

Southern Great Plains Site Scientist Team Quarterly Report

December 1 – February 28, 2005

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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 December 1 to February 28, 2005:

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

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 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 for meetings with the Assistant Site Scientist, Site Operations personnel, field campaign participants, etc. Don met with Dr. Evgeni Fedorovich (University of Oklahoma) prior to bringing him to the site to discuss logistics for a proposed field campaign. That trip was also utilized to confer with Site Operations regarding the troubleshooting of the Soil Water and Temperature System at Cyril, OK (E24).

Pete Lamb and Don continued planning for future SGP science efforts to aid Operations in prioritizing facilities and instruments needs.

a. New Instruments and Datastreams

Aerosol Observing System (AOS): The PSAP instruments in the Aerosol Trailer and on the In-situ Aerosol Profiling aircraft, which currently provide measurements of absorption at 565 nm, will be upgraded to add measurements at 450 nm and 700 nm to complement the total scatter and hemispheric backscatter measurements from the nephelometers at 450 nm, 550 nm, and 700 nm (ECR-439). Also, a Tandem Differential Mobility Analyzer (TDMA) will be built by Texas A&M University for deployment at the AOS (ECR-434). A new 3-wavelength PSAP will be deployed at the SGP in March for comparison with the existing 1-wavelength PSAP before the 1-wavelength PSAPs in the AOS and In-situ Aerosol Profiling aircraft are upgraded.

Atmospheric Emitted Radiance Interferometer (AERI): A new AERI VAP, aeriprof3feltz, was released to replace the discontinued AERI PROF VAP (BCR-971). It uses RUC data to form an initial 'best guess' basis set and then performs an iterative retrieval process. The benefits include uniform time-series (essentially no missing data under non-precipitating conditions) and improved vertical resolution (~75 meters in the lower 3 km).

CPM Model Forcing Data: A new special data subdirectory contains both continuous data sets for model forcing and data sets for individual ARM field campaigns, produced for the CPM WG, using the Constrained Variational Analysis method. Data directories:

0special-data/cpm-forcing/continuous_at_sgp/
0special-data/cpm-forcing/iop_at_sgp/

MFRSRCLDOD VAP: This VAP uses MFRSR, MWR and Langley data, and produces cloud properties such as optical depth, effective radius and liquid water path for the warm, single layer and overcast cloud (BCR-936). New data streams:

sgpmfrsrclod1minC1.c1
sgpmfrsrclod1minE13.c1

ShortWave Spectrometer (SWS): John Pommier (NASA/Ames) submitted a report on the

prototype testing and recommendations for the new SWS (ECO-428). Construction of the new instrument will begin as soon as a contract is in place.

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. The deployment has been delayed at least until April 2005 due to manufacturing problems at the power tube supplier. The radome, blower and splash plate were delivered. Modification of the MMCR shelter and installation of the W-band radar components are scheduled for March. Fleharty Engineering installed the concrete tower base, and SGP Site Operations installed the tipping tower for the radar calibration (corner cube) reflector.

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.

Don met with new University of Oklahoma radar scientists regarding planned activities at the Kessler Farm, which houses ARM Boundary Facility #6 (Purcell, OK). Discussions covered possible conflicts between ARM operations and proposed instrument additions, as well as introducing the scientists to the ARM program in anticipation of future collaborations.

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	Completed	April 15 – December 31, 2004
Boundary Layer CO ₂ / CW Lidar	Planned	April 24 – 28, 2005

c. Site Accomplishments

Balloon-Borne Sounding System: Vaisala phased out the RS90 radiosondes for the new RS92 radiosondes, requiring upgrades to the DigiCORA-I and -II ground stations (ECO-380). Barry Lesht (ANL) trained the radiosonde launch personnel in the use of the RS92 radiosondes in January. SGP began launching RS92 sondes during the first week in February with a single additional launch at 14:30 local time until the supply of RS90 sondes was exhausted on February 9th, after which RS92 sondes were launched exclusively (BCR-761).

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. 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. A C program to acquire the IRT data was installed on the local computer for testing. SGP staff continue to work with Vic and Chuck on refinements to the mirror cleaning system. Deployment of the revised system at Ashton, KS, (EF9) is anticipated for April or May.

Raman Lidar: A Continuum technician replaced the THG crystal and output window in December. Problems with the HVAC system that briefly caused shelter temperatures to reach 80°F were corrected.

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). OCS has a new outreach website that integrates ARM, Oklahoma Mesonet, radar, satellite and upper air data. The new website is

<http://earthstorm.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.

OCS continues to prepare for the 2005 National Science Teacher Association conference in Dallas (April) and the annual EarthStorm teacher workshop held during July 2005 for teachers in the SGP.

Kevin Kloesel sent Andrea Maestas lesson plans to post on the ARM Education web page. Andrea will format the lessons and work with the web development team at PNNL to post the lessons online.

Final edits were made and submitted to Brooks-Cole publishing for the OCS Lab Manual entitled Explorations in Meteorology: A Lab Manual. This lab manual includes ARM data exercises targeted for undergraduate students.

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. Preliminary meetings were held with Delta Education to integrate ARM data into the Full Option Science Series (FOSS) kits targeted for middle-school students. OCS will host the national FOSS Weather and Water workshop during June 2005.

Preliminary preparations are ongoing for the 2nd Annual CASA remote sensing workshop to be held in Puerto Rico in June 2005.

OCS hosted its 12th annual ARM/Mesonet Science Fair in February. Nearly 100 students from across Oklahoma participated in the fair. Project abstracts were reviewed and categorized, and data requests from students were filled to support project activities. The students were mentored by ARM and Mesonet scientists during project preparation and were judged by ARM and Mesonet scientists and students during the fair itself. This year's upper division winner incorporated input from ARM mentor scientists to improve her project, and it has since been accepted for the International Science Fair. This is the 3rd straight year that a project from the OCS ARM/Mesonet Science Fair will appear at the international competition.

4. Data Quality

Dave and Don interact with Instrument Mentors, Site Operations, and the DQO through the 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.

The annual Continuous Quality Improvement Program (CQIP) tours of the Extended, Intermediate, and Boundary Facilities augment data quality efforts and provide regular evaluation of the scientific fitness of the facilities. 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

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

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 instrument.

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 replaced in July '03 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 conducted 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 last quarter.

Summary statistics of SWATS measurements were prepared for display at the Science Team meeting. Don traveled to the Central Facility to confer with Site Operations regarding troubleshooting the SWATS instrument at E24 (Cyril, OK).

Don updated the instrument page and prepared Instrument Mentor guidance for the Data Quality Office to use as an example for requesting official written guidance from ARM Instrument Mentors for their analysts.

6. 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 Instantaneous Radiative Flux WG meeting in Santa Barbara (November 29th – December 3rd), the Aerosol Working Group meeting in Boulder (December 8th – 10th), and the Cloud Properties WG meeting in Reston (January 5th – 7th).

Appendix A – Field Campaigns

Boundary Layer CO₂ / CW Lidar Study

April 24 – 28, 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 CO₂ in the planetary boundary layer.

PGS Validation 2004 Study

April 15 - December 31, 2004

The PGS validation study continues measurements of carbon, water and energy fluxes in crop fields at the SGP. Two LBNL portable flux systems were deployed. The first system is 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 deployed in a wheat field near Larned, KS, (EF1) and redeployed in a milo field near the Central Facility. The end date of this study was extended again.

Appendix B – BCR’s and ECR’s

Table B1. BCR’s

ID	State/Status	Summary	Priority
BCR-00971	Closed/Completed	Release new aeriprof3feltz VAP that replaces discontinued aeriprof VAP	3 - Very Important
BCR-00972	Closed/Completed	Install Upgraded Site Access Request System (SARS)	3 - Very Important
BCR-00974	Closed/Completed	Temporarily relocate spare MWR to test RFI from 50 MHZ RWP	3 - Very Important
BCR-00976	Closed/Completed	MMCR spare processor test - install spare and test to see if it will run.	3 - Very Important
BCR-00978	Open/Implementing	Connect MWR air temperature sensor to analog board	3 - Very Important
BCR-00980	Closed/Completed	Add ISR Link to ACRF Field Campaign Page	3 - Very Important
BCR-00982	Closed/Completed	Releasing new version of the TSI ingest	3 - Very Important
BCR-00983	Closed/Completed	Increase temporal resolution of Raman Lidar to 10 s	3 - Very Important
BCR-00984	Open/Implementing	Update MWR statistical retrieval coefs to monoRTM	4 - Important
BCR-00988	Open/Implementing	Release new irt_ingest per PIF Po41227.1	3 - Very Important
BCR-00989	Open/Implementing	New ingest: cmdliap_ingest for "in-situ aerosol profile" data	3 - Very Important
BCR-00991	Closed/Completed	Update to DQPR System	3 - Very Important
BCR-00992	Closed/Completed	Replace PGS dessicant (Enivrogen) with Dri-Rite at SGP	3 - Very Important
BCR-00996	Open/Implementing	Add qc delta flag to sg1smos data files	4 - Important
BCR-00997	Closed/Completed	MMCR - TWT Manufacturer changes	3 - Very Important
BCR-00998	Open/Implementing	Upgrade production machines to Seem 3	3 - Very Important
BCR-01001	Closed/Completed	A new ingest for the Oklahoma Mesonet 30 minute data stream	3 - Very Important
BCR-01002	Closed/Completed	SGP CF 4m CO2 Flux System Relocation	3 - Very Important
BCR-01003	Open/Implementing	Deploy re-engineered TSIs	3 - Very Important
BCR-01006	Closed/Completed	Please remove the 2 channel NFOV from service and return it to Battelle.	3 - Very Important
BCR-01009	Closed/Completed	Correct minor bug and add information to sonde metadata variable	3 - Very Important

Appendix B – BCR’s and ECR’s (cont.)

Table B1. BCR’s (cont.)

ID	State/Status	Summary	Priority
<u>BCR-01010</u>	Open/Implementing	A 3 wavelength PSAP will be added to the AOS system on March 3, 2005.	3 - Very Important
<u>BCR-01011</u>	Closed/Completed	Modify power tweak software on RL	3 - Very Important
<u>BCR-01012</u>	Closed/Completed	Change in Cimel processing and transfer	3 - Very Important
<u>BCR-01013</u>	Closed/Completed	Site and Computer Access Request System - minor textual change	3 - Very Important

Table B2. ECR’s

ID	State/Status	Summary	Priority
<u>ECR-00446</u>	Closed/Completed	2-channel NFOV instrument modifications	3 - Very Important
<u>ECR-00448</u>	Closed/Completed	Change to Data Quality Problem Report (DQPR) system	3 - Very Important
<u>ECR-00449</u>	Closed/Completed	Add a new datastream for filtering out the noise of aeri for both C1 and S01	3 - Very Important
<u>ECR-00451</u>	Closed/Completed	Upgrade network at SGP	3 - Very Important
<u>ECR-00453</u>	Closed/Completed	MMCR Temperature/RH Monitoring Experiment	3 - Very Important
<u>ECR-00454</u>	Closed/Completed	Revise BA EBBR VAP to Correct Errors	3 - Very Important
<u>ECR-00455</u>	Closed/Completed	Update Vaisala software and convert digiCORA-III PCs to ARM CorePC	3 - Very Important
<u>ECR-00463</u>	Closed/Completed	Rename aeriprof and gaeriprof data streams	3 - Very Important
<u>ECR-00466</u>	Closed/Completed	Upgrade NSA and SGP digiCORA-IIIs for TCP/IP communications	3 - Very Important
<u>ECR-00467</u>	Closed/Completed	Changes to ARM EBBR Ingest (does not affect data)	3 - Very Important
<u>ECR-00468</u>	Closed/Completed	Add category attribute to all netCDF primary measurement variable headers	3 - Very Important