

# **Southern Great Plains Site Scientist Team Quarterly Report**

**September 1 – November 30, 2004**

Issued December 1, 2004

**Don W. Bond, David N. Groff, Peter J. Lamb**

## **1. Introduction**

The Southern Great Plains (SGP) Site Scientist Team (SST) prepares Quarterly Site Scientist Reports, outlining scientific support for site operations for the period covered by the report and assessing the efficacy of site operations in achieving the goals outlined in the *Site Scientific Mission Plan*. The reports are distributed to the ARM Science Team (Chief Scientist) and delivered to the ARM Program Office on March 1, June 1, September 1, and December 1 of each year. Updates on the SST's research and educational outreach programs are available in other documents provided to the ARM Program.

The following sections in this report cover the period from September 1 to November 30, 2004:

2. SGP Site Scientist Team
3. Site Operations Activities
4. Outreach Program
5. Data Quality
6. Instrument Mentorship
7. Meetings

## **2. SGP Site Scientist Team**

This quarter, the SGP Site Scientist Team welcomed David Groff (Penn State Univ.) to the Central Facility as the Assistant Site Scientist. David joined the team on October 15 and immediately began assisting with field studies. David has assumed numerous data quality and operations responsibilities from the Associate Site Scientist, and the SGP Site Scientist Team is now fully staffed.

## **3. Site Operations Activities**

The SST provides scientific guidance to SGP Operations and Facility personnel in all activities that are related to data quality or that might influence the scientific productivity of the site. Each week, the SST hosts the Site Scientist Coordination teleconference to review data availability, data quality, engineering, facilities, and field campaign

performance at the SGP. In addition to the SST, personnel from the Site Data System (SDS), Operations, and the Data Quality Office (DQO) participate. Notes from these meetings, including links to the weekly Data Availability and Data Quality Reports, are available online at:

<http://www.cimms.ou.edu/ARM/sscm/minutes.html>

The SST also develops and maintains computer code to aid Operations in analyzing and reporting on data availability and validity. Changes in instrument operating frequencies and status are reflected in the code as necessary, as well as Engineering ingest and processing changes.

Don Bond continued visits to the Central Facility (CF) for meetings with the Assistant Site Scientist, Site Operations personnel, field campaign participants, etc.

Pete Lamb and Don spent considerable time this quarter planning for future SGP science efforts to aid Operations in prioritizing facilities and instruments needs.

#### **a. New Instruments and Datastreams**

**InfraRed Thermometers (IRTs):** Chuck Long proposed that an IRT be deployed at each of the 22 SGP Extended Facilities (ECR-345) for the purpose of measuring cloud base temperature and inferring cloud base height over the SGP domain. The purchase of six IRTs for deployment has been approved. On November 8<sup>th</sup>, Vic Morris deployed a prototype system including an IRT, Windows XP computer running a Lab View data acquisition program, and a lens-cleaning mechanism at the Guest Instrument Facility.

**Narrow Field-Of-View (NFOV) Radiometer:** On September 15<sup>th</sup>, the new two-channel NFOV and the repaired single-channel NFOV became operational. They were mounted on the same platform as the IRT and in close proximity to the MWR so that their respective fields of view overlap. The new NFOV will have a measurement channel at 673 nm in addition to the original measurement at 870 nm. The new two-channel datastream is named `sgpnfov2chC1`; the repaired single-channel datastream is still named `sgpnfovC1`.

**ShortWave Spectrometer (SWS):** Operations helped John Pommier and Tony Trias (NASA/Ames) install a prototype for about a month of initial testing on November 19<sup>th</sup> (ECO-428).

**W-Band Cloud Radar:** A W-band cloud radar is being built by ProSensing for deployment at the SGP Central Facility (ECO-301). The new radar will complement the existing MilliMeter Cloud Radar (MMCR) by differentiating between clouds and spurious radar returns due to insects and other detritus in the boundary layer. Deployment is currently scheduled for February 2005. SGP technicians have begun preparing for modifications to the MMCR shelter needed to accommodate the new radar.

## **b. Field Campaigns**

Field campaigns during this period continued their focus on providing critical data sets on an episodic basis for the Science Team, as well as field support for instrument development.

David reported cloud base height, cloud top height, optical depth estimates, and optical depth forecasts to Lieutenant Andy Bowers in support of the Flare Observations field study. Optical depths were estimated from MicroWave Radiometer liquid water content data.

Detailed descriptions of the following field campaigns are contained in Appendix A.

<u>Name of Study</u>	<u>Status</u>	<u>Dates</u>
PGS Validation 2004	In Progress	April 15 - December 8, 2004
WSI Stereoscopic Imaging	Completed	June 9 - October 31, 2004
Flare Observations	Completed	October 18-22, 2004
Surface Albedo	Completed	October 20-27, 2004
Boundary Layer CO <sub>2</sub> / CW Lidar	Planned	January - February 2005

## **c. Site Accomplishments**

**Aerosol Observing System (AOS):** The AOS vacuum pumps were relocated to a pump shed outside the Aerosol Trailer to reduce the heating of the wet nephelometer by the pumps, to make additional room for the TDMA, and to reduce the noise level in the trailer (ECO-404).

**MicroWave Radiometers (MWRs):** Vic Morris (PNNL) installed new Windows XP computers and an XP-compatible version of the MWR application program on all SGP MWRs. These upgrades are expected to eliminate the program crashes caused by incompatibility between the application program and Windows 98. A new time synchronization mechanism using network time protocol (NTP) was also installed.

**Radar Wind Profiler:** Due to erosion of the soil in the vicinity of the 50 MHz RASS speakers, Dan Nelson (SGP) proposed (ECO-377) relocating the speakers outside the fence surrounding the 50 x 50 m antenna array. Rich Coulter (ANL) analyzed the RASS performance and recommended relocating the SE speaker to a position 35m from the SW corner of the antenna array. The SE speaker was relocated in November to test this recommendation, but failures of the other two speakers occurred about the same time. Testing the new configuration will be delayed until the speakers are repaired.

Radiometer Calibration: Craig Webb (SGP) traveled to NREL in Golden, Colorado, September 27<sup>th</sup> – October 8<sup>th</sup> for the annual pyrhelimeter/cavity radiometer comparison. This annual comparison traces the calibration of the ACRF reference standard radiometers to the World Radiometric Reference maintained by the World Meteorological Organization (WMO).

Raman Lidar: On September 15<sup>th</sup>, Dave Turner (PNNL), John Goldsmith (SNL-Livermore), and Chris Martin (SGP) aligned the newly refurbished telescope, installed new interference filters, and optimized the signal levels. They also enlarged the hail shield to prevent back flash of the laser pulses into the telescope. These upgrades improved the signal levels by a factor of 2.5-4, depending on the channel. The maximum altitudes of the nighttime and daytime water vapor measurements have been extended, and the noise levels have been substantially reduced (EWO-11029).

Site Data System: The dial-up ISP link at E1 (Larned, KS) was replaced with a less costly DSL link.

Temperature and Relative Humidity Chamber: On November 22<sup>nd</sup>, Robert Hardy (Thunder Scientific) calibrated and recertified the temperature and relative humidity chamber at SGP used for sensor calibrations.

#### **d. BCR's and ECR's**

Don participates in the Baseline Change Request (BCR) and Engineering Change Request (ECR) processes to provide SST input to discussions involving operations changes. BCR's and ECR's submitted during this quarter are summarized in Appendix B.

#### **4. Outreach Program**

The SST conducts educational outreach as administered by the Oklahoma Climatological Survey (OCS). The OCS SGP outreach website is

<http://k12.ocs.ou.edu/>

During this quarter, Don mentored two international students participating in an exchange program with the University of Oklahoma. The students used ARM data in a semester-long research project. The investigation focused on possible correlations between SGP cloud data and other meteorological indicators. Each student received an 'A' for the project.

Don and OCS answer emails and telephone calls from both the general public and the research community about the ARM program, instrumentation, shared data, etc.

This quarter OCS began negotiations with the Lawrence Hall of Science (UC – Berkeley) to bring ARM data into U.S. middle schools as extension activities to the Full Option

Science System (FOSS) kits used around the globe. OCS also began planning education activities for 2005, including an international workshop for curriculum coordinators.

OCS participated in GeoGirl Day, a Girl Scout Geosciences Badge effort for female youth throughout the Oklahoma City metropolitan area. Instrumentation, the fundamentals of remote sensing, and ARM data were shared with over 120 female student participants and their 12 Troop leaders. In addition, a follow-up visit was held via tele- and video-conference with 25 teacher participants from 5 states and Puerto Rico as part of the Engineering Research Center workshop held this past summer in Amherst, MA. ARM SGP data are now flowing to 25 classrooms in Massachusetts, Colorado, Kansas, Florida, Arizona, and Puerto Rico. These data will reach approximately 2500 students in this effort.

## **5. Data Quality**

Dave and Don interact with Instrument Mentors, Site Operations, and the DQO through the new DQPR database to troubleshoot data quality problems and expedite corrective maintenance. The format of the database encourages dialogue between participating entities and provides comprehensive documentation of discussions and maintenance activities associated with the process. The DQPR database can be accessed online at

<http://www.db.arm.gov/DQPR/>

Dave examines the weekly Data Quality Assessment Reports issued by the DQO to alert Site Operations of instrument problems and issue DQPR's as necessary, as well as performing calculations or investigations requested by Operations or others.

Dave and Don performed the Continuous Quality Improvement Program (CQIP) tour of the Extended, Intermediate, and Boundary Facilities this quarter. Don and Dave accompanied John Schatz (Site Safety Officer, L3) on inspections from November 15<sup>th</sup> to November 17<sup>th</sup>. Monte Brandner (ARM Field Operations Manger, ANL) joined David and John S. on inspections from November 29<sup>th</sup> to December 1<sup>st</sup>. The semiannual tours cover half of the sites each time so that each site is visited once per year. Results of the inspections are available on the SGP Operations Management Information System (OMIS) web page at

[http://198.124.96.210/cqip/cqip\\_intro.htm](http://198.124.96.210/cqip/cqip_intro.htm)

David began a comparative study of SMOS vs. SuomiNet temperature, pressure, and relative humidity measurements to investigate possible drift in the SuomiNet instruments.

## **6. Instrument Mentorship**

Don serves as Instrument Mentor for the Soil Water and Temperature System (SWATS). Mentoring duties include monitoring and reporting data quality, maintaining the SWATS Instrument Page, coordinating with Operations to troubleshoot instrument problems,

requesting data reprocessing as necessary, and serving as a point of contact to the public for questions about the SWATS system.

The SWATS at Morris, OK, (E18) has been providing unrepresentative data due to its location in a low area where the water table is apparently just below the surface. This system was recently replaced (July 2003) due to lightning damage attributed in part to saturated soil conditions. It may be necessary to remove the SWATS from this location and find another site for it. In addition, other SWATS installations have steadily degraded over time. Don is conducting a thorough review of these systems to determine whether the installation of a redundant sensor array would be beneficial and for which sites it would be necessary (EWO 10928). Candidate facilities for replacement instruments were prioritized this quarter.

## **7. Meetings**

The SST is represented at ARM Working Group (WG) meetings as necessary in order to help plan field campaigns and participate in discussions regarding data quality, new instruments and datastreams, emerging research issues, etc. Don attended the Cloud Parameterization and Modeling WG meeting in Williamsburg, VA (November 1<sup>st</sup> – 4<sup>th</sup>) and the Instantaneous Radiative Flux WG meeting in Santa Barbara (November 29<sup>th</sup> – December 3<sup>rd</sup>).

Don attended the Kessler Farm Planning Workshop on October 28<sup>th</sup> and 29<sup>th</sup>. The workshop is an NSF-funded project to prioritize scientific and educational efforts on the Kessler land recently donated to the University of Oklahoma. SGP Boundary Facility #6 (Purcell, OK) is located on the Kessler farm.

## **Appendix A – Field Campaigns**

### **Boundary Layer CO<sub>2</sub> / CW Lidar Study January - February 2005**

Mike Dobbs (ITT) is planning a series of flights over the SGP Central Facility for demonstration and validation of a new lidar remote sensing technology intended to be applied towards future NASA and NOAA missions. Data will be used to validate, by comparison with ground truth data, the performance of the instrument and retrieval algorithm as they operate together to resolve small variations in the concentration of CO<sub>2</sub> in the planetary boundary layer. Flights over the SGP are anticipated to occur in the January-February 2005 period, and again in April-May 2005.

### **Flare Observations Field Study October 18-22, 2004**

Andrew Bowers (Hanscom Air Force Base) conducted a series of flights over the SGP Central Facility to observe a series of Armtec MJU-23 flares using both ground-based and airborne sensors. The tests will be used to validate optical clutter suppression methods.

### **PGS Validation 2004 Study April 15 - December 8, 2004**

The PGS validation study continues measurements of carbon, water, and energy fluxes in crop fields at the SGP. Two LBNL portable flux systems have been deployed. The first system is located in a pasture within 7 km of the Central Facility as in previous years and will remain in the pasture for the duration of the campaign. The second system was initially located in a wheat field near EF #1 (Larned, KS), but has been redeployed in a milo field near the Central Facility.

### **Surface Albedo Field Study October 20-27, 2004**

Alexander Trishchenko (Canada Centre for Remote Sensing) conducted a field campaign to collect surface albedo spectra for representative surface types in the ARM SGP domain during autumn conditions. The data are necessary for conducting surface type classification from aerial and satellite remote sensing.

### **WSI Stereoscopic Imaging Field Study June 9 - October 31, 2004**

Gabriela Seiz (Swiss Federal Institute of Technology, Zurich) led a field study to explore the stereoscopic sky imaging capabilities of the WSI instruments. The original WSI (unit #10) was moved to the IDP4 location on May 19<sup>th</sup> to achieve the spatial separation

necessary for stereoscopic imaging. The upgraded WSI (unit #11) commenced full operation on June 9<sup>th</sup>.

## Appendix B – BCR’s and ECR’s

**Table B1. BCR’s**

ID	State/Status	Summary	Priority
<a href="#">BCR-00906</a>	Closed/Completed	Cyril EF PC Enclosure and SIRS Tracker Height Adjustment	3 - Very Important
<a href="#">BCR-00910</a>	Closed/Completed	rename and bundle updates for MWRP and SONDE raw data files	3 - Very Important
<a href="#">BCR-00911</a>	Open/Implementing	Update collection scripts for Active Instrument Time Verification	3 - Very Important
<a href="#">BCR-00913</a>	Closed/Completed	Implement Delivery of NSA MPACE Sonde Data to NOAA	3 - Very Important
<a href="#">BCR-00916</a>	Closed/Completed	Software updates to get sonde data to the NWS	3 - Very Important
<a href="#">BCR-00918</a>	Closed/Completed	New release of mmcrmom_ingest	2 - Critical
<a href="#">BCR-00920</a>	Open/Implementing	Add Voice Over IP Functionality to AMF	3 - Very Important
<a href="#">BCR-00921</a>	Closed/Completed	Release updated MWR ingest to production	3 - Very Important
<a href="#">BCR-00923</a>	Closed/Completed	New release of mfr_ingest for PIF P040916.1	3 - Very Important
<a href="#">BCR-00924</a>	Closed/Completed	SGP Raman Lidar Hail Shield Modification	3 - Very Important
<a href="#">BCR-00925</a>	Closed/Completed	Installation of new SGP Weather Obs DB/forms	2 - Critical
<a href="#">BCR-00932</a>	Closed/Completed	Allow collector process access to BBSS message directories	2 - Critical
<a href="#">BCR-00933</a>	Closed/Completed	SGP AOS Sampler Pump Relocation	3 - Very Important
<a href="#">BCR-00934</a>	Closed/Completed	Test MWR.EXE ver 4.14	3 - Very Important
<a href="#">BCR-00935</a>	Open/Implementing	SGP CF Onsite Access Road Repair	4 - Important
<a href="#">BCR-00936</a>	Open/Implementing	A new datastream called MFRSRCLDOD, the first version of the VAP.	3 - Very Important
<a href="#">BCR-00937</a>	Closed/Completed	Test new EF Replacement Computer with E14 ECOR	3 - Very Important
<a href="#">BCR-00938</a>	Closed/Completed	New release of mmcr_ingest	3 - Very Important
<a href="#">BCR-00947</a>	Closed/Completed	Move one 50 MHz RASS acoustic source to the southwest	4 - Important
<a href="#">BCR-00948</a>	Closed/Completed	Test and Install remote control software on SGP BF XP based systems	3 - Very Important
<a href="#">BCR-00949</a>	Closed/Completed	Upgrade MWR software to version 4.14	3 - Very Important
<a href="#">BCR-00956</a>	Open/In Review	Modify field names for cmdlaos_ingest	3 - Very Important
<a href="#">BCR-00957</a>	Open/Implementing	New release of Langley VAP per PIF P040819.1	3 - Very Important
<a href="#">BCR-00961</a>	Closed/Completed	Change DSview binocular image	3 - Very Important

## Appendix B – BCR’s and ECR’s (cont.)

**Table B2. ECR’s**

ID	State/Status	Summary	Priority
<a href="#">ECR-00416</a>	Closed/Completed	Upgrade Vaisala MW-11 (digiCORA-I) for RS92	3 - Very Important
<a href="#">ECR-00420</a>	Closed/Completed	Software I/Q balancing on MMCRs	3 - Very Important
<a href="#">ECR-00421</a>	Closed/Completed	Increase TSI zenith field-of-view	3 - Very Important
<a href="#">ECR-00422</a>	Closed/Completed	Ascertain file-system integrity throughout all datasystems	3 - Very Important
<a href="#">ECR-00426</a>	Open/In Review	Development of Net Radiometer Calibration Device	3 - Very Important
<a href="#">ECR-00428</a>	Closed/Completed	SWS at SGP	3 - Very Important
<a href="#">ECR-00429</a>	Closed/Completed	Purchase and Deploy an IR Sky Imaging System	3 - Very Important
<a href="#">ECR-00430</a>	Closed/Completed	Cessna Turbo 206 for IAP and Airborne Carbon Measurements	3 - Very Important
<a href="#">ECR-00431</a>	Closed/Completed	Revise Site Access Request Policy and System for visitors connecting to network	3 - Very Important
<a href="#">ECR-00432</a>	Closed/Completed	Modify the Operations Status System	3 - Very Important
<a href="#">ECR-00434</a>	Closed/Completed	Build and Deploy the Tandem Differential Mobility Analyzer for the SGP AOS	3 - Very Important
<a href="#">ECR-00439</a>	Closed/Completed	Procure and Install additional PSAP Wavelengths for AOS and IAP	3 - Very Important
<a href="#">ECR-00440</a>	Closed/Completed	Consistency among AOS-related datastreams	3 - Very Important
<a href="#">ECR-00442</a>	Closed/Completed	Change NASA/Langley LBTM Cloud Retrieval Datastream to VISST.	3 - Very Important