

Southern Great Plains Site Scientist Team Quarterly Report

September 1 – November 30, 2003

Issued December 1, 2003

Don W. Bond, Chad P. Bahrmann, 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, 2003:

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

In July 2003, the DOE Office of Biological and Environmental Research announced that the ARM sites have been designated a National User Facility and renamed the ARM Climate Research Facility (ACRF). As a result, the former ARM CART sites are now known as Climate Research Sites. A draft ACRF Management Plan is due the first week in December.

2. 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 Intensive Operational Period (IOP) performance at the SGP. In addition to the SST, personnel from Engineering, the Site Data System, Operations, the Data Quality Office (DQO), and Argonne National Laboratory (ANL) 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. Additional software updates following a hardware upgrade were completed this quarter.

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

a. New Instruments and Datastreams

Atmospheric Emitted Radiance Interferometers (AERI's): QMEAERILBLCLOUDS data from 08/01/03 to 08/31/03 have been processed and are available at the archive (EWO 10666).

Eddy Correlation (ECOR) System: New ECOR systems have been installed and are operational at the following Extended Facilities (EF's): Halstead, KS (EF-5), Towanda, KS (EF-6), Tyro, KS (EF-10), Lamont, OK (EF-14), Vici, OK (EF-16). The new systems replace the ECOR's previously installed and measure carbon dioxide fluxes in addition to water vapor and heat fluxes. The systems incorporate Gill Windmaster Pro sonic anemometers and LICOR-7500 IR Gas Analyzers (H₂O and CO₂). The unit at Okmulgee, OK, cannot be installed until the turkey vulture issue is resolved. The remaining three systems will have to wait until funding permits the acquisition of the remaining three computers.

NASA Satellite Data: GOES 12 data from Pat Minnis's group at NASA-Langley are available for April 2003 to the present:

sgpgoes12minnis-acfX1.c1- ARM CF
sgpgoes12minnisX1.c1- North America

AVHRR data for NOAA-15, NOAA-16, and NOAA-17 are available in HDF:

sgpavhrr15X1.a1
sgpavhrr15radX1.a1
sgpavhrr16X1.a1
sgpavhrr16radX1.a1
sgpavhrr17X1.a1
sgpavhrr17radX1.a1

Whole Sky Imager (WSI): An upgraded WSI was deployed at the CF and became operational on November 29. Site Operations personnel assisted Janet Shields of the Marine Physical Laboratory (MPL) in the deployment and relocated the existing WSI approximately 10 m west of the new instrument. Following a period of collocated

operation for performance verification, the older instrument may be returned to MPL for upgrading.

b. IOP's and Campaigns

IOP's and 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.

Site Operations staff devoted considerable time to supporting the second Diffuse Shortwave IOP, the Spectral Ice and Liquid Water IOP, and the AIRS Water Vapor-Ground (AWEX-G) campaign. Preparations for AWEX-G included erecting a temporary shelter for inflating 15-foot diameter balloons and setting up three Balloon-Borne Sounding System (BBSS) ground stations (DigiCORA-II) at the Guest Instrument Facility (GIF).

Don constructed a website for updating/input by AWEX-G IOP participants and provided daily forecast briefings for sonde flights. Don also updated IOP participants on SGP instrument health and status.

Detailed descriptions of the following IOP's and campaigns are contained in Appendix A.

<u>Name of Study</u>	<u>Status</u>	<u>Dates</u>
Broadband Radiometer Cleaning Study	In Progress	January 1 – December 31, 2003
AIRS Validation IOP	In Progress	September 9 - ?
Diffuse Shortwave IOP	Completed	October 6 – 17, 2003
Spectral Liquid Water and Ice Experiment	Completed	October 14 – November 4, 2003
AIRS Water Vapor Experiment – Ground (AWEX-G)	Completed	October 27 – November 16, 2003
WSI Stereoscopic Experiment	Proposed	January – April, 2004
Cirrus WB-57 Campaign	Anticipated	April 2004

c. Site Accomplishments

AERI's: The AERI systems at the four SGP Boundary Facilities (BF's) are to be reallocated to TWP, NSA, the ARM Mobile Facility, and the SGP CF (BCR-721). The

AERI's at BF-5 (Morris, OK) and BF-6 (Purcell, OK) failed and were returned to the University of Wisconsin in November for repair and upgrades. The AERI at BF-1 (Hillsboro, OK) was relocated to the CF. When the BF-1 AERI's cooler is replaced, it will be temporarily collocated with, and ultimately replace, the CF AERI in the Optical Trailer.

Cimel Sunphotometer (CSPOT): New aerosol optical properties are available for CSPOT data (BCR-00672). For a listing of datastreams, refer to www.arm.gov/docs/xds under "Aerosols".

Data Quality Problem Report (DQPR) System: Changes to the DQPR System were completed (BCR-00716).

GPS Time Synchronization: GPS receivers were added to the EF's to provide local time synchronization for the instrumentation in November (ECO-225).

Infrared Calibration System (IRCAL): The chiller on the IRCAL cold temperature alcohol bath was repaired. PIR calibrations were completed, and the EF PIR's were changed out.

Millimeter Cloud Radar (MMCR): The MMCR was upgraded in September. Continuous spectra will be recorded in addition to the moments and reflectivity.

Narrow Field-of-View (NFOV) Radiometer: John Schmelzer constructed a new, two-channel NFOV with wavelengths at 673 and 870 nm (ECO-245). The target date for SGP deployment is February 2004.

Radar Wind Profilers (RWP's): The operating systems on all four 915-MHz RWP's were upgraded from the DOS-based POP4 software to the new LAP-XM software that runs under Windows (BCR 629). Data is being successfully collected and ingested.

Radiometer Calibration: Craig Webb participated in the annual pyrheliometer/cavity radiometer comparison (September 22 – October 3) at the National Renewable Energy Laboratory (NREL) in Golden, Colorado. This annual comparison ensures the calibration of our reference standard radiometers is traceable to World Meteorological Organization standards.

Radiometer Stands: To alleviate leveling problems caused by shifting soils, new radiometer stands of the type installed at the Earlsboro, OK (EF-27), and Hillsboro, KS (EF-2), sites have been installed at Larned, KS (EF-1), and Elk Falls, KS (EF-7).

Raman Lidar: Tim Tooman (Instrument Mentor) and John Goldsmith installed a new beam transmitting mirror assembly (BCR-720) in September. Site Operations replaced the chiller to increase cooling capacity by 50% and installed an additional coolant pump for the second laser head (ECR-349). The second laser ran successfully, but other problems with the system have arisen that will require a service call by the laser vendor.

Degradation of the system performance has been attributed to degradation of either or both the original telescope and optics; a new telescope may be necessary. Since the laser vendor (Continuum) was sold, problems with responsiveness and quality of repair parts have arisen.

Roads: Grant County Road Department graded the west access road and added rock to the east access road.

Surface Reference System (SRS): Barry Lesht (ANL) and Bob White (ANL) installed a new SRS at the GIF for the BBSS as part of the AWEX-G IOP. The SRS will be relocated from the GIF to the central compound area to replace the Chilled Mirror and the preflight aspiration system for the BBSS.

Shortwave Spectrometer (SWS): The SWS was removed from service following repeated hardware failure (BCR-763). In spring 2004 the mentor (Peter Pilewski) will test a new shortwave spectrometer as a possible replacement.

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.

3. Outreach Program

The SST conducts educational outreach as administered by the Oklahoma Climatological Survey (OCS). Updates on this program are found at

<http://kato.ou.edu/~cimms/ARM/outannrp.html>

The OCS SGP outreach website is <http://k12.ocs.ou.edu/>

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. Don toured a reporter from KOSU – Stillwater, the main NPR affiliate in Oklahoma, through the CF instruments and taped an interview.

OCS presented an invited workshop entitled “Mirror, Mirror on the Wall, Do ‘Snow’ and ‘White’ Reflect it All?” at the annual National Science Teacher Association Conference in Kansas City in November. Teachers utilized ARM data to evaluate radiation balances and surface temperature fluctuations before, during, and after a December snowstorm in the SGP.

OCS attended the Society for the Advancement of Chicanos and Native Americans in Science annual meeting in Albuquerque. Work is beginning on the introduction of ARM data and educational modules into numerous Native American schools in Oklahoma and

Kansas. OCS will be working with the University of Oklahoma (OU) Native American Studies Department in this effort.

Preparation for the 2004 ARM/Mesonet Science Fair (February 2004) has begun. Several companies have been lined up to sponsor prizes for students and gifts for teachers from Oklahoma and Kansas.

Kevin Kloesel taught two Introduction to Meteorology classes in the School of Meteorology this fall. OCS rewrote the laboratory portion of this course, featuring ARM data in several labs covering the global energy balance and albedo.

4. Data Quality

Don interacts 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/>

Don examines the weekly Data Quality Assessment Reports issued by the DQO to alert Site Operations of instrument problems and issue DQPR's as necessary. Don assisted the DQO with SGP data quality related issues as necessary and assisted the DQ Reporter development team with testing of the new DQPR database (ECR-00229).

Continuous Quality Improvement Program (CQIP): Don accompanied Monte Brandner (ARM Conduct of Operations Coordinator) and John Schatz (SGP Site Safety Officer) on the second half of the 2003 CQIP, November 17 - 20. The CQIP is an inspection tour of all SGP Extended, Intermediate, and Boundary Facilities to identify safety and data quality issues. Results of the inspections are available at

http://198.124.96.210/cqip/cqip_intro.htm

5. 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.

Last quarter's efforts were primarily devoted to reinstalling the SWATS instruments at Morris, OK, (EF-18) and Earlsboro, OK (EF-27). Engineering Work Order #10853 was submitted this quarter along with various DQR's and PIF's to request the necessary

NetCDF header changes to reflect the instrument configuration changes at Morris. The soil study at Earlsboro was completed by Oklahoma State University, the soil characterization information was submitted to Engineering, and the ingest was released.

6. Meetings

The SST is represented at ARM Working Group meetings as necessary in order to help plan IOP's and participate in discussions regarding data quality, new instruments and datastreams, emerging research issues, etc.

Don attended the Cloud Properties Working Group Meeting in Broomfield, CO, October 27 - 30. Don also met with ARM-affiliated researchers at OU to address their interest in the ARM Science Plan.

Appendix A – Campaigns and IOP's

AIRS Validation IOP

September 9 - ?

In support of the validation of the AIRS instrument on the Aqua satellite launched in March 2002, two radiosondes are launched daily from the CF approximately 45 minutes apart. These supplemental soundings are scheduled to occur at the satellite's overpass. The first sondes were launched on July 23, 2002. The second round of radiosonde launches in support of AIRS validation resumed on September 9. Launches in support of AIRS validation were suspended from October 29 to November 19 because NASA shut down the satellite during this period to protect it from solar flares.

<http://iop.archive.arm.gov/arm-iop/2002/sgp/airs>

<http://iop.archive.arm.gov/arm-iop/2003/sgp/airs>

AIRS Water Vapor Experiment – Ground (AWEX-G) IOP

October 27 -November 16, 2003

David Whiteman (NASA/GSFC) led a ground-based experiment involving several radiosonde technologies and the NASA/GSFC Scanning Raman Lidar (SRL). Radiosondes brought to the site include the NOAA Frostpoint Hygrometer, RS-80H, Snow White, Sippican, and Internet. They also incorporate RS-90 coverage of approximately 30 overpasses that occur during this period through the currently funded AIRS validation activity. Radiosonde launches were performed during daytime and nighttime overpasses of the Aqua satellite for comparison with AIRS radiances. SRL measurements of water vapor were performed during the nighttime overpasses. Because NASA shut down the satellite during the IOP period to protect it from solar flares, the IOP refocused on its secondary goal to compare the different radiosonde types and other ground-based water vapor sensors. The AERIbago was a last-minute addition to the IOP instruments.

Broadband Radiometer Cleaning Study

January – December 31, 2003

Tom Stoffel (NREL) has initiated a controlled, yearlong study of the effects of radiometer cleaning schedules on the accuracy of SIRS broadband shortwave and longwave irradiance measurements at the SGP. This study is using the Radiometer Characterization System at the SGP GIF to collect downwelling irradiance measurements from duplicate instruments maintained on different schedules to simulate the current SIRS network practices. NREL will acquire and process the Cleaning Study data. The data (and plots of the data) are available at:

http://www.nrel.gov/midc/arm_rcs/

Cirrus WB-57 Campaign
Mid - April, 2004

Jay Mace (University of Utah) is preparing for a cirrus cloud study involving over-flights of the SGP CF by the NASA WB-57 aircraft.

Diffuse Shortwave IOP
October 6 – 17, 2003

A second Diffuse Shortwave IOP followed up on the first Diffuse Shortwave IOP held in late October 2001. The goal of this effort is to develop a consensus reference standard for shortwave diffuse horizontal irradiance since there is no absolute reference, and no development efforts of such a standard are foreseen.

Spectral Liquid Water and Ice Experiment
October 14 - November 4, 2003

John Daniels (NOAA/AL) carried out near-infrared spectral measurements of scattered sunlight to retrieve path-integrated liquid and ice water paths from clouds over the SGP site. These retrieved values will be compared to similar quantities retrieved from the AERI instruments (optically thinner clouds) and the Microwave Radiometer (optically thicker clouds).

WSI Stereoscopic Experiment IOP
January – April, 2004

Gabriela Seiz (Swiss Federal Institute of Technology, Zurich) has proposed an IOP to explore the stereoscopic sky imaging capabilities of the WSI instruments.

Appendix B – BCR's and ECR's

Table B1. BCR's

ID	State/Status	Summary	Priority
BCR-00721	Closed/Completed	Discontinue AERI Operation at SGP Boundary Facilities	3 - Very Important
BCR-00722	Open/Implementing	Deployment of new ECOR systems	3 - Very Important
BCR-00723	Closed/Completed	new version of TSI ingest	3 - Very Important
BCR-00724	Closed/Completed	Release new cm_ingest and TDB keys to production.	3 - Very Important
BCR-00725	Closed/Completed	Release new smos_ingest and TDB keys to production.	3 - Very Important
BCR-00726	Closed/Completed	Release new thwaps_ingest and TDB keys to production.	3 - Very Important
BCR-00727	Closed/Completed	Release new twr_ingest and TDB keys to production.	3 - Very Important
BCR-00730	Closed/Completed	Release new vceil_ingest and TDB keys to production.	3 - Very Important
BCR-00732	Closed/Completed	Change in connection scripting at EF sites	3 - Very Important
BCR-00733	Closed/Completed	Release new ebb_r_ingest and TDB keys to production.	3 - Very Important
BCR-00737	Closed/Completed	new release of sonde_ingest	3 - Very Important
BCR-00739	Closed/Completed	SGP Sounding Systems support for AWEX-G IOP	3 - Very Important
BCR-00741	Open/Implementing	CART Site SDS Graceful Shutdown Process	3 - Very Important
BCR-00743	Closed/Completed	Fix List Items for October 7th, 2003	3 - Very Important
BCR-00744	Closed/Completed	Updates to current MentorQC logic	3 - Very Important
BCR-00746	Closed/Completed	Release updated swats_ingest and TDB keys to production.	3 - Very Important
BCR-00751	Closed/Completed	Upgrade SGP digiCORA-III software	3 - Very Important
BCR-00753	Closed/Completed	Updates to input datastreams for the VAP -QME AERI LBL CLOUDS	3 - Very Important
BCR-00754	Closed/Completed	SGP AOS Chemical Filter Sampling System Check and Reporting	3 - Very Important
BCR-00755	Open/Implementing	Install new ingest: mmcrmom_ingest	3 - Very Important
BCR-00756	Closed/Completed	Install IDL on SGP R1	3 - Very Important
BCR-00757	Closed/Completed	Relocate WSI in preparation for new WSI deployment	2 - Critical
BCR-00760	Open/Implementing	Relocation of Morris (BF5) AERI to SGP-CF	3 - Very Important
BCR-00761	Open/Implementing	Begin series of RS92 operations test soundings	3 - Very Important
BCR-00762	Open/Implementing	Install GPS Receivers at EF's for timekeeping	3 - Very Important

BCR-00763	Open/Implementing	Remove shortwave spectrometer (SWS) from service	3 - Very Important
BCR-00764	Closed/Completed	update cmdlaos_ingest to generate new time fields	3 - Very Important
BCR-00768	Closed/Completed	Install SIRS instrument on new radiometer stand design	3 - Very Important
BCR-00769	Closed/Completed	Auxiliary A/C for the SGP Profiling Radar Shelter, ECO-00331	3 - Very Important
BCR-00772	Closed/Completed	Removal of SGP CM instrument	3 - Very Important

Table B2. ECR's

ID	State/Status	Summary	Priority
ECR-00346	Closed/Completed	Change over to YES UVB Instruments	3 - Very Important
ECR-00347	Closed/Completed	Calibrate SWS data at the SGP site	3 - Very Important
ECR-00348	Closed/Completed	Create ARMified Redhat 9 Installation	3 - Very Important
ECR-00349	Closed/Completed	Replace SGP Raman Lidar chiller with larger unit	3 - Very Important
ECR-00350	Closed/Completed	MFRSR integrating of Campbell data logger	3 - Very Important
ECR-00351	Closed/Completed	Remove and relocate the Boundary Facility AERIs	3 - Very Important
ECR-00352	Closed/Completed	Revise EBBR CR10 Program to Improve Primary Measurements Quality	3 - Very Important
ECR-00353	Closed/Completed	Ingests/collections log-messages (replace MDS email-logs)	3 - Very Important
ECR-00354	Closed/Completed	Automate RL Log retrieval	3 - Very Important
ECR-00355	Closed/Completed	USER FACILITY PROPOSAL: PRECIPITATION ISOTOPE ANALYSIS	3 - Very Important
ECR-00356	Closed/Completed	Improve DMF VAP Quicklook interface	3 - Very Important
ECR-00357	Closed/Completed	Addition of ABLE data and information into ARM	3 - Very Important
ECR-00358	Closed/Completed	SGP Replacement Hardened EF Computers	3 - Very Important
ECR-00359	Closed/Completed	Mentor access to ECOR and IF RWP Instrument Computers	3 - Very Important
ECR-00360	Closed/Completed	Best Estimate Aerosol Optical Depth VAP (BE AEROSOL 1TURN)	3 - Very Important
ECR-00362	Closed/Completed	Micro-Pulse Lidar (MPL) Instrument Re-engineering & Updates	3 - Very Important
ECR-00363	Closed/Completed	Apply CMDL corrections and calibrations to AOS data	3 - Very Important