OS, the chip reads incorrectly. The chip reads correctly with older OS revisions. Currently all loggers have an older revision loaded. This will not cause data errors.

Slide 6; **Cosine Bench Comparisons**:

- Two left plots compare runs before move to SGP.
- Two right plots compare after move to SGP. One in Nov 2007 and one in Nov 2008
- All comparisons use an average of J. Schmelzer runs performed before the move.
- After the move we see some dropping off of sensitivity at higher angles. More so in 2008 than 2007.
- Two theorized reasons at this point. 1) Bench alignment is not the same after the move. Either the lamp is tilted, or the rotating assembly is tilted. Can't say if pre- or post-move positioning is better. 2) Results are consistent with a loss of transmittance in the diffuser.
- The head used is kept in the lab. Not used in the field.
- Patrick Disterhoft of ESRL in Boulder has recently added visible capability to his cosine bench. We will be running the head in Patrick's bench within a few weeks to gain insight into the small changes we have observed.

Slide 7; **Spectral Bench**:

- This is the spectral bench ARM has bought.
- Assembled and tested by Jerry Berndt, Patrick Disterhoft and Charles Wilson.

Slide 8; **Example Spectral Data**:
- Spectral data from a visible MFRSR head
- Net signal (Light – Dark)
- Not corrected for lamp signal. Reason for "bumps" in wings of 940 and 870. Will go away once normalized to lamp output.

Slide 9; **Calibration and Data Hierarchy**:
- Slide lists data levels and processing done at each level.

Slide 10; **Continuing with c1 Level Data**:
- Bottom line is, we intended to include everything a user of MFRSR data would want. A "one-stop-shop" for MFRSR data and related files.

Slide 11; **Historical Data**:
- Receives same treatment as current data.
- One main difference... We do not have nighttime data for historical data, so the dark signal from lamp cals are used.

Slide 12; **Maintenance Effort**:
- The systems at each EF site and effort put toward each for 5-month period.
- Middle column is avg preventative maintenance required for each.
- Right column is number of corrective maintenance incidents for each.
- Take home point, MFRSR is now the least "costly" instrument at the EF sites.

Slide 13; **Inventory**:
- All are approximate numbers based on shipping records and phone calls to SGP.
- Take-home point. Generally we're in pretty good shape. Could use a few more of some items, but we're not talking about a large sum of money to shore up the inventory.
- A valid concern is: Time required of Mark Klassen to assemble, repair, etc., heads, boards, etc. Though, it should be noted, where we're at now is exactly where ARM set out to go with the MFRSR network. That is, bringing it entirely in-house. And that has been accomplished!

Slide 14; **What's Left**:
- To complete the upgrade as originally envisioned we need to: Upgrade the TWP, NSA and AMF sites. To upgrade NSA the logger code will need to have high latitude functionality added.
- In the beginning the intent was to add expanded system functionality that was not able to be accomplished with the proprietary logger. The most desired new feature was to add a "stutter" mode, along with the traditional instrument operation. The stutter mode would add additional band stops before and after shading the diffuser. The addition of these stops should improve large particle retrievals. This would be accomplished by being able to fit a function, rather than using a linear estimate, that would improve the correction that is made to account for the sky that is obscured by the shadowband.
- These items are being addressed in BCR-00688. If approved, Patrick Disterhoft will update the code.

Slide 15; **Summary**:
- The main take-home points
- Upgrade at SGP is finished and all sites are operating
- Effort in both time and money going forward is relatively low
- TWP upgrade is next
- NSA will be finished if logger code is updated.