

Quarterly Report of the Southern Great Plains Site Scientist Team

**For the period
March 1, 1999-May 31, 1999**

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1. Introduction

The Southern Great Plains (SGP) Site Scientist Team (SST) is obligated to prepare **Quarterly Site Scientist reports**, outlining 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 to be suitable for distribution to the ARM Science Team and delivered to the ARM Program Office on March 1, June 1, September 1, and December 1 of each year. This document focuses on our efforts relating to scientific support for site operations. Updates on our research and educational outreach programs are available in other documents provided to the ARM Program.

This Quarterly Report covers the period **March 1 through May 31, 1999**, due June 1, 1999.

2. Goals for the Period as Outlined in the *Site Scientific Mission Plan*

Priorities for site activities for January-June 1999, as outlined in section 2.2 of the present *Site Scientific Mission Plan*, are as follows:

- Facilitate all data quality assessment efforts, particularly those focused on the development of a full suite of data quality analysis tools, participation in the testing and further development of the Meta Data Navigator, implementation of Quality Measurement Experiments (QMEs) and Value Added Procedures (VAPs), and better dissemination of information on data quality.
- Continue assessment of the measurement capability of the SGP CART site relative to Science Team needs.
- Plan and implement key Intensive Observation Periods (IOPs) and campaigns.

- Finish implementation of the Okmulgee extended facility.
- Support the Instrument Development Program (IDP).
- Continue review of routine site operations.

3. Site Operations in Support of Goals for the Period

- Facilitate all data quality assessment efforts, particularly those focused on the development of a full suite of data quality analysis tools, participation in the testing and further development of the Meta Data Navigator, implementation of Quality Measurement Experiments (QMEs) and Value Added Procedures (VAPs), and better dissemination of information on data quality.*

Mike Splitt and Chad Bahrmann continued to spend significant effort developing new **data quality metrics and graphical displays** for diagnosing the quality of SGP data streams. This work also included continued participation in the design and beta testing of Build One of the ARM Information Architecture (AIA) **Meta Data Navigator** (MDN), as well as planning for Build Two. The SST also continued its role of issuing **work order guidance** to instrument mentors and site operations staff based on its quality analysis results. Randy Pepler helped oversee these activities and also participated in the MDN Build One and Two efforts.

All SST metrics and associated graphical displays can be found on our **data quality web page**:

http://www.res.sgp.arm.gov/sst/dq_monitor/DISPLAYS.html

Progress during this period was made as follows:

- Mike Splitt and Chad Bahrmann continued work to monitor the performance of **SIRS broadband downwelling pyrgeometers**. Various estimates of the downwelling broadband longwave flux based on surface meteorological conditions are being compared to the SIRS measurements. The estimates currently shown on the SST web site are based on either a clear sky or a cloudy sky and provide an approximate range with which one would expect the actual data to occur. Mike Splitt developed a modified Aubinet algorithm during the period that uses regression on a data set that includes both August and December data. Work continues.
- Mike Splitt created a new 10-day plot to examine **MWR liquid and vapor data** from the MWR line of site (LOS) files. Graphics also plot markers on the vapor values when the wet-window flag is raised.

- Mike Splitt participated in a meeting at PNNL in May regarding the **SIRS DQMS and other SIRS IDPC issues**. He will be working with the SIRS mentor, Tom Stoffel, on developing **broadband longwave radiation flags** that follow from previous work done. Flagging codes may be implemented in the IDPC. Mike also helped draft an outline of the **working relationship between the SST and the SIRS mentor** over the next few years. In other SIRS news, Mike Splitt made minor revisions during this period to the SIRS QC web page shortwave section.
- Chad Bahrmann continued his extensive efforts on establishing data quality baselines for **SWATS**. During this period, he spent considerable time writing code for SWATS quicklooks. Also during this period, direct troubleshooting of the Byron (EF11) and Morris (EF18) SWATS was done. These were the only two sites that did not improve after last quarter's extensive electronics troubleshooting. Chad and site operations staff were able to revive Byron, but not Morris. At Byron, a faulty CE8 module and some miswiring was found. At Morris, the same problems were found, but it also appears that most of the individual soil moisture sensors are blown. This site will require instrument mentor intervention. A tour of all SWATS sites is planned by Ken Fisher and Chad Bahrmann in June to assess and standardize each site for the long-term.
- To help determine **SMOS and THWAPS** data quality, while at the same time providing near real-time SMOS/THWAPS data displays for anyone who desires them, Chad Bahrmann, with input from Randy Pepler, developed **EF SMOS/THWAPS Current Conditions** displays that are automatically updated on the web every 30 minutes. These displays are similar to current weather observations displays shown by other networks, and include temperature, wind speed and direction, relative humidity, barometric pressure, heat or wind chill index, maximum and minimum temperature and wind speed, and accumulated precipitation. These displays should prove particularly valuable during IOPs and for use in educational outreach. During the period, Chad Bahrmann added **meteograms** to the web display capability, which has added great value to the information presented. Also, during this period, **NWS forecast offices in Kansas** began using the displays in a near real-time mode. Four Kansas NWS representatives from Dodge City and Wichita visited Randy Pepler on May 3 to learn more about these displays and ARM's general data measurement capabilities. They are interested in developing a Kansas Mesonet from existing networks and would like to see ARM move to hourly collection at its Kansas extended facilities. Randy suggested that they contact Ted Cress as a start. These display items are available at:

http://www.res.sgp.arm.gov/sst/dq_monitor/GIFS/sgpsmos.gif

- Chad Bahrmann did substantial work during the period revising and perfecting a technique to calculate **post-flight sonde trajectories**. This work was necessary for

the **Ice Replicator Sonde Campaign** that was conducted during the period by Larry Milosovich of NCAR. This campaign required the launching of ice replicator sondes, which must be retrieved post-flight. The trajectories were also needed to prove to Vance AFB that the sondes did not fly into its restricted flight MOA. Coordination was necessary with SDS staff to allow automation of the program to produce the trajectories. Chad also extended this work to produce predicted trajectories pre-flight using **915 MHz RWP data**. These trajectory plots can be found at:

http://www.res.sgp.arm.gov/sst/dq_monitor/GIFS/bbsstraj.html

- Work continued during the period on generating statistics on the **long-term performance of key metrics** for each instrument platform, to be displayed on the SST data quality web site. These graphs and statistics will be developed to help assess and document the longer-term health of instrument performance. Randy Pepler and Chad Bahrmann will be particularly involved in this work. These analyses at first will include mean, standard deviation, the median, and the first and third quartiles.

Future data quality activities may include a SIRS/GRAMS comparison, but this will be dependent on establishing scientific units for the GRAMS data and continuous instrument operation. A RSS/SWS (both spectral radiometers) comparison would also be desirable, and could perhaps be extended to the Colorado State SSP-3 scheduled for installation semi-permanently at the Central Facility. Both the RSS and the SSP-3 should be installed permanently at the Central Facility during the next three-month period. We would also like to begin analyses of the MWR/BBSS QME. Work on ECOR data quality would also be desirable, but must wait until a more reliable, Y2K compliant system is installed.

The **Meta Data Navigator (MDN) Build One** was issued in late February and was subjected to beta testing by representatives of the three ARM site scientist teams. Initial feedback from the beta testing was heard by MDN developers during a special meeting held at the ARM Science Team Meeting in late March. Early feedback was generally quite positive. Discussion occurred at this meeting on how to incorporate flagging, quicklooks, and batch submission of DQRs into **Build Two**. Agreed-upon methods are now being incorporated into Build Two. General discussions concerning the MDN continue on an e-mail list dedicated to it (aia@arm.gov).

The SST continued the process of formally suggesting **work orders** to instrument mentors and site operations in its **weekly status reports** on the instruments it currently scrutinizes (MWR, AERI, EBBR, SIRS, BRS, 915 and 50 MHz RWP, SWATS, MPLHR, SMOS, SWS, THWAPS, and Central Facility thermodynamics). This process appears to be working well in most cases, with prompt responses from mentors and site

operations. Major work order suggestions and actions during the past three months continued to be for the SIRS and SWATS.

The work order paradigm led to the development of a **SIRS troubleshooting guide** that is used by the SIRS mentor (Tom Stoffel), Mike Splitt, and Site Operations to help translate what they see in terms of data quality problems into recommended service actions. A similar document is under discussion for the **AERIs**.

b. Conduct an assessment of the measurement capability of the SGP CART site relative to Science Team needs

No progress was made in this area during the quarter because to date there has been little substantive feedback from ARM management on most of the issues raised by the assessment. It may be instructive to revisit the Scientific Working Groups in late 1999 or early 2000 to update their thoughts on SGP measurement and IOP needs. The 1998 assessment results can be seen at:

<http://parker.gcn.ou.edu/~cimms/ARM/meas98.html>,

including some feedback:

<http://parker.gcn.ou.edu/~cimms/ARM/feedback.html>

c. Plan and implement key Intensive Observation Periods (IOPs) and campaigns

IOP and campaign activities **during the period** included:

- The Jet Propulsion Laboratory (JPL) had deployed a **GPS instrument** for making water vapor measurements at the CF in late June 1998. This instrument and a number of water vapor measuring devices (including a Radiometrics MWR) have resided at the Central Facility since then, and all but the Radiometrics MWR and a temperature profiling radiometer (removed in the fall) will remain at the Central Facility through fall 1999. Chad Bahrmann had assisted in selecting locations for these instruments and helped troubleshoot the computing and communications problems of the JPL staff when they were on-site. The JPL project leader is Steve Keihm.
- A spring (March 1-21, 1999) **SCM IOP** was conducted to study cool early springtime stratus.
- A "**mini**" **Shortwave IOP** was conducted at the same time as the spring SCM IOP. The NASA/Ames SSFR and University of Denver ASTI were deployed at the Central Facility to study stratiform cloud conditions.

- Mike Reeves and James Wilson of the University of Denver deployed the **ERAST aerosol spectrometer** during the end of March 1999 to intercompare with AOS instrumentation. The goal is to evaluate the extent to which the spectrometer-derived aerosol light scattering coefficient agrees with the integrating nephelometer in the AOS.
- JPL (Dave Rider) deployed an **airborne emission spectrometer (AES)** over the Central Facility and launched approximately six ozonesondes during the **AES Campaign**. This occurred during late April and early May. The purpose of this exercise was to compare the AES instrument to others at the CF, especially the AERI. The AES is a demonstration version of the troposphere emission spectrometer (TES), which will also be used in the experiment. The TES is a device similar to the AERI-X that could be used for side-by-side comparisons and provide a calibration for the AERI-X independent of that of the AERI. The TES is an EOS Chemistry Platform instrument. Rider was extremely impressed with the Central Facility and Jim Teske's operation.
- Larry Milosovich (NCAR) conducted the **Ice Replicator Sonde Campaign** from April 26-May 17, 1999. Conditions allowed for only two ice replicator sonde launchings from the Central Facility during this period for cirrus cloud studies in concert with the MMCR. The campaign did take advantage of a larger study being conducted by Jay Mace and others in Utah involving the Paul Lawson Lear jet. The jet made several flights over the Central Facility, including the cirrus-rich day of May 24 after the ground portion of the exercise had ended. In addition to sonde trajectory programming, Chad Bahrmann supported the campaign with weather forecasts.
- The Peter May **MCS Campaign** started in May. The first order of business was to fine-tune the operation of the 50 MHz RWP and to develop a mechanism to allow rapid change of the RWP parameter files whenever a good convective situation develops. Data collection for the campaign will occur over several months. The first convective data set was collected on May 31.

Other planned 1999 activities include:

- The **USDA ARS** is planning a reprise of its "SGP97" exercise, called the **SGP99 Campaign**, during July 7-22. This campaign will be largely conducted in and around the Central Facility. Tom Jackson of ARS is again leading the effort. This field exercise is part of the USDA's ongoing Hydrology Experiment. There are three primary objectives: (1) development of soil moisture retrieval algorithms for the EOS-PM Advanced Microwave Scanning Radiometer (AMSR) with an aircraft prototype, (2) testing of the feasibility of soil moisture retrieval from the TRMM microwave imager, and (3) evaluation of the multifrequency, multipolarization active passive information using a new JPL aircraft instrument. Sampling will be

conducted in farm fields adjacent to the Central Facility, and additional BBSS launches will be made to support the correction of satellite radiometer data and regional water and energy balance modeling.

- A ten-day **summer SCM IOP** (July 12-22) will be conducted in support of the SGP99 Campaign at the Central and Boundary Facilities.
- AOS mentor John Ogren plans a fall 1999 proof-of-concept study to see how the use of complimentary methods can improve confidence in **aerosol light absorption measurements**. A 3-4 week comparison will be made of photoacoustic instruments, aethalometers, nephelometers, and particle soot absorption photometers (PSAPs). This will be referred to as the **Photoacoustic Campaign**.
- MJ Post of NOAA-ETL and Russian colleagues plan to deploy **GPS water vapor instrumentation** during fall 1999. This activity had been delayed from fall 1998. This will be known as the **ETL/GPS Campaign**.
- An **International Pyrgeometer Intercomparison** will take place at the Central Facility RCF in September 1999. Joe Michalsky and Tom Stoffel are planning the exercise. It will be limited to working standards only in order to limit the number of participants. The Sci-Tek solar trackers on the RCF will house the pyrgeometers. Data streams will be collected by the RCF/NREL data system.
- Jens Bosenberg (Germany) will bring his **DIAL system** to the Central Facility in fall 1999 for intercomparison and validation with the CART Raman lidar. This activity is being coordinated with the Water Vapor Working Group.
- In conjunction with the Bosenberg activity, NOAA/ETL is planning to deploy a **mini-MOPA DIAL** during this period. Alan Brewer is leading this effort. This device was previously deployed at the CART site during the spring 1996 SUCCESS campaign. This will be known as the **Mini-MOPA Campaign**.

An early look at 2000 indicates the following possibilities:

- March 2000 **SCM, Cloud, Aerosol, and Shortwave IOPs**
- March 2000 **UAV ARESE Follow-On IOP** involving the Twin Otter
- Summer 2000 **SCM IOP** to help document conditions during more diffuse convection
- Summer 2000 **Soil Sampling Campaign** - Jim Happell (University of Miami) has now received funding for this effort. He is planning a late May/early June campaign.

- Fall 2000 **AFWEX Water Vapor experiment** (including the third Water Vapor IOP and an SCM IOP). AFWEX stands for ARM-FIRE Water vapor EXperiment.
 - Fall 2000 **SCM IOP** to be held in support of AFWEX.
 - Fall 2000 **UAV IOP** involving the Altus at 50,000 feet and above, known as the "**Top of the Troposphere Experiment.**"
 - Spring 2001 **International H2O Project (IHOP)**, to serve as a water vapor validation precursor to TIMEx to intercompare a wide variety of water vapor measuring devices
 - Spring 2001 **SCM IOP** in support of IHOP activities
- d. *Finish implementation of the Okmulgee extended facility/Other site development activities*

The SST plays an advisory role on **site development** activities and priorities. In particular during March-May 1999, Site Operations and Site Development staff continued planning for instrument deployments at the Okmulgee wooded EF.

Site development **during the period** included:

- The **Okmulgee EF** has been a phased implementation. A 55-foot walk-up tower, shelter and infrastructure were completed in fall 1997. Electrical and phone service was established in May, and all other infrastructure needed to hold instruments was completed in July. SIRS and SMOS were scheduled for deployment during summer 1999. ECOR components will be delayed somewhat until Y2K issues can be settled. Dave Cook, the instrument mentor for the site, and Dan Nelson of Site Operations, have developed a design for mounting instrumentation to the tower structure at Okmulgee.
- **SMOS towers** changeout began in late April 1999 and continue as of this writing. This work is under the oversight of Wayne Meadows. Temporary data loss occurs at each Extended Facility as this work is conducted.
- **IDP4** development was accelerated in support of a plan for the SGP CART site to become the instrument-sparing depot for all three ARM CART sites. Some office space may also be made available there.
- The final disposition of the planned **Ft. Cobb wheat EF** has not been determined. Past discussions have centered on moving this site to an area in Payne County near Stillwater to fill a void in the EF network. This site would deploy an ECOR. Discussions are ongoing. There also remains one placeholder for possible EF expansion.

- One **Auxiliary Facility** may yet be established to house a second WSI.
- The **Continuous Quality Improvement Program** (CQIP) continued during this period. SGP staff representing site safety, data quality, and site/instrument maintenance) visit each site according to a prescribed schedule to assess the efficacy of the sites from their point of view and will report on their findings. Dan Nelson, John Schatz, and Chad Bahrmann are the program managers. The anticipated result of this effort is never-ending improvement of remote site operations and data quality.

e. Support the Instrument Development Program (IDP), including new instruments

The **IDP** has primarily come in the form of allowing guest instruments to participate in IOPs and campaigns. These periods allow for ARM instruments to be compared and calibrated against other state-of-the-art instruments from collaborating agencies such as NASA, NOAA, USDA, and various universities. Guest deployments of prototype instruments have led to eventual permanent deployments of hardened ARM versions at the SGP site (e.g., MMCR, Raman lidar).

Issues of instrument development **during this period** included:

- Further work continues to remain on instrument calibration and the generation of scientific units for the **GRAMS**. This instrument has great potential for the SGP site. Tim Tooman is working on the creation of calibration units and Mission Research Corporation is working on data quality metrics for the instruments.
- Operation of the **Raman lidar** (RLDR) has become more stable with the installation of a three-phase uninterruptable power source (UPS) in February 1999. RLDR daily operations remain under the close scrutiny of Dave Turner of the DSIT, Chris Martin of Site Operations, and others. During summer 1999, the instrument will undergo hardware and software upgrades for Y2K compliance.
- Plans for the **UV spectral radiometer** now show it ready for deployment in summer 1999. The USDA sees it as an important addition for the SGP site.
- Two new **radiometers** were recently added to the suite of instruments at the Central Cluster. They are the Eppley 8-48 (close cousin to the PSP) and the Eppley TUVR (Total UV Radiometer). The Eppley 8-48 replaced the shaded PSP in the SIRS testbed. The reason for deployment of the Eppley 8-48 is to investigate the apparent nighttime offset experienced by the shaded SIRS PSPs. This work is now scheduled for spring 1999. The Eppley TUVR radiometer is part of the BRS (Broadband Radiation Station). The conversion of the BSRN to the BRS is being managed through the BCR and PRR systems. This conversion is significant, with earliest estimates for completion being late summer 1999.

- Bob McCoy (Colorado State University) has requested the installation of a **scanning spectral polarimeter** (SSP-3) at the Central Facility for an indefinite period. This installation was requested for the March 1999 mini Shortwave IOP. This deployment has still not occurred.
- The **WSI** was moved to a cement pad east of its present location in late February 1999 in the southeast corner of the Optical Cluster.
- Chris Rocken (NOAA/ETL) is currently in the process of deploying a **GPS water vapor network** within 10 kilometers of the Central Facility. Up to 30 such devices will be deployed for at least a three-year period, and will support ARM SGP water vapor activities.
- The **Thunder Scientific temperature/relative humidity chamber** was prepared by Scott Richardson and has been delivered to the Central Facility. It is now ready to be used for calibrations for instruments from all three CART sites. A noise-reducing box has been ordered for the compressor and should be delivered soon. The chamber can be used without the enclosure but tends to be noisy. Scott has written an "Operating Procedure" document for the chamber. This document is intended as an introduction to the use of the chamber and outlines how the chamber is to be operated. It appears that the first user of the device will be Bill Porch of LANL for humidity instruments related to the TWP CART site.
- The **Chilled Mirror hygrometer** systems have been modified by Scott Richardson and are now more user-friendly. This modification was accomplished by shortening the cable, simplifying wiring, mounting the air filter on the outside of the enclosure to facilitate easier filter changing, and securely fastening all components to the enclosure. The system at the Central Facility BBSS launch site was completely overhauled and can now be maintained by on-site personnel. This particular system required two maintenance visits during the period, one for general maintenance and the other to install the overhauled system. All three chilled mirror systems were checked using the new T/RH calibration chamber and they appear to be within manufacturer specifications.
- Scott Richardson has been examining the **dry bias of the sondes** and checking to see if the THWAPS relative humidity can be corrected using chilled mirror values (the THWAPS relative humidity sensor appears to be biased), with the goal of correcting the BBSS relative humidity using an accurate surface point value (the corrected THWAPS relative humidity). So far, a good correlation has not been found, and the errors appear to be somewhat randomly distributed. This could be caused by the data collection method currently being used for the THWAPS. Scott has asked mentor Barry Lesht to modify the THWAPS relative humidity collection so that the dry bias issue can be further examined.

- The **ARM electronics laboratory** remains in operation. This lab is allowing site technicians to service and repair CART instruments and sensors, instead of sending them back to the vendors under expensive service contracts. The lab will serve all three CART sites. Jim Teske is the point of contact for the electronics lab.
- A discussion occurred last July regarding a **Microtops handheld ozonometer** that was used to make total ozone measurements during the fall 1997 IOP. It could be used to make daily weather observation type measurements, or it could be used to collect data that become part of the routine ingested data stream from the site. The device is fairly simple to operate. Discussions continue.

f. Continue review of routine site operations

Routine site operations, in support of 24-hour per day, 7-day per week data collections, remain the top priority of the SGP CART site. The SST plays a strong role in these activities by helping advise the Site Program Manager, the Site Operations Manager and his staff, the head of the Instrument Team and his mentors, and the head of the Site Data System and his staff regarding site priorities and procedures, and suggesting solutions or plans.

The **SST weekly teleconference** is held every Tuesday morning. In addition to the SST, it is attended by the Site Operations Manager and his key staff, the Site Program Manager, the ARM Technical Director, the ARM Instrument Team leader, the DSIT leader, the SGP SDS leader, and the DSIT liaison to the Scientific Working Groups (who represents the ARM Science Team). Site status for the previous week is discussed relative to site operations, IDPCs, data quality, and site development. Current and future IOPs and campaigns are discussed, as well as other important scientific and operational issues affecting the site. The meeting is used for planning and assessment purposes, and for initiating action as appropriate. Minutes of meetings conducted since September 1995 are available at the following web site:

<http://manatee.gcn.ou.edu/sscm/minutes.html>

Discussions related to **current instruments during this period** included:

- **50 MHz RWP** - Special test equipment was used by Peter May (MCS Campaign) and mentor Rich Coulter in April to determine that the computer-generated audio signal for the RASS had proper width and amplitude characteristics and produced a good acoustic signal for the RASS. However, wind and RASS sensitivities were limited by receiver noise problems. A further analysis of the network noise is necessary to determine a method of reducing the noise level and improving the performance of the system.

- **MMCR** - Ken Moran of NOAA/ETL and Peter May tested the MMCR in April and found that the power output of the instrument could be increased by 1-2 dB by changing the setting of the attenuator on the up-down converter, although doing so may shorten the life of the traveling wave tube amplifier. They also found that use of algorithms on the RWPs that lessen the effects of backscattered signal from birds seems to reduce the interfering effects of echoes from insects on MMCR data. Further analyses will be carried out to evaluate the beneficial effects of the algorithms.
- **RSS** - Both versions of the RSS were removed in November 1998 to SUNY-Albany for calibration and have been offsite since. The newer version of the two machines will return to the Central Facility in June 1999.
- **SWS** - It was discovered during the period that the diffuse target on the SWS had never been evaluated for its cosine response. There are likely major deviations from the cosine response, especially in the near IR region (1000-2500 nm) due to optical absorption in the target material (Delrin or Spectrolon). The SWS is operating normally but probably not accurately, as readings deviate by as much as 100 W/m² with SIRS PSPs on clear sky days. Work to mitigate these differences is ongoing by the SWS mentor, Jeff Griffin.
- **MFRSR** - Some new discussions were begun on the shading issue. Upgrades of the MFRSR filter-detectors have been discussed previously. Cost-effectiveness is a key priority related to future upgrading of these instruments. One scientific benefit of well-operated MFRSRs would be site-wide cloud and aerosol optical depth.
- **SMOS towers** - New counter weighted, single pole, guy wireless towers, with easy lowering, are being installed, with work scheduled to be completed in June. A flaw in the design of the new towers was discovered and the vendor is now working on a fix.
- **915 RWP 60 Hz noise problem** - Radian amplifier boards have been identified as the 60 Hz noise source and the mentor, Rich Coulter, continues to work on a solution. A PIF remains open.
- **RCF** - Use of the RCF during non-BORCAL and non-IOP periods remains under discussion. Tom Stoffel is preparing a comprehensive plan for use of the RCF.
- **SWATS** - As indicated in subsection a above, a great deal of troubleshooting continued to take place during the period regarding SWATS datalogger programs and electronics. The electronics in the logger boxes at E11 and E18 were badly corroded due to water damage, so the entire structures were raised above ground. A general release of SWATS data should occur later this year. A comprehensive

visit of all EF sites will occur this summer to standardize all sites. Chad Bahrmann and Ken Fisher will make the visits.

- **E12 Communications** - A great deal of work continued during the period by Jesse Smith to improve communications to our Pawhuska extended facility. Due to poor lines in the area, a large amount of data had been lost from this site. Options such as cellular communications are being considered.

IDPCs under development or modified **during the period** include the following:

- **ARSCL** - The Active Remote Sensing of Clouds (ARSCL) reprocessing strategy continued during the period. Work should be completed in summer 1999.
- **EF ECORs** - Communications tests were conducted throughout the period. A vendor representative visited the Central Facility with mentor Dick Hart in May to learn more about the problems of fielding ECORs for long periods of time. The vendor representative was made aware of a number of items that do not occur in the laboratory. A Y2K fix is also required.
- **Non-SMOS Raingages** - The discussion on including precipitation data in SWATS ingest continues. Little progress has been made, though mentor Jeanne Schneider did meet with Chris Klaus of the SDS team in March.
- **Raman lidar** - Work has started to make the Raman lidar software and IDPC Y2K compliant. Some hardware changes were recently made to facilitate this work.
- **915 MHz RWPs** - Collection software at the Intermediate Facilities remains to be upgraded to ensure Y2K compliance. Also, a new web interface was developed so that certain approved people can change RWP parameter files in the near real-time. This work was necessitated for the MCS Campaign. The mentor, SST, and Peter May have access privileges.
- **SIRS** - Work continues on the implementation of the instrument mentor's sophisticated automated data-flagging scheme (DQMS - see discussion in subsection a above).
- **THWAPS** - Work to finalize this Boundary Facility effort took place in March. Three sites remain offline, awaiting sensors.
- **WSI** - Work continues on the IDPC, which is extremely complicated.

Y2K compliance has been a major activity of **SDS staff**. To date, all systems except the IF RWPs, ECORs, and Raman lidar are certified. A certified system is running at PNNL to duplicate the SDS. This system will be transferred to the SDS by September 1.

An effort is afoot to create a **Common Data Acquisition System (CDAS)** for all three CART sites. Meetings are being held at each CART site to learn requirements. A meeting will be held at the SGP Central Facility on June 9-10. Randy Peppler and Chad Bahrmann will represent the SST. As part of this effort, the research computer system the SST uses daily for data quality activities, **R1**, will undergo changes. Mike Splitt and Chad Bahrmann are currently reviewing SST requirements for this system. The SST also uses the REX1 system for displaying data quality results on the WWW. This machine suffered a catastrophic failure during the period, and it was discovered that SDS system backups had also been failing. Mike and Chad performed a loss assessment and corresponding software recoveries during the period, expending considerable effort. In addition, some code was lost and had to be rewritten. Among the loss was html code for EF SMOS displays, BBSS and RWP trajectories, and E13 SMOS and C1 THWAPS meteograms. Mike and Chad are now doing their own backups on R1.

The **BCR process** was very active during **March-May**, as BCRs **204-218** were submitted and considered. They are described in the table below. Priorities are included in parentheses under "Title". BCRs 195, 197, and 201-203 submitted during December-February remain open.

BCR #	Title (Priority)	Submitted by	Open Date	Approval Date	Resolution
204	Sonde - PC Cora & Digi-Cora upgrades (all sites) for Y2K and processor upgrade (2 - critical)	Barry Lesht	3/4/99	3/9/99	Approved - remains open until Barry Lesht inst new PC-Cora software release at the CF and the MF-12 PROM at B6 in early June.
205	MMCR - Insect echo filtering algorithm test #1 (2 - critical)	Mark Miller	3/5/99	4/16/99	Approved - remains open until the dates of the testing are known and captured.
206	EBBR - CR10 program Version 8 upgrade (5 - routine)	Dave Cook	3/18/99	4/21/99	Approved - closed on 5/14/99. Version 8 was automatically included in all recalibrated units.
207	SDS - Network disk storage upgrade (4 - important)	Todd Hull	4/13/99	6/1/99	Approved - remains open to capture the success completion date of all associated actions.
208	50 RWP - Temporary, variable operations capability (3 - very important)	Rich Coulter	4/14/99	4/16/99	Approved - closed on 5/14/99. Tests were completed for the upcoming MCS Campaign. Allows for certain pre-approved individuals to change parameter file in the near real-time.

209	50 RWP - Perform test on RASS-only operation (2 - critical)	Rich Coulter	4/14/99	4/16/99	Approved - closed on 5/14/99. Testing was successfully completed to assess durability of the RASS system.
210	SDS - Move SGP development environment off of SDS data processing system (3 - very important)	Krista Gaustad	4/20/99	N/A	In Review.
211	Raman lidar - Upgrade control computer hardware and software (5 - routine)	Tim Tooman	4/22/99	5/18/99	Approved - remains open so that the required coordination and scheduling of the implementation can be captured in the BCR. So implementation work took place the week of 5/24/99.
212	Raman lidar - Pico motor controller upgrade (2 - critical)	Jim Teske	4/27/99	5/4/99	Approved - remains open to document when the hardware is changed out.
213	MMCR - Archiving two additional (calibration and log) files (2 - critical)	Mark Miller	4/27/99	N/A	In Review.
214	RWP - MCS Campaign & implementing the mechanism of RWP parameter file modification (3 - very important)	Chris Klaus	4/28/99	5/14/99	Approved - closed on 6/1/99. The new web interface for invoking different parameter files is implemented and is working properly.
215	BLC - Preliminary test to produce Klett profiles (3 - very important)	Connor Flynn	5/4/99	5/7/99	Approved - remains open so that the mentor can verify the successful completion date of the work.
216	SDS - R1 operating system upgrade to Sun OS 2.6 (4 - important)	Jesse Smith	5/13/99	N/A	In Review.
217	RSS - Modify to receive dry air from existing supply in Optical Trailer (3 - very important)	Joe Michalsky	5/13/99	5/14/99	Approved - remains open to track implementation which began on 5/14/99.

218	915 RWP at Meeker - Change parameter file using new web interface (1-emergency)	Rich Coulter	5/24/99	5/24/99	Approved - remains open to track successful implementation, which began 5/24/99. The problem at this site was that after several days of operation the system shut down when RASS mode was implemented.
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Data availability statistics for the CART site as a whole during the period were generally in the 80-90 percent range. After all "sneakernet" data are accounted for, however, availability should increase to the 90 percent range. The main reasons for the drop over the previous period included the ongoing replacement of SMOS towers, necessitating some data loss, and scattered communications problems, including the chronic Pawhuska site (EF12). Corrective maintenance actions were done promptly after receipt on the two-week visitation cycle. Preventative maintenance and calibration checks were also performed tightly per schedules developed by Jim Teske and the instrument mentors. Chad Bahrmann continued his efforts on providing Site Operations with automated data availability percentages each week. This program must be modified whenever a new instrument is added to the CART site or some collection strategy changes. During the period, BF THWAPS was added to the data availability program.

Chad Bahrmann continued informal **Friday debriefings with field technicians**. These sessions are being held to gain more understanding about the effectiveness of current maintenance protocols, evaluation of current maintenance strategies, and formulation of fixes for chronic problems. Chad also occasionally accompanies field technicians on their maintenance trips to learn more about the effectiveness of their activities and the procedures used.

Chad Bahrmann also **assists Jim Teske and IOP scientists** regarding scientific issues as necessary, and helps Jim Teske with programming issues. An example of IOP programming support was the work Chad did on sonde trajectories for the **Ice Replicator Sonde Campaign**. Randy Pepler maintains almost daily contact with Doug Sisterson, **SGP Site Program Manager**, on site scientific issues, and makes occasional visits to the Central Facility to visit with Jim Teske.

4. Other Activities Related to Scientific Support for Site Operations

The SST performs a number of additional activities that can be categorized as **scientific coordination tasks**.

Facilitation of **e-mail and WWW-based scientific discussions** relating to the SGP site is an ongoing task. This is done to generate timely discussions on important issues and to gather facts on long-term problems. The ongoing MDN discussion is one example of such collaboration with other ARM scientists around the country. The 1998

measurements assessment, involving all of ARM scientific working groups, was another.

Writing of the **Site Scientific Mission Plan** has become more streamlined during the past two years. In addition, these documents are now available on the WWW. A standard process is in place for producing the next version of the plan. Randy Peppler of the SST makes a first modification of the document and then sends it to Doug Sisterson, who adds additional items. The document is then iterated until a draft suitable for the WWW site is produced. A final published version (and finalized WWW version) is issued after a general review by the ARM community. The January-June 1999 issue has been published in final form both on the WWW site and in hard copy. Work on the July-December 1999 edition is nearing completion. Its size has been greatly reduced with the elimination of most "boiler plate" and use of references to ARM web pages in lieu of detailed content. The plans can be seen at:

http://www.arm.gov/docs/sites/sgp/internal_docs.html

Activities of the **Site Advisory Committee** (SAC) have been put on hold pending **ARM Infrastructure Review (AIR)** Committee findings. Randy Peppler is a **member** of the AIR Committee and represents the three SSTs. The AIR is examining ARM infrastructure for its effectiveness in terms of organization and use of resources. An introductory meeting was held during the ARM Science Team Meeting on March 22. A subsequent substantive two-day meeting was held in Baltimore on April 13-14, with a follow-up meeting scheduled for San Diego on July 13-14. A final report is due to ARM's DOE management on September 1.

Randy Peppler and Doug Sisterson continue writing an overview manuscript describing the SGP CART site for the **Bulletin of the American Meteorological Society**. They will meet in June or July to produce a manuscript. We expect to submit this manuscript to the AMS in fall 1999.

The SST **conducts ARM research** that is presented at **scientific meetings**. During this period, the SST presented twelve (12) posters at the **March 1999 Science Team Meeting**. Titles are:

"Near Real-Time Assessment of SWATS Data Quality, Resulting in an Overall Improvement in SWATS Data Quality in 1998", C.P. Bahrmann and J.M. Schneider

"Radiative Properties of 3-D Stratocumulus Clouds in the Near-IR Spectral Range", E.I. Kasyanov and Y.L. Kogan

"Retrieval of Cloud Effective Radius Using ARM SGP Ground-Based Observations", Z.N. Kogan and Y.L. Kogan

"Application of a Cloud Analysis Package to Estimate Hydrometeor Advection over the SGP ARM CART", S.M. Lazarus, M.E. Splitt, C.C. Ciliberti, and M.A. Miller

"Evaluation of Cloud Water Retrieval Algorithms Using ARM Instruments", M. Ovtchinnikov and Y.L. Kogan

"Identification and Analysis of the 1998 Central American Smoke Event at the SGP CART Site", R. A. Pepler, L. Ashford, C.P. Bahrman, J.C. Barnard, R.A. Ferrare, R.N. Halthore, N.S. Laulainen, F.J. Murcray, J.A. Ogren, M.R. Poellot, P. Sheridan, M.E. Splitt, and D.D. Turner

"A Chilled Mirror Dew Point Hygrometer for Field Use", S.J. Richardson and R.O. Knuteson

"A NIST Traceable Relative Humidity Calibration Chamber for the ARM CART CF", S.J. Richardson and D.A. Nelson

"The Soil Water and Temperature System (SWATS): Progress Toward a Calibrated Network", J.M. Schneider

"Maintaining Continuous Operation of Complex Instruments at the SGP CART Site", D.L. Sisterson, J.J. Teske, D.K. Breedlove, R.A. Pepler, and C.P. Bahrman

"Detection of SIRS Solar Tracking Problems with Automated Algorithms", M.E. Splitt and C. P. Bahrman

"Improvement in the Assessment of SIRS Broadband Longwave Radiation Data Quality", M.E. Splitt and C.P. Bahrman.

Scott Richardson's manuscript describing water vapor measurements during the first Water Vapor IOP in fall 1996 has been accepted by the ***Journal of Atmospheric and Oceanic Technology*** and should appear in the January 2000 issue. The title of this manuscript is "Enhancement of ARM Surface Meteorological Observations During the Fall 1996 Water Vapor Intensive Observation Period." Co-authors are Mike Splitt and Barry Lesht (ANL).

Randy Pepler continued coordination of a case study on the **Central American smoke episode** of May 1998 from the perspective of how it was detected by instrumentation at the SGP CART site (see poster title above). Work on a manuscript to the ***Bulletin of the American Meteorological Society*** is in progress, to be submitted this summer. A detailed web site has been created to help describe the event:

<http://parker.gcn.ou.edu/~cimms/ARM/smoke.html>

Mike Splitt helped a number of **OU researchers** in their interactions with ARM. He made arrangements with Dan Nelson of Site Operations to include a number of Professor Claude Duchon's radiometers in BORCAL 99-01. He also provided help to Dr. Duchon's graduate student Ken Hamm regarding SIRS netCDF files.

Mike Splitt also provided **Dr. Bruce Forgan** of Australia with some of his findings on diffuse PSP offsets and wind speed. Dr. Forgan is regarded as an expert in the field of radiometry.

The SST also conducts **educational outreach** (as provided by the Oklahoma Climatological Survey) programs as well. Updates on these programs are described in other documents provided to the ARM Program. The SGP outreach website can be found at:

<http://outreach.ocs.ou.edu/arm/>

A **workshop for ARM teachers** is scheduled for late July 1999 at the University of Oklahoma. It will be conducted by Outreach staff of the Oklahoma Climatological Survey.

Chad Bahrmann conducted **other outreach activities** during the period. In April, he gave an interview and conducted a site tour to a Ponca City elementary school student about meteorology and what work is being done at the CART site. Also in April, Chad gave a talk about meteorology and ARM to a group of about 150 students and faculty at Washington Elementary School in Blackwell.

Finally, Randy Peppler was responsible for **producing or coordinating reports** such as this one in fulfillment of our contract with ARM.