



Routine
ARM Aerial Facility (AAF)
Clouds with Low Optical Water Depths (CLOWD)
Optical
Radiative
Observations



RACORO Instrument Status

John Hubbe
ARM Aerial Facility

for ARM Science Team Meeting
March 31, 2009



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RACORO, Instrument Status

► Outline

- Who's Who
- Data Flow
- Status Board
- Examples

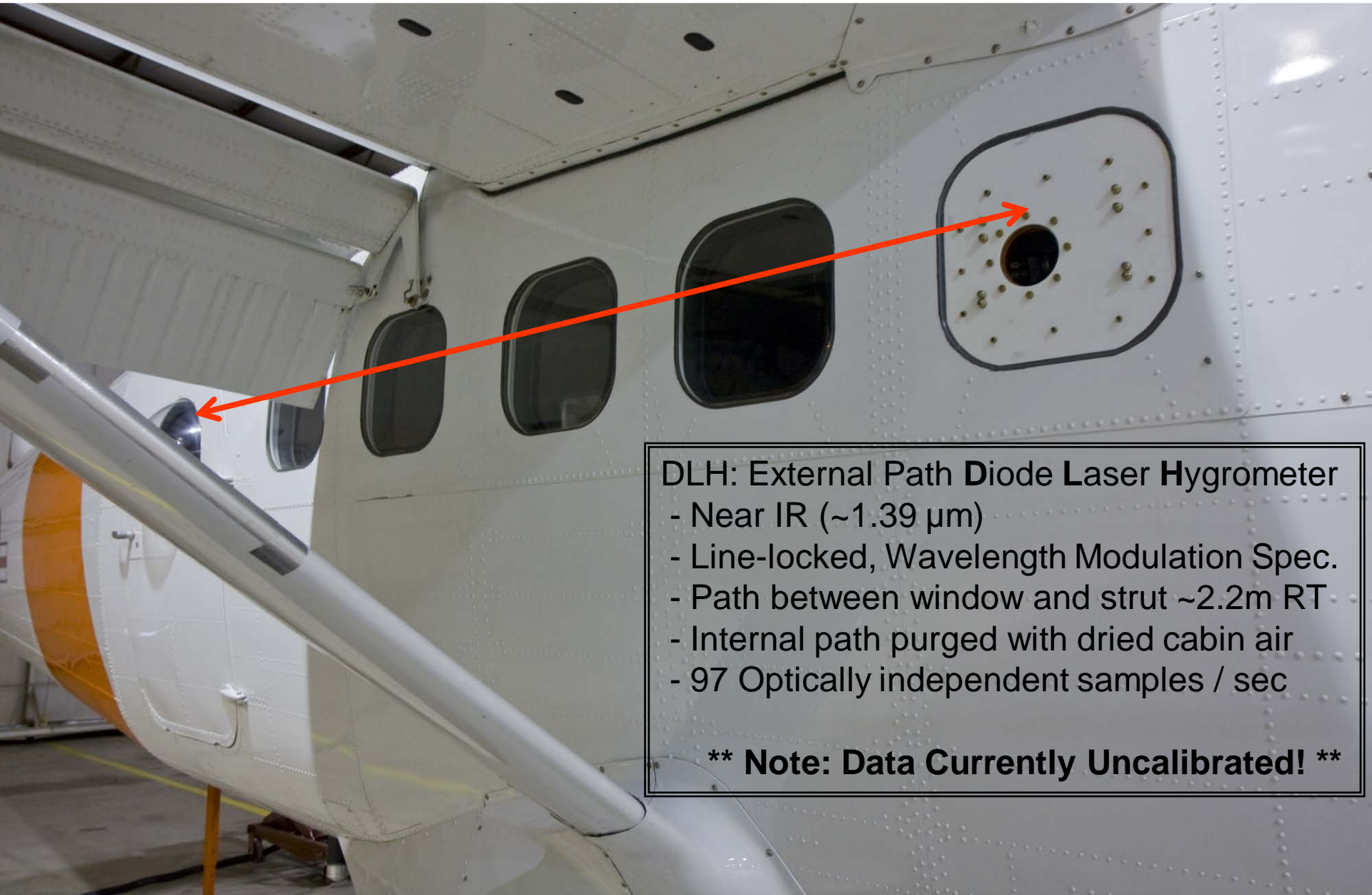


RACORO Instruments: Who's who

RACORO Instruments

<i>Instrument</i>	<i>Measurement</i>	<i>Investigator</i>
Flight path and attitude		
NovAtel GPS	platform position, velocity, attitude	Haf Jonsson
TansVector		Haf Jonsson
C-Migets-II		Haf Jonsson
Radar Altimeter	Altitude above ground level	Haf Jonsson
Meteorology		
Buck CR2 Hygrometer	Water Vapor Concentration	Haf Jonsson
Dewpoint	Td	Haf Jonsson
Diode Laser Hygrometer	Water Vapor Concentration	Glenn Diskin
Static Pressure	P	Haf Jonsson
Temperature	T	Haf Jonsson
Gust probe	Updraft velocity and turbulence	Haf Jonsson
Aerosol		
CCN Dual Column DMT	Cloud condensation nuclei concentration	Roy Woods
DMA	Aerosol size dist (10 - 500 nm)	Don Collins
PCASP	Aerosol size dist (0.1 - 2.5 μm)	Haf Jonsson
2 CPCs (TSI 3010)	Total aerosol number conc. (>10nm)	Haf Jonsson
Ultrafine CPC (TSI 3025)	Total aerosol number conc. (>3nm)	Haf Jonsson

RACORO Instruments: Diode-Laser Hygrometer



DLH: External Path **D**iode **L**aser **H**ygrometer
- Near IR ($\sim 1.39 \mu\text{m}$)
- Line-locked, Wavelength Modulation Spec.
- Path between window and strut $\sim 2.2\text{m}$ RT
- Internal path purged with dried cabin air
- 97 Optically independent samples / sec

**** Note: Data Currently Uncalibrated! ****

RACORO Instruments: Who's who

RACORO Instruments

<i>Instrument</i>	<i>Measurement</i>	<i>Investigator</i>
Cloud Microphysics		
DMT CAPS (CAS/CIP/King)	T, LWC, aerosol size dist. (0.5 - 50 μm), cloud size dist (0.5 - 1500 μm)	Haf Jonsson
DMT 2d-CIP	Imaging of cloud particles (15 - 960 μm)	Greg McFarquhar Robert Jackson
FSSP-100	Cloud PSD (5 - 50 μm)	Haf Jonsson
Gerber PVM-100A	LWC	Haf Jonsson
Gerber CIN	Asymmetry Parameter (g) Optical Extinction Coefficient Extinction-to-Backscatter Ratio	Hermann Gerber
SEA hot wire	LWC	Haf Jonsson
SPEC 2D-S	Cloud PSD (10 - 1280 μm)	Qixu Mo Paul Lawson



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RACORO Instruments: Cloud-Integrating Nephelometer



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RACORO Instruments: Who's who

RACORO Instruments

<i>Instrument</i>	<i>Measurement</i>	<i>Investigator</i>
Radiation		
Heitronics 19.85 IRT (Up and Down)	Longwave narrowband (9.6 - 11.5 μm)	Haf Jonsson Anthony Bucholtz
Hydrorad-3	Upward and downward irradiance and downwelling radiance (350 - 850 nm)	Anthony Bucholtz
Kipp & Zonen CM 22 (Up and Down)	Total shortwave broadband (0.200 - 3.6 μm)	Anthony Bucholtz
Kipp & Zonen CG 4 (Up and Down)	Longwave broadband (4.2 - 42 μm)	Anthony Bucholtz
MFR head (Up and Down)	Shortwave spectral	Anthony Bucholtz
SPN-1 (Up)	Total and diffuse shortwave broadband (0.4 - 2.7 μm)	Anthony Bucholtz



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Solar Spectral Irradiance and Radiance Measurements From the CIRPAS Twin Otter During RACORO

Anthony Bucholtz, Andy Vogelmann, Chuck Long

Instrumentation:

- Hobi Labs HydroRad-300:
 - 3 channel fiber optic based spectrometer
 - Wavelength Range: 350-850 nm
 - Mounting configuration:
 - one **irradiance** collector looking **up**
 - one **irradiance** collector looking **down**
 - one **radiance** collector looking **up or down** depending on application



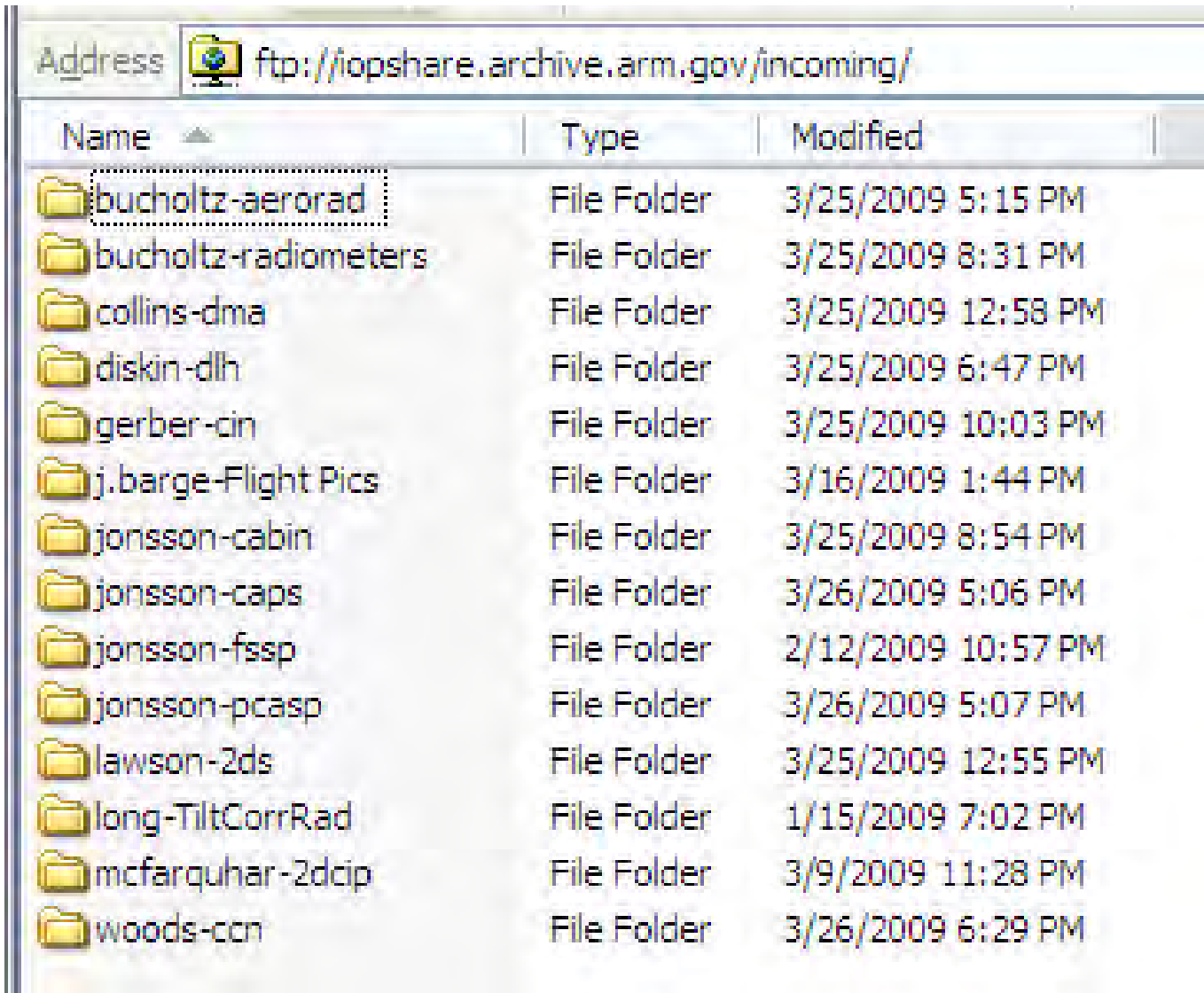
NPS HydroRad-300

Measurements:

- **Upwelling and Downwelling Solar Spectral Irradiance**
- **Downwelling Narrow FOV (2-3 deg) Solar Spectral Radiance**

**2 nm resolution,
350-850 nm range,
100 ms exposure time
= 1 sec sampling**

RACORO Data Flow



The image shows a screenshot of an FTP directory listing. The address bar at the top displays the URL: ftp://iopshare.archive.arm.gov/incoming/. Below the address bar is a table with three columns: Name, Type, and Modified. The table lists 14 folders, each with its name, type (File Folder), and the date and time it was last modified. The folder 'bucholtz-aerorad' is highlighted with a dashed border.

Name	Type	Modified
bucholtz-aerorad	File Folder	3/25/2009 5:15 PM
bucholtz-radiometers	File Folder	3/25/2009 8:31 PM
collins-dma	File Folder	3/25/2009 12:58 PM
diskin-dlh	File Folder	3/25/2009 6:47 PM
gerber-cin	File Folder	3/25/2009 10:03 PM
j.barge-Flight Pics	File Folder	3/16/2009 1:44 PM
jonsson-cabin	File Folder	3/25/2009 8:54 PM
jonsson-caps	File Folder	3/26/2009 5:06 PM
jonsson-fssp	File Folder	2/12/2009 10:57 PM
jonsson-pcasp	File Folder	3/26/2009 5:07 PM
lawson-2ds	File Folder	3/25/2009 12:55 PM
long-TiltCorrRad	File Folder	1/15/2009 7:02 PM
mcfarquhar-2dcip	File Folder	3/9/2009 11:28 PM
woods-ccn	File Folder	3/26/2009 6:29 PM



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RACORO Data Flow

(Wiki)

[Research Flights](#)

1. [20090122](#) : Test flight for aerosol instrument characterization. Encountered tire fire and biomass burning.
2. [20090124](#) : Test flight for radiometer characterization. Overhead sky was clear, but clouds were present on the horizon.
3. [20090206](#) : Test flight for cloud probe characterization. Flew south to encounter broken clouds.
4. [20090208](#) : Broken low-level cloud field with highly variable cloud top and cloud base heights.
5. [20090217](#) : Measured a dissipating cloud system with notable haze present between clouds.
6. [20090226](#) : Thin, broken stratocumulus field sampled to the southwest of Guthrie.
7. [20090301](#) : CCN characterization over the SGP.
8. [20090304](#) : CCN characterization over the SGP for a high aerosol loading.
9. [20090315](#) : Turbulence flight with radiometer tilt characterization.
10. [20090317](#) : Turbulence flight with radiometer tilt characterization.
11. [20090318](#) : CF albedo mapping under cirrus and broken cirrus.
12. [20090320](#) : Standard pattern in variable stcu (broken and multi-level).
13. [20090324](#) : Albedo flight with turbulence legs

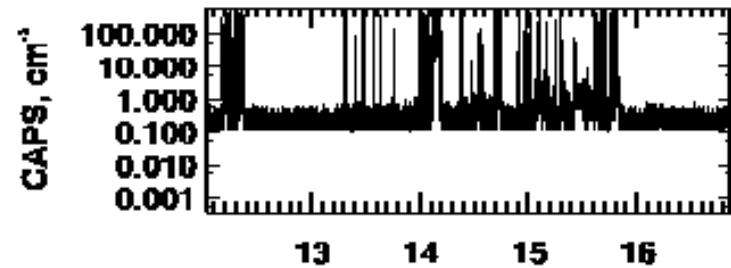
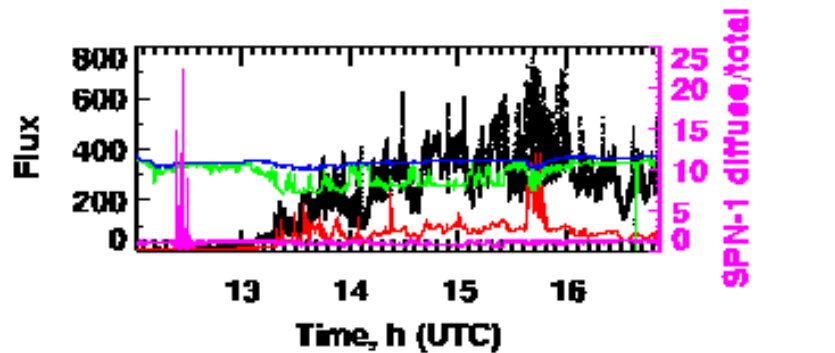
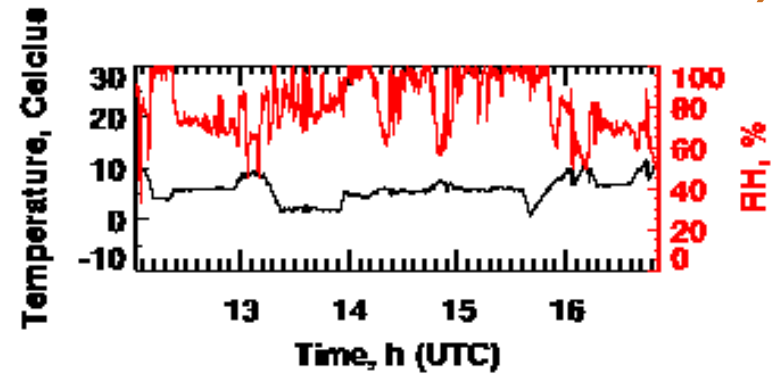
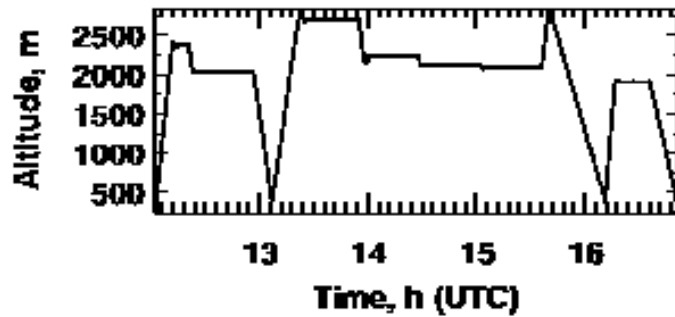


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RACORO Data Flow

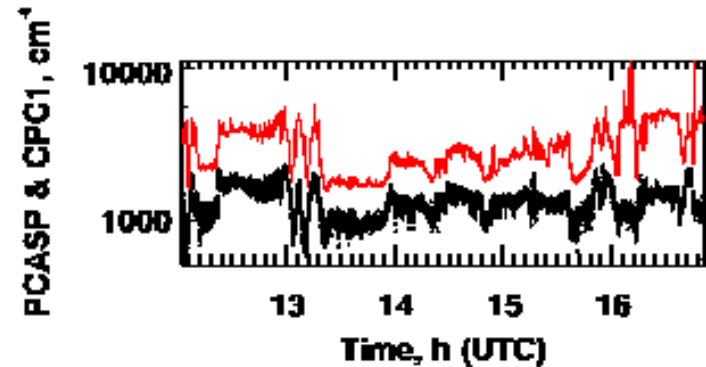
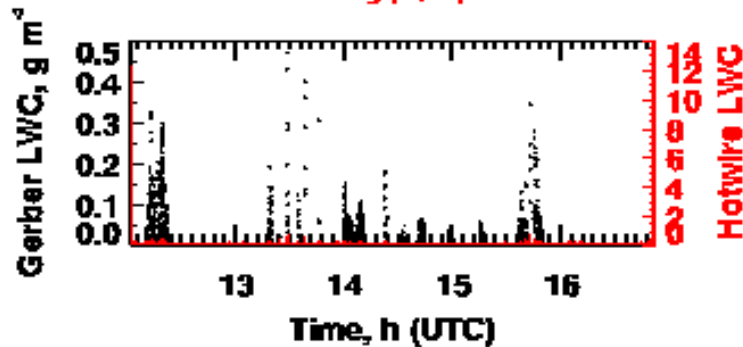
(Wiki, Quicklooks, Lo/Comstock)

09032002 Summary



black: CIM-22 uplooking (W/m^2) green: CG-4s uplooking (V)
 red: Can-22 downlooking (W/m^2) blue: CG-4s downlooking (V)

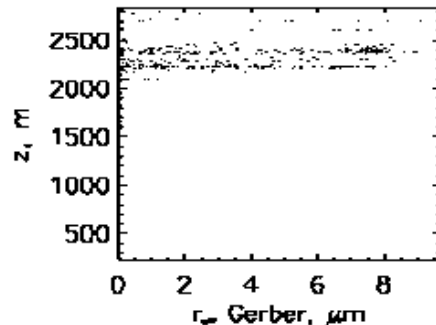
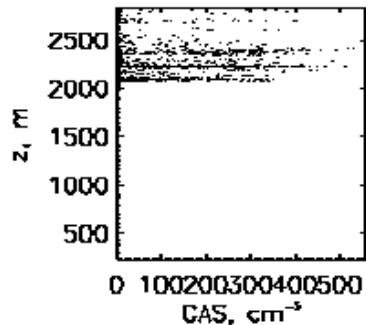
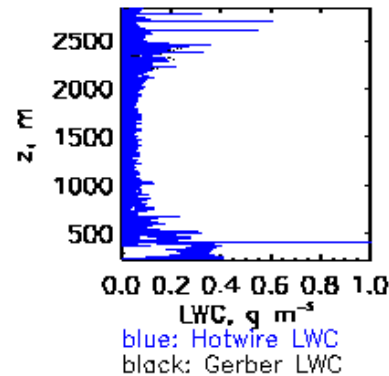
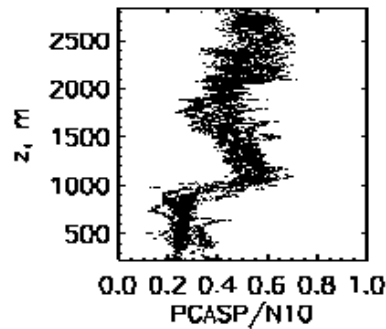
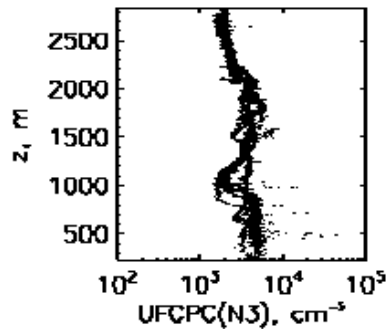
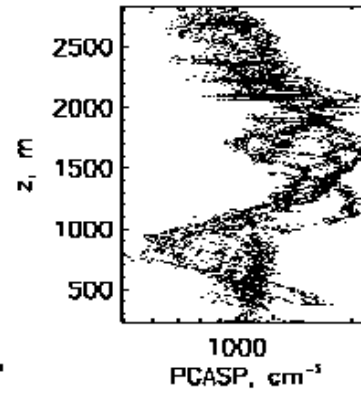
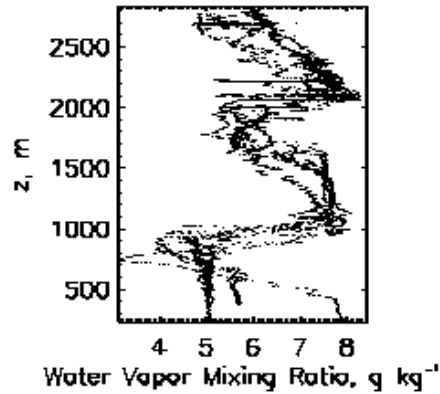
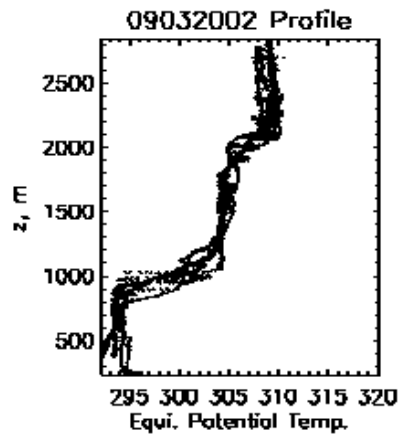
black: $N_p(\text{CAS})$
 red: $N_p(\text{CIP})$



black: PCASP
 red: CPC1

RACORO Data Flow

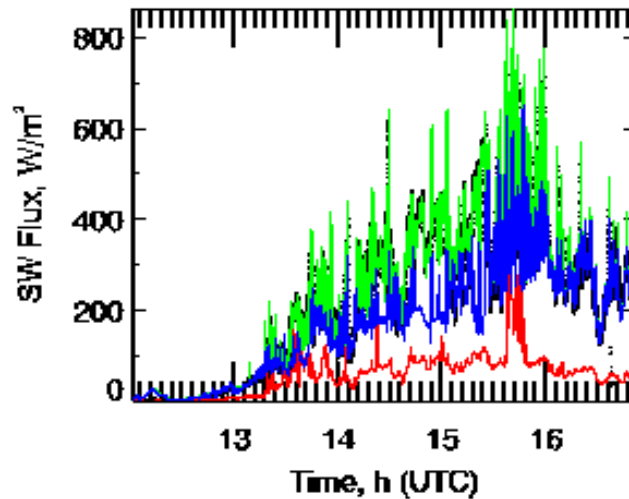
(Wiki, Quicklooks , Lo/Comstock)



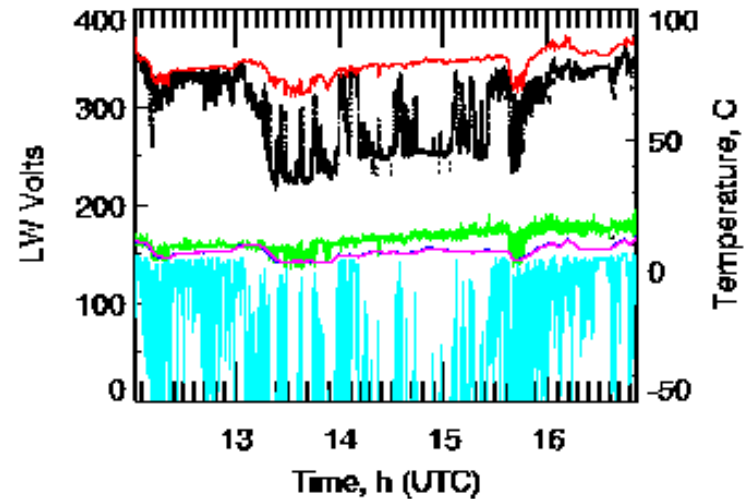
RACORO Data Flow

(Wiki, Quicklooks, Bucholtz)

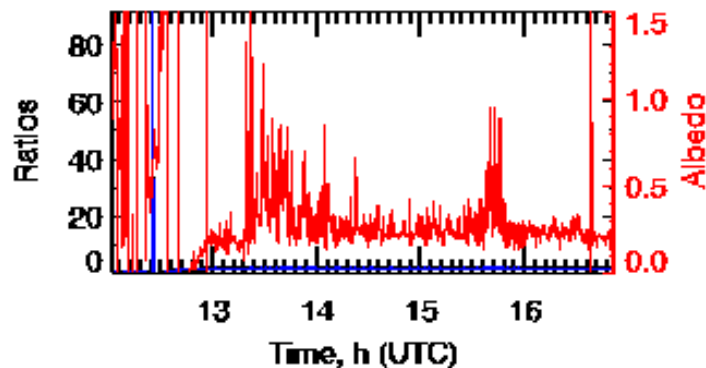
09032002 Radiation



black: CM-22 uplooking
 red: CM-22 downlooking
 green: SPN-1 Total
 blue: SPN-1 Diffuse



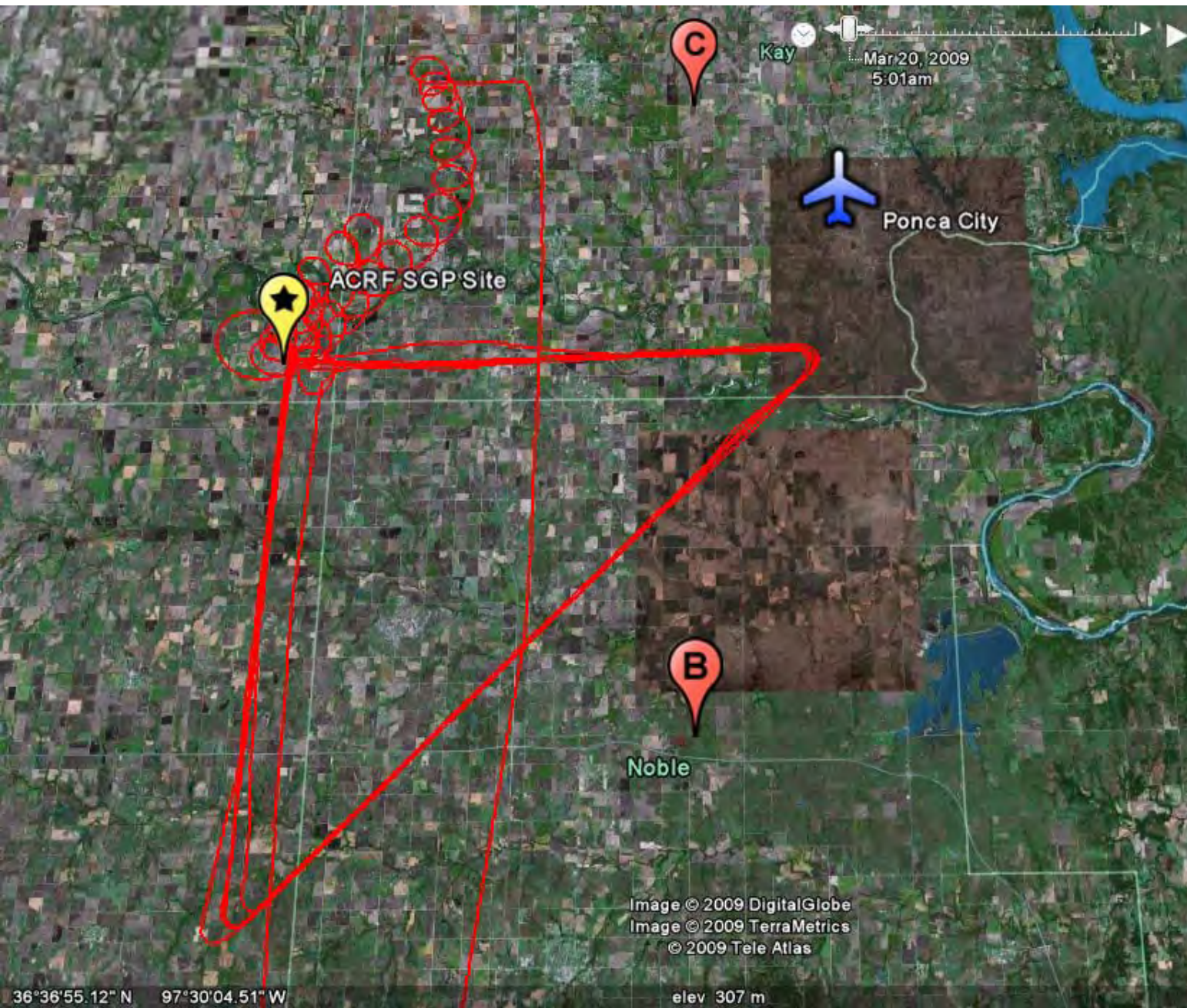
black: CG-4s uplooking (V)
 red: CG-4s downlooking (V)
 green: IRT downlooking (Celsius)
 cyan: IRT Uplooking (Celsius)
 blue: CGS4 uplooking case Temperature
 purple: CGS4 downlooking case Temperature



blue: upward facing CM22/total SW from SPN-1
 red: albedo = downward facing CM22/upward facing CM22

RACORO Data Flow

(Wiki, KML, Tomlinson)



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RACORO

Instrument status

[ARM Wiki](#) » [AAF](#) » [RACORO](#) » Racoro Data Quality Control

INSTRUMENTS	INSTRUMENT PI	0122	0124	0206	0208	0217	0226	0301	0304	0315	0317	0318	0320	0324
Atmospheric State														
DLH	Glenn Diskin													
Temp and H2Ov	Haf Jonsson													
Vertical Velocity and Horizontal Winds	Haf Jonsson													
DAQ Pictures Taken														

Edit

Instructions

Click the edit button above. This will modify the calendar to give you a drop down menu for each w

- "led-box-gray" Unknown
- "led-box-red" Bad
- "led-box-yellow" Caution
- "led-box-green" Good
- "led-box-blue" Missing

RACORO

Instrument status

INSTRUMENTS	INSTRUMENT PI	0122	0124	0206	0208	0217	0226	0301	0304	0315	0317	0318	0320	0324
Aerosol														
CCN	Roy Woods	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
CPCs	Haf Jonsson	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
DMA	Don Collins	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🔴
PCASP	Haf Jonsson	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢



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Instrument status

INSTRUMENTS	INSTRUMENT PI	0122	0124	0206	0208	0217	0226	0301	0304	0315	0317	0318	0320	0324
Clouds														
2D CIP	Geg McFarquhar Bobby Jackson	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡
2D-S	Qixu Mo Paul Lawson	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
CAPS	Haf Jonsson	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
CIN	Hermann Gerber	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
FSSP	Haf Jonsson	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡
LWC-CAPS	Haf Jonsson	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
LWC-CIN	Hermann Gerber	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
LWC-PVM-100A	Haf Jonsson	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
LWC-SEA	Haf Jonsson	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡



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Instrument status

INSTRUMENTS	INSTRUMENT PI	0122	0124	0206	0208	0217	0226	0301	0304	0315	0317	0318	0320	0324
Radiation														
CG4 (IR)	Anthony Bucholtz Chuck Long	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
CM22 (Solar)	Anthony Bucholtz Chuck Long	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Hydrorad	Anthony Bucholtz Chuck Long	🟡	🟢	🟢	🟡	🟡	🟡	🟢	🟢	🟢	🟢	🟢	🟢	🟢
IRT	Haf Jonsson	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
MFR	Anthony Bucholtz Chuck Long	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡	🟡
SPN-1	Anthony Bucholtz Chuck Long	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢



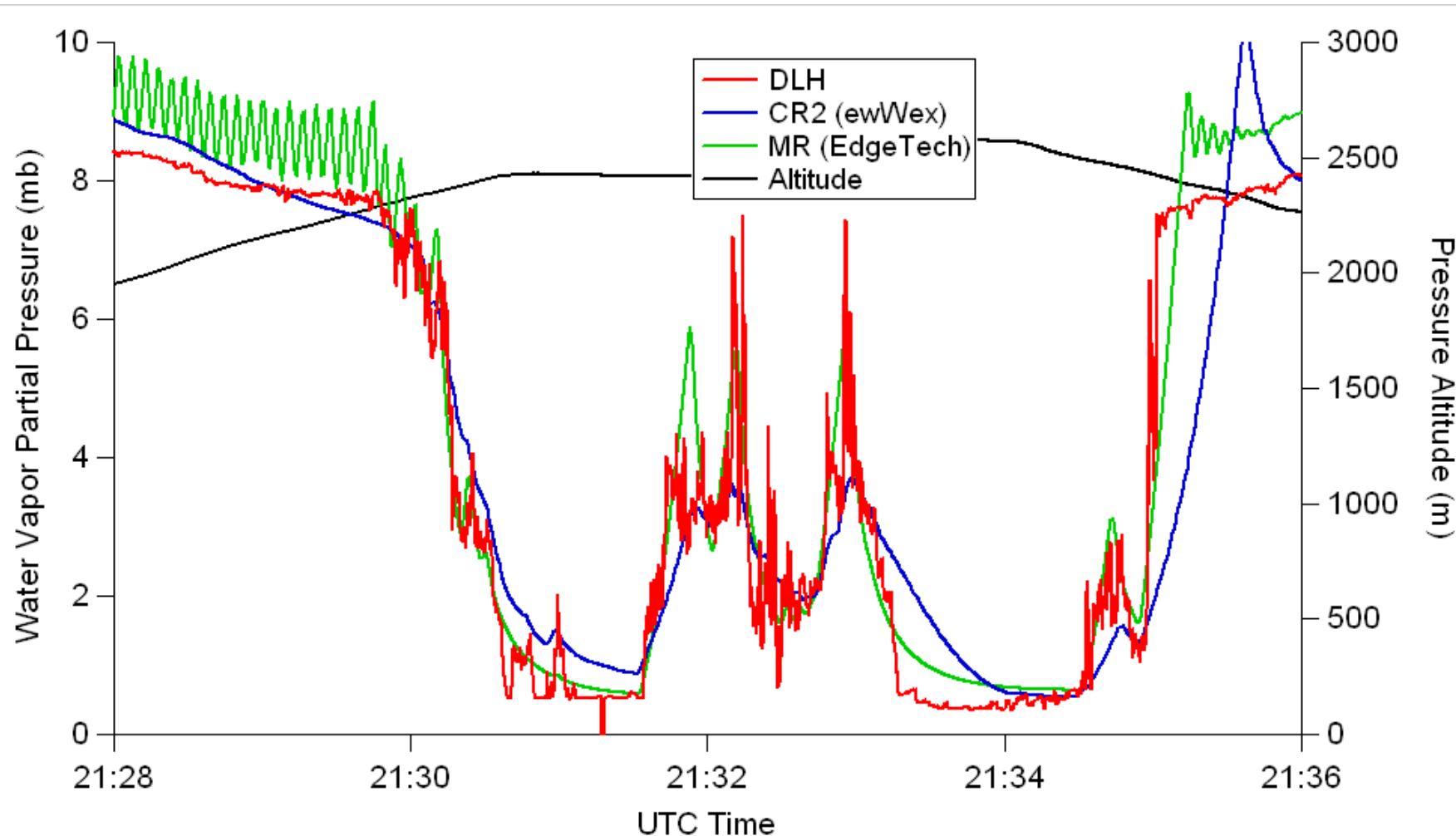
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RACORO Data

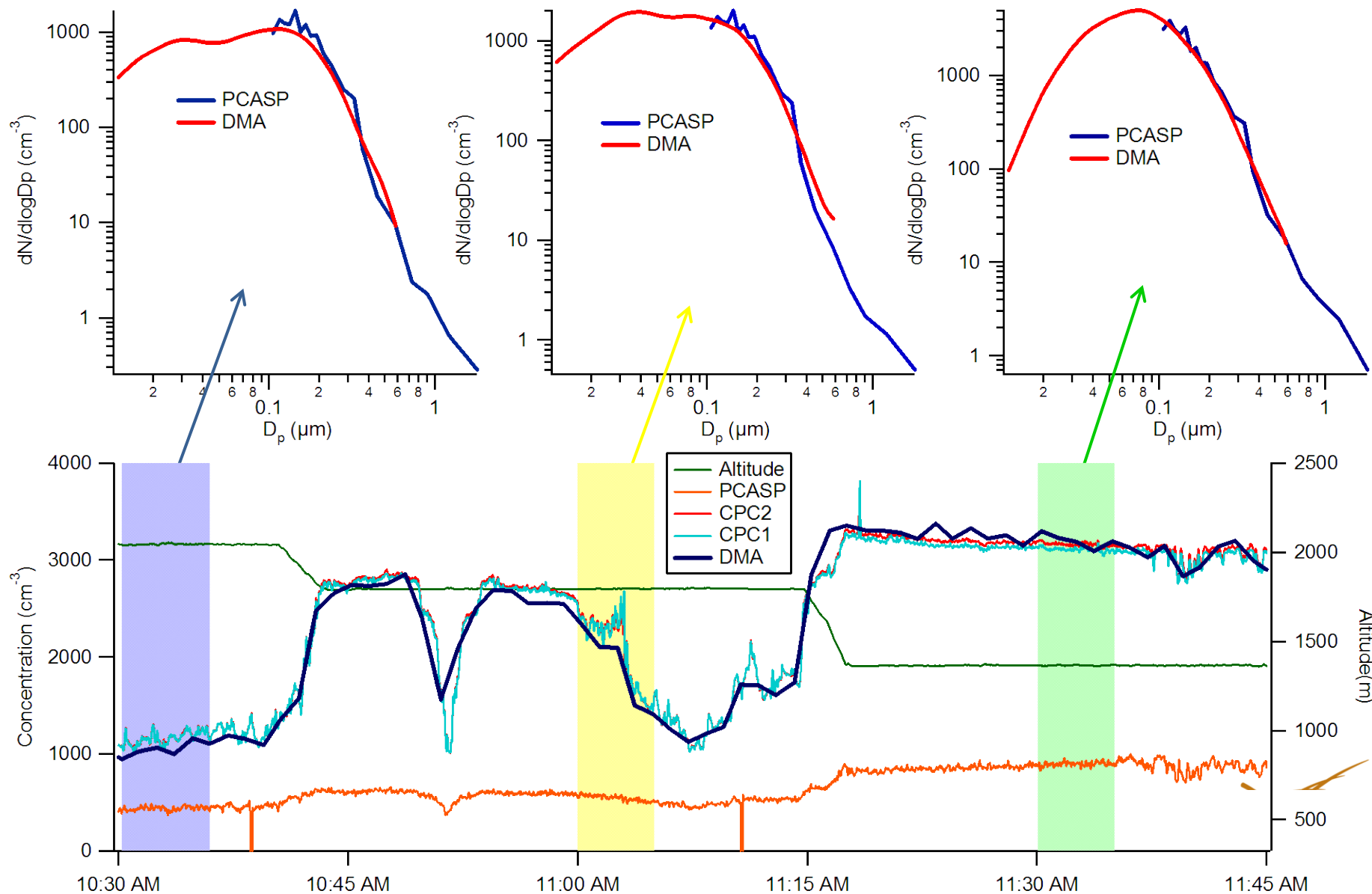
02/08/2009

(Glenn Diskin)



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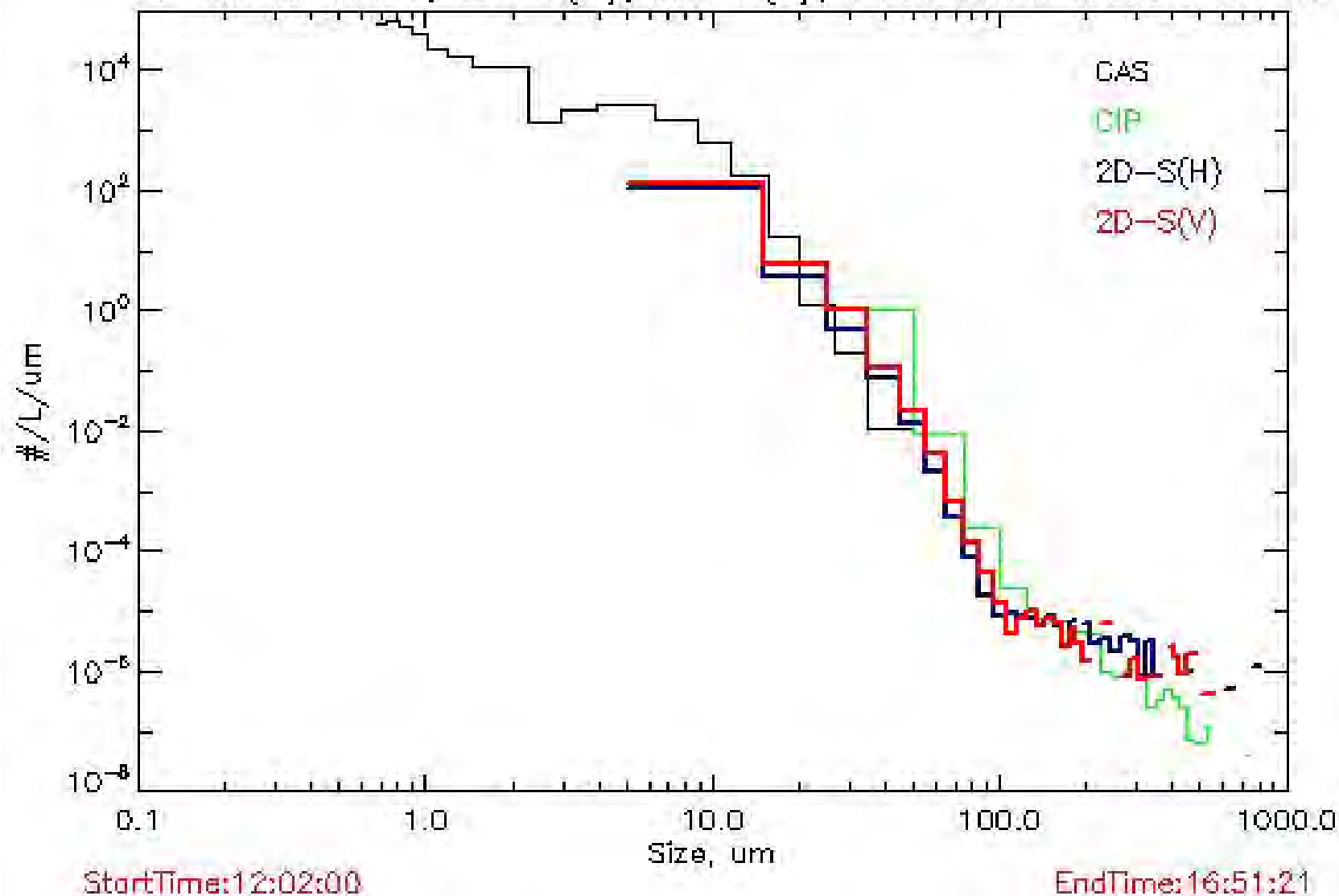


RACORO Data

(Quixu Mo & Paul Lawson)

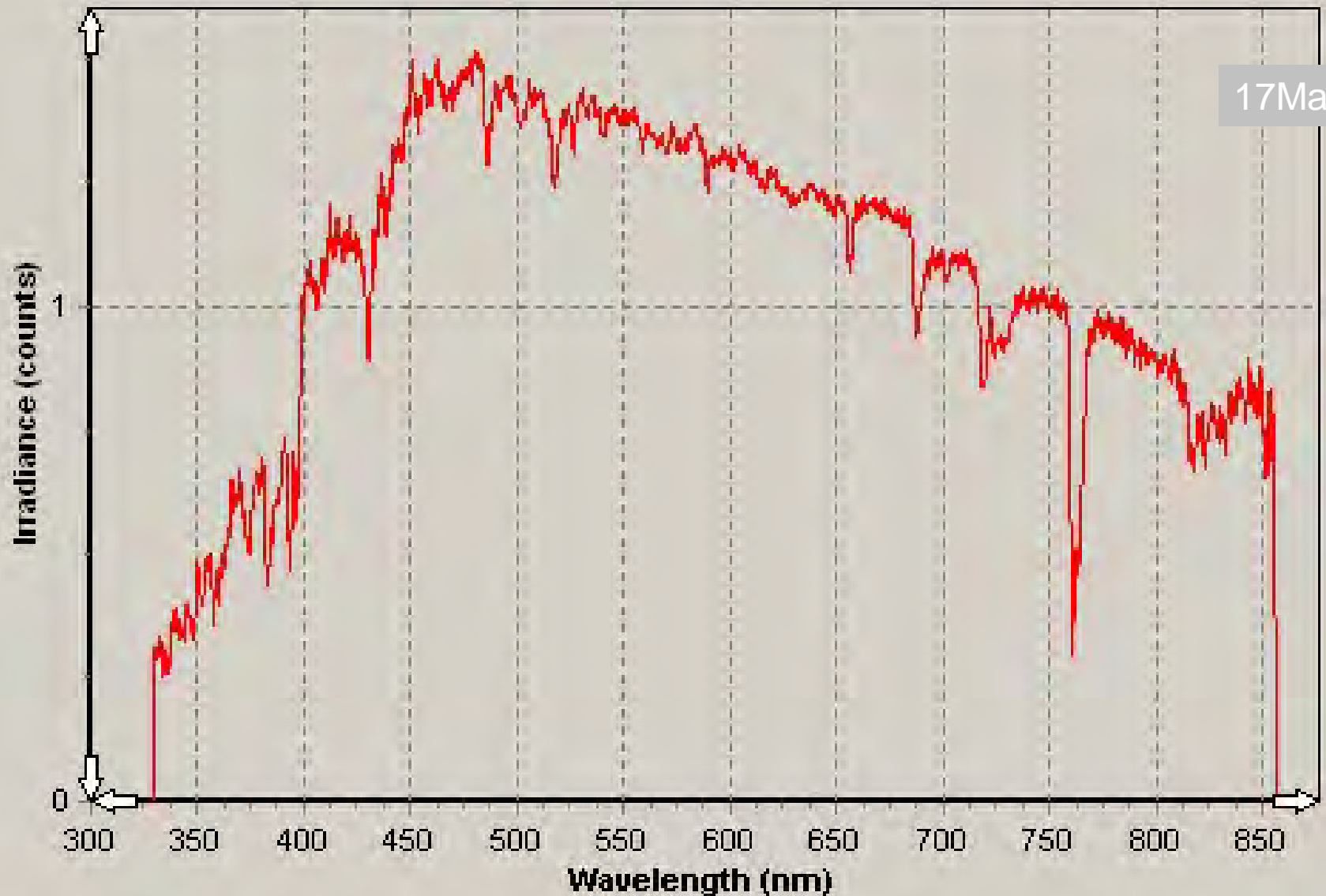
Fig.2

PSDs of CAPS, 2D-S(H), 2D-S(V); Data Date: 2009-03-20



Solar Spectral Irradiance and Radiance Measurements From the CIRPAS Twin Otter During RACORO

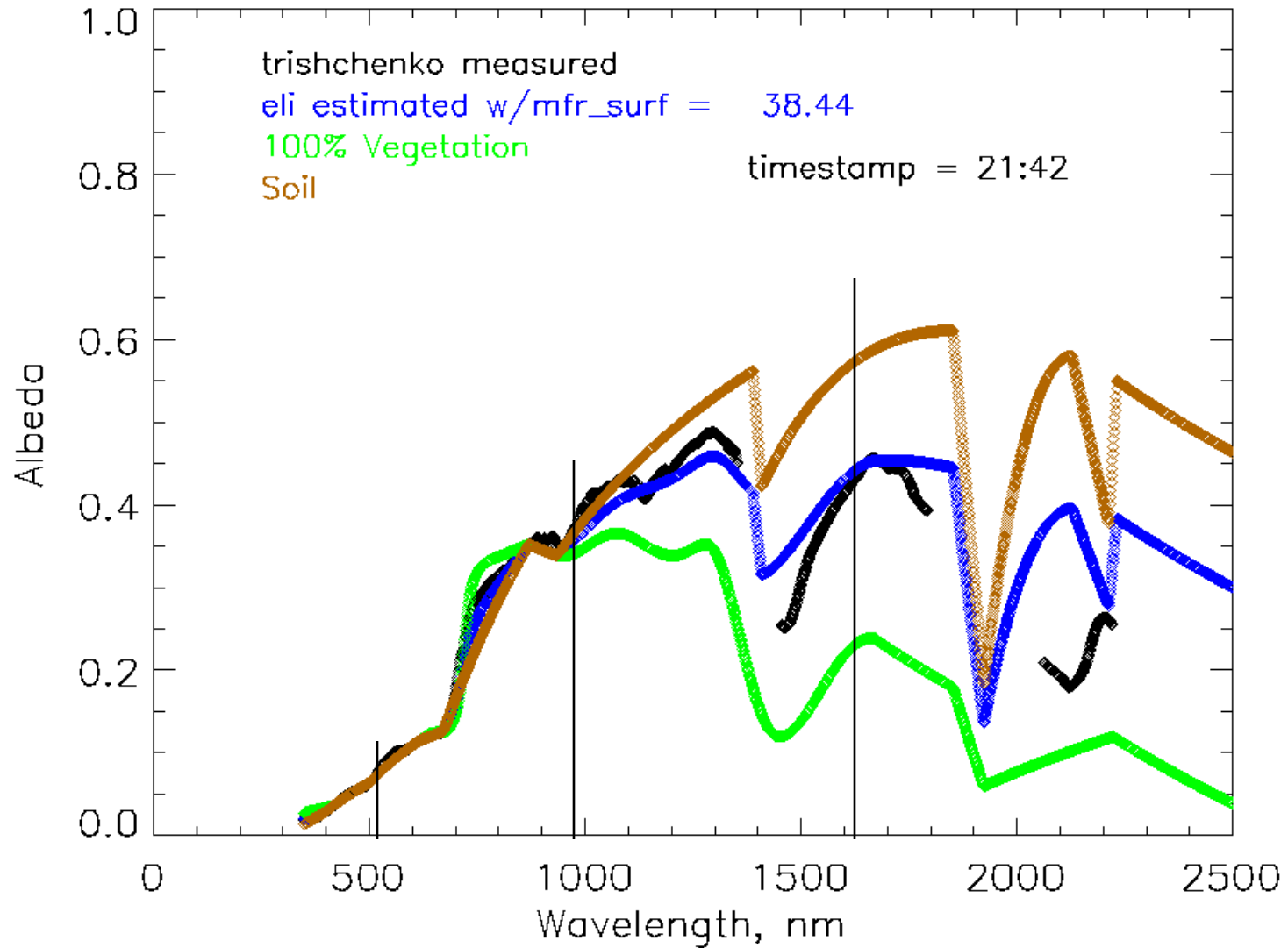
Anthony Bucholtz, Andy Vogelmann, Chuck Long



Spectral Albedo VAP

Poster at last year's ARM Science Team Meeting

Grass, Ashton1, 25 Oct 2004



RACORO

Thank you all, for all your hard work!

