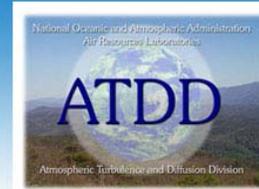




NOAA/ATDD Quarterly Activity Report

April 2009 – June 2009



*Bruce Baker, Director
Atmospheric Turbulence and Diffusion Division*

(This report is prepared for the use of the NOAA/Air Resources Laboratory and is also sent as a courtesy to other agencies. Please do not copy and forward it elsewhere.)

CLIMATE

Local Meteorological Support

Data reduction for April, May, and June were completed without many problems. There was a power outage at the site the last week of June that resulted in data loss. Data from a nearby research tower were used to fill any data gaps. The monthly data (a summary file and precipitation table files for each month) have been downloaded to [ftp.atdd.noaa.gov/](ftp://atdd.noaa.gov/) (anonymous FTP, change directory to pub/data/ormet). The archived data are located in the sub-folder "archive". lynne.satterfield@noaa.gov

U.S. Climate Reference Network (U.S. CRN)

In April, May, and June NCDC retrieved 51 data files from U.S. CRN sites through the server [ftp.atdd.noaa.gov](ftp://atdd.noaa.gov). Data are passed to NCDC by this path when retrieved episodically by ATDD from individual sites to fill data gaps. A record is maintained of the number of missing hours of retrievable data over the past 12 months. Instruments' characteristics for each site are maintained in the database ISIS (Integrated Station Information System) on NCDC's server, along with a record of events which affect data quality. New events are identified from ATDD's field crews, NCDC's Anomaly Tracking System (ATS), and email messages. lynne.satterfield@noaa.gov

In April, the first soil-moisture and soil-temperature probes were installed at the U.S. CRN site near Crossville, TN. The ATDD team, lead by M. Hall, developed the techniques used to install three to five probes in each of three holes at mandatory depths of 5 cm, 10 cm, and 20 cm with extensions to 50 cm and 100 cm, if conditions permitted. Ultimately, about 85% of the CONUS U.S. CRN stations will be outfitted with the probes. mark.e.hall@noaa.gov

Since mid-April, a total of 24 U.S. CRN sites have been upgraded with sensors to measure relative humidity, soil moisture, and soil temperature. These upgrades were completed in conjunction with annual maintenance visits. Seventeen more sites are scheduled for the new sensor installations by January 2010. mark.e.hall@noaa.gov

A preliminary report of observations from the Marshall Test Facility near Boulder, CO, has been prepared. It relates the results of comparisons between various precipitation gauges and wind screen configurations. See photograph below. mark.e.hall@noaa.gov



Software updates for all U.S. CRN sites in Alabama were completed to add 12 five-minute temperature and precipitation reports to the data transmission. This gives the most current data available to the National Weather Service for distribution to its forecast offices. This feature is also being added to the U.S. CRN network as the SM/ST are installed. mark.e.hall@noaa.gov

A comprehensive review of the performance of U.S. CRN solar sites is underway and modifications to the sites, as needed, will be based on this review. mark.e.hall@noaa.gov

Several U.S. CRN and HCN-M site visits were completed from April-June 2009. Details are listed in the table below. mark.e.hall@noaa.gov

Month	Type of Site Visit	Site Name	Network
Apr	UMV	AL Thomasville0 N	AL HCN-M
Apr	UMV	GA Newton8 W	CRN
Apr	UMV	AL Gadsden19 N	CRN
Apr	UMV	AL Courtland0 N	AL HCN-M
Apr	UMV	AL Gadsden19 N	CRN
Apr	AMV	AL Gadsden19 N	CRN
Apr	AMV	AL Selma13 WNW	CRN
Apr	AMV	GA Watkinville5 SSE	CRN
Apr	AMV	SC Blackville3 W	CRN
Apr	AMV	SC McClellanville7 NE	CRN
Apr	AMV	AL Fairhope3 NE	CRN
Apr	AMV	TN Crossville7 NW	CRN
May	AMV	LA Lafayette13 SE	CRN
May	AMV	TX Palestine6 WNW	CRN
May	AMV	MS Newton5 ENE	CRN
May	AMV	IA Des Moines17 E	CRN
May	AMV	IL Shabbona5 NNE	CRN

Month	Type of Site Visit	Site Name	Network
May	AMV	MO Chillicothe22 ENE	CRN
May	AMV	OK Stillwater5 WNW	CRN
May	AMV	OK Goodwell2 E	CRN
May	AMV	OK Stillwater2 W	CRN
May	Installation	AL USCOE Lock & Dam0 N	AL HCN-M
Jun	UMV	NC Asheville8 SSW	CRN
Jun	UMV	TX Palestine6 WNW	CRN
Jun	AMV	AR Batesville8 WNW	CRN
Jun	AMV	MS Holly Springs4 N	CRN
Jun	AMV	LA Monroe26 N	CRN
Jun	AMV	MO Salem10 W	CRN
Jun	AMV	MO Joplin24 N	CRN
Jun	AMV	NE Lincoln8 ENE	CRN
Jun	AMV	NE Lincoln11 SW	CRN
Jun	AMV	KS Manhattan6 SSW	CRN
Jun	AMV	KS Oakley19 SSW	CRN
Jun	Installation	CO Eads 16 ENE	HCN-M
Jun	Installation	CO Saguache 2 WNW	HCN-M
Jun	Installation	CO Stratton 24 N	HCN-M
Jun	Installation	CO Akron 4 E	HCN-M
Jun	Installation	CO Grand Junction 9 W	HCN-M

Chestnut Ridge Environmental Study Site (CHESS)

Using a modified respiration chamber and the Li-Cor 6400 photosynthesis/respiration measurement system, a method was developed to measure soil and litter respiration separately. In addition to respiration measurements, measurements of soil and litter water content have been ongoing throughout the summer at the Chestnut Ridge site, which is located on the Oak Ridge National Laboratory preserve. T. Wilson has also made considerable progress developing an ecosystem model that partitions carbon and energy fluxes between the soil and the litter. The goal of this work is to enhance our understanding of the biology and physics driving ecosystem respiration, which is arguably the most variable and difficult to describe portion of the cumulative net ecosystem exchange of carbon. john.kochendorfer@noaa.gov, T. Wilson

Manuscripts

A paper by N.L. Dias, J. Hong, M.Y. Leclerc, T.A. Black, Z. Nestic and P. Krishnan entitled "A simple method of estimating scalar fluxes over forests" has been accepted for publication in *Boundary-Layer Meteorology*. praveena.krishnan@noaa.gov

A manuscript by P. Krishnan, T.A. Black, R. Jassal, B. Chen and Z. Nestic entitled "Interannual variability of the carbon balance of three different-aged Douglas-fir stands in the Pacific Northwest" is in press at the *Journal of Geophysical Research - Biogeosciences*. praveena.krishnan@noaa.gov

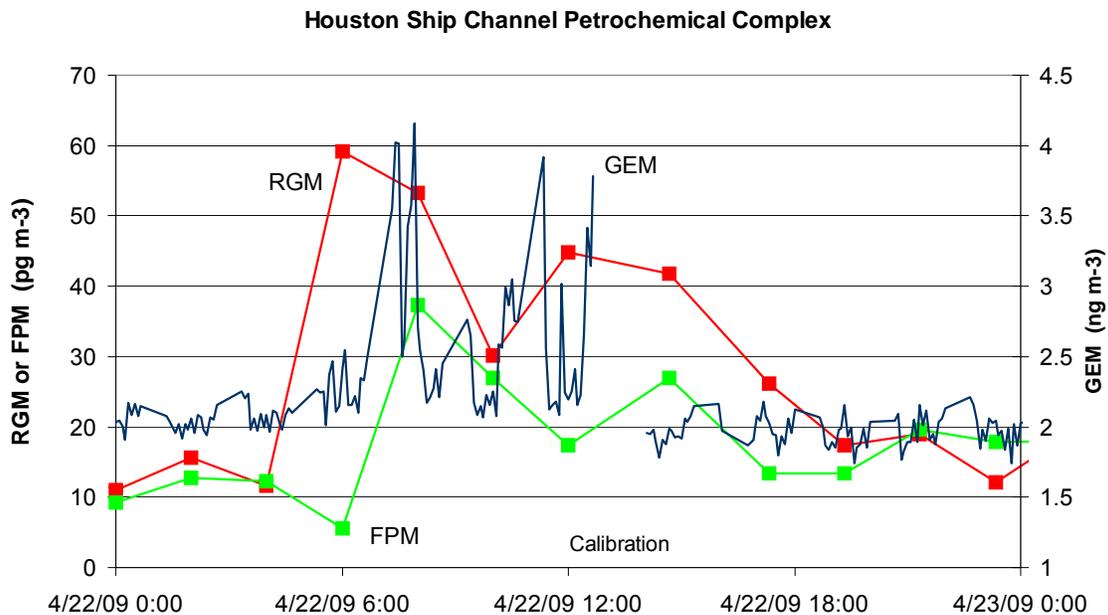
AIR QUALITY

Atmospheric Integrated Research Monitoring Network(AIRMoN)

Scott Dossett, with the National Atmospheric Deposition Program (NADP), conducted a systems and performance survey of the Walker Branch Watershed AIRMoN site (TN00) in mid-May. The survey included a review of field collection and laboratory sample processing procedures. The only major finding was a worn precipitation stickgauge, which has subsequently been replaced at all AIRMoN sites. latoya.myles@noaa.gov, Simone Klemenz

Study of Houston Atmospheric Radical Precursors (SHARP)

S. Brooks traveled to Houston, TX, on June 1-4 for the post-calibrations and removals of the deployed mercury sensors. Mercury speciation measurements were included in the SHARP field program, which ran April 15 to May 31. The data were characterized by long periods of baseline concentrations with sharp episodic plumes when all mercury species were highly elevated. These enhancements occurred only when the site was downwind of the nearby (1 - 8 km) Houston Ship Channel petrochemical facilities. Gaseous elemental mercury concentrations showed the greatest enhancement. These enhancements were significantly correlated with NO_x . The entire speciation dataset (gaseous elemental mercury, reactive gaseous mercury, and fine particulate mercury $\text{PM}_{2.5}$) is shown below. The SHARP program directors have requested that ARL prepare and submit a proposal for permanent year-round mercury speciation measurements in Houston. steve.brooks@noaa.gov



Manuscripts

An article entitled “Underestimating Ammonia” by L. Myles was published in *Nature Geoscience* (DOI: 10.1038/ngeo565). The News & Views commentary explained the contributions that satellite measurements of ammonia can make to air quality research and international policy development. latoya.myles@noaa.gov

A NOAA Technical Memorandum (#OAR ARL-261) entitled “Measurement of sulfur dioxide, nitric acid, and ammonia with annular denuder systems and intercomparison with collocated techniques” was revised with helpful input of ARL reviewers and is currently in press. The manuscript details variations in trace gas concentrations measured with annular denuders and offers a preliminary comparison to concentrations determined by collocated fast-response devices, Monitoring Instruments for Aerosols and Gases (MARGA). Good agreement between the techniques was found for sulfur dioxide ($R^2 \geq 0.77$) and nitric acid ($R^2 \geq 0.69$). For ammonia, low concentrations during the experiment contributed to dissimilar results from the two techniques. latoya.myles@noaa.gov

A manuscript entitled “A case study of atmospheric ammonia in East Tennessee” is in preparation for submission to the *American Journal of Environmental Sciences*. The work, authored by R. Allen, L. Myles, and M. Heuer, details *in-situ* measurements of atmospheric ammonia at two sites in East Tennessee, one in proximity to the I-40/Watt Road interchange and the other in a forest clearing in the Walker Branch Watershed. latoya.myles@noaa.gov

Presentations

A presentation entitled “Temperature and sunlight controls on atmospheric mercury oxidation atop the Greenland ice” by S. Brooks, C. Moore (presenting author), G. Southworth, J. Dibb, B. Lefer, G. Huey, and D. Tanner was made during the Mercury in Polar Regions session of the 9th International Conference on Mercury as a Global Pollutant (ICMGP) in Guiyang, China, in June. ICMGP is the preeminent international forum for scientific advances concerning environmental mercury. steve.brooks@noaa.gov

L. Myles presented an overview of ATDD’s research during the OAR session of the NOAA Educational Partnership Program Student Orientation in Silver Spring, MD in late May. Over 150 scholars were in attendance to learn about OAR’s field research activities. latoya.myles@noaa.gov

An abstract entitled “Measurement of ammonia, nitric acid, sulfur dioxide, and sulfate ($PM_{2.5}$) fluxes over soybeans using the modified Bowen-ratio method” was accepted for presentation during the Managing Agricultural Gas and Particle Emission Symposium to be held at the 238th ACS National Meeting and Exposition in Washington, DC, on August 16-20. The authors of the poster presentation, L. Myles, J. Kochendorfer, M. Heuer, and T.P. Meyers, are also drafting a manuscript for submission to a special issue of the *Journal of Environmental Quality*. latoya.myles@noaa.gov

DISPERSION

Joint NOAA ARL/JSU Field Study

A contingent of scientists, engineers, and summer interns from ATDD participated in the Mississippi Coastal Atmospheric Dispersion Study (MCADS), a joint field project with Jackson State University. The study, which ran June 15-20, utilized existing ARL/JSU monitoring stations located at Harrison Central High School and West Wortham Elementary School plus newly installed sites at Wiggins/Stone County Airport and the USFS Southern Experimental Station. Each site was outfitted with devices that measured wind speed and direction, temperature, relative humidity, velocity covariance, and solar radiation. The Harrison and Wiggins Airport sites were utilized as supersites with suites of instruments that measured ground-level ozone, nitric acid, and fine particulate sulfate. Also, portable rawinsonde systems acquired vertical profiles of wind speed, wind direction, temperature and pressure at both sites, with five launches daily. The profiles of temperature, humidity, and winds provided valuable information on the structure of the local sea breeze circulation and will be used to improve atmospheric dispersion modeling efforts for the region. A workshop discussing results from analyses of the data is planned for Fall 2009 at Jackson State University. The study involved over 15 students from a variety of academic backgrounds that worked closely with JSU and NOAA researchers in conducting the studies (see photos below).

Local interest in the study was remarkable, as evidenced by community involvement and media coverage. L. Myles gave an invited presentation to the Rotary Club of Wiggins while E. Dumas and D. Senn hosted local Sky Warn spotters and a group of ham radio operators at the Wiggins Airport site. C.A. Vogel was interviewed for an article that appeared in the June 26th edition of the Stone County (MS) Times (<http://www.timesstonecounty.com/index.php?id=1675&voliss=5-34>), and the NOAA press release about the study was picked up by the Clarion-Ledger (Jackson, MS) and the Sun Herald (Biloxi, MS). chris.vogel@noaa.gov, W. Pendergrass, L. Myles, R. Meyer, R. White, E. Dumas, and D. Senn



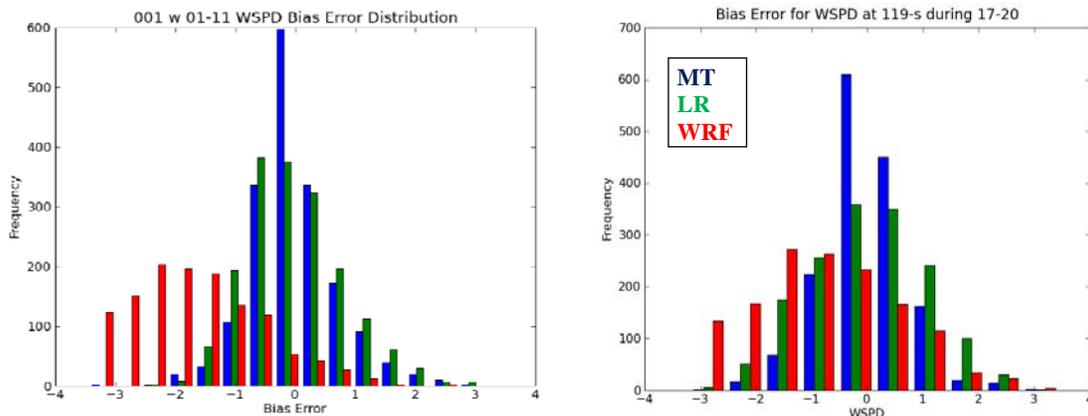
JSU students and NOAA researchers during the Mississippi Coastal Atmospheric Dispersion Study (MCADS), a joint field project between ARL/ATDD and Jackson State University.
(Photo credit: D. Senn)

ARL Diffusion Workshop

C.A. Vogel, along with W. R. Pendergrass and R. J. Dobosy, attended an ARL Atmospheric Diffusion Workshop on April 28-29 in Silver Spring, MD. The purpose of the workshop was to discuss recent measurement and modeling developments pertaining to atmospheric diffusion research and to plan for future studies. Recent unique observations of wind and turbulence statistics profiles from SODAR (Sonic Detection And Ranging) measurements in downtown District of Columbia were presented. chris.vogel@noaa.gov

WRF Model Output Statistics (MOS)

D.J. Gagne, a NOAA Hollings scholar from the University of Oklahoma, completed a research internship at ATDD 27 May through 24 July. He developed a MOS capability for ATDD's east-Tennessee application of WRF, based on a model-tree (MT) approach that first partitions the space of predictor quantities into subregions. This enables a piecewise linear fit, rather than the traditional global linear regression (LR). Cross validation on one year's data showed the MT to have significantly lower mean absolute error than LR. The primary benefit of MOS is a correction for biases that regularly occur in the rule-based model-WRF in this case. A wind-speed example appears in the figures, which show forecast errors at two sites and times representing extremes of vertical mixing. To the left is Site 001 at ATDD's building on the valley floor showing nighttime errors (01Z to 11Z; 20E to 06E). To the right is Site 119 at midday (12E to 15E), 100 m higher on top of a nearby ridge. Many such long parallel ridges corrugate the valley floor unresolved by WRF's 3.3-km grid spacing. Bias is negative if the model overpredicts the measurements. The nocturnal overprediction of wind speed by WRF is obvious in the left figure, as is the compensation for that bias by both MOS schemes. ron.dobosy@noaa.gov



DCNet

In-depth analyses of wind profiles within the Washington, DC, urban surface layer were performed resulting in a "blending" technique to combine profiles measured in both the inertial and roughness sublayers (ISL and RSL, respectively). The data were obtained through deployment of a mini-SODAR on a rooftop near the National Mall. Typically, wind profiles above various terrain are obtained within the ISL, and few field measurements exist of profiles within an urban RSL. Because of ambient noise levels for the downtown location, the mini-SODAR could resolve winds to only 180 m above the canopy, approximately six canopy heights. Wind profile analyses showed that all of the urban RSL and much of the urban ISL were captured in the measurements. Smoothing

and interpolation techniques had to be employed to obtain continuous records for the various measurement levels. For the skimming flow observed above Washington, DC, consistent profile shapes differing significantly from the classic log-law wind profile relation were observed. The results will be presented at the 90th Annual Meeting of the American Meteorological Society, Atlanta, GA, January 2010. chris.vogel@noaa.gov and W. Pendergrass

MISCELLANEOUS

ATDD hosted four NOAA scholars and one Howard Hughes Medical Institute Fellow for research internships this summer. David J. Gagne II, a NOAA Hollings scholar from the University of Oklahoma was mentored by Ron Dobosy and utilized RAMAN network data to evaluate model output statistics (MOS) in the East Tennessee WRF Model Domain. Another Hollings scholar, Kenneth Pratt from Pennsylvania State University worked with Will Pendergrass to study the effects of stability on fine particulate matter concentrations in a unique topographic area surrounding the I-40/Watt Road interchange in Knoxville, TN. NOAA EPP scholar Aziza Marchant from Savannah State University teamed with Tilden Meyers to evaluate the relationship between aspirated and non-aspirated temperature sensors in support of U.S. CRN power management. Samuel Ubanyionwu, a NOAA EPP scholar from Texas Southern University, was mentored by LaToya Myles and measured concentrations of atmospheric compounds (including nitric acid and PM_{2.5} sulfate) along the Mississippi Gulf Coast during a collaborative field program with Jackson State University. Spelman College Howard Hughes Summer Research Visiting Fellow Ridwaana Allen was mentored by LaToya Myles and measured ambient ammonia concentrations at two sites in East Tennessee to determine influences of combustion emission sources.

A two-page summary of ATDD research was drafted with guidance from M. Kerchner (ARL HQ). The document provides a synopsis of ATDD's air quality, climate, and dispersion work with an emphasis on transition to operations, input to modeling efforts, and support of policy development. latoya.myles@noaa.gov

TRAVEL

Boice, M.C., Eutaw, AL, April 2-3, 2009, to perform an unscheduled maintenance visit to Thomasville.

Pendergrass, W. and Myles, L., Jackson, MS, April 7-20, 2009, to conduct preliminary work on Jackson State Field Study.

Brooks, S.B., Houston, TX, April 12-25, 2009, to participate in the Texas Air Quality SHARP field study.

Burris, J.H. and Randolph, J.B., Fort Payne, AL; Selma, AL; Montgomery, AL; Athens, GA; Augusta, GA; Aiken, SC; Mount Pleasant, SC; and Madison, GA, April 20-30, 2009, to perform annual maintenance on the USCRN stations.

Boice, M.C., Madison, AL, April 23-24, 2009, to perform unscheduled maintenance on CRN and HCN-AL sites.

White, J.R. and Meyer, R.W., Washington, DC, April 26 – May 1, 2009, to conduct quarterly maintenance visits and upgrades.

Dobosy, R.J., Silver Spring, MD, April 27-29, 2009, to attend a meeting of the Atmospheric Dispersion Group of the Air Resources Laboratory.

Vogel, C.A., Silver Spring, MD, April 27-30, 2009, to attend meetings at NOAA Headquarters.

Pendergrass, W., Washington, DC, April 27-29, 2009, to attend the ARL Directors' Meeting and Dispersion Workshop.

Baker, C.B., Silver Spring, MD, April 27-30, 2009, to attend the ARL Directors' Meeting.

Bryant, D.K. and Jordan, J.J., Trussville, AL; Daphne, AL; Broussard, LA; Lafayette, LA; Monroe, LA; Palestine, TX, and Meridian, MS, April 28 – May 9, 2009, to conduct CRN annual maintenance visits.

Meyers, T.P., Silver Spring, MD, April 29-30, 2009, to attend the ARL Directors' Meeting.

Shifflett, B., Kansas City, MO, May 1-8, 2009, to attend the DPA Conference.

French, B.F. and Rutherford, J.M., Tuscaloosa, AL, May 20-21, 2009, to complete the Alabama HCN station.

Brooks, S.B, Oak Ridge, TN, May 25-26, 2009, to return field study equipment to ATDD and discuss current projects with the new director.

Boice, M.C. and Randolph, J.B., Stillwater, OK; Guymon, OK; Manhattan, KS; Colby, KS; and Kansas City, KS, May 26 – June 7, 2009, to perform CRN annual maintenance visits.

Myles, L., Silver Spring, MD, May 28-29, 2009, to attend the EEO/Hollings Scholars' Orientation.

White, J.R., Washington, DC, May 28-30, 2009, to perform an unscheduled maintenance visit at the Hoover building.

Haire, D.A., Bessemer, AL; Saraland, AL; Selma, AL; Montgomery, AL; and Pell City, AL, May 29 – June 3, 2009, to perform annual maintenance at HCN/CRN sites.

Hamby, T.R. and Rutherford, J.M., Kingdom City, MO; Brookfield, MO, Lincoln, NE; Colfax, IA; and Sycamore, IL, May 29 – June 7, 2009, to perform annual maintenance on CRN stations.

Brooks, S.B., Houston, TX and Hagerstown, MD, June 1-4, 2009, to calibrate and remove field study equipment at the conclusion of the SHARP Air Quality Study in Houston, TX, and attend a meeting in Frostburg, MD on June 4.

Meyers, T.P., Boulder, CO, June 5-12, 2009, to attend CRN SEBN meetings.

Baker, C.B., Boulder, CO, June 6-12, 2009, to attend CRN SEBN meetings.

Meyer, R.W. and White, J.R., Ocean Springs, MS, June 8-23, 2009, to participate in the joint NOAA/Jackson State University boundary layer experiment.

Wilson, T.B., Oxnard, CA, June 8-12, 2009, to attend SMAP workshop where he gave a brief talk on the importance of planning and coordinating future and ongoing research activities, the need for additional resources to support coordination efforts, and the need for better coordination between the remote sensing group and the land observation group.

Black, M.D., Mt. Vernon, IL; Burlington, CO; Fort Morgan, CO; Brighton, CO; Fruita, CO; Salida, CO; Pueblo, CO; and Hays, KS, June 10-19, 2009, to install HCN-M sites.

Jordan, J.J., Columbia, MO; Limon, CO; Denver, CO; Grand Junction, CO; Gunnison, CO; Lamar, CO; Burlington, CO; and Columbia, MO, June 10-20, 2009, to install HCN-M sites.

Land, G.S., Gaithersburg, MD, June 10-13, 2009, to attend Travel Manager 9.0 training at NOAA Financial Systems Division.

Burris, J.H. and Hall, M.E., Mt. Vernon, IL; Burlington, CO; Ft. Morgan, CO; Fruita, CO; Salida, CO; and Lamar, CO, June 11-21, 2009, to install HCN-M sites.

Myles, L. and Pendergrass, W., Gulfport, MS, June 15-30, 2009, to participate in the Jackson State University Field Study.

Vogel, C.A., Gulfport, MS, June 15-22, 2009, to participate in the Mississippi Coastal Atmospheric Dispersion Study (MCADS).

Dobosy, R.J., Boulder, CO, June 21-26, 2009, to attend a workshop for users of the Weather Research and Forecast Model.

Bryant, D.K., Galloway, K.W., Haire, D.A., Holly Springs, MS; Monroe, LA; Batesville, AR; Joplin, MO; and Rolla, MO, June 22-28, 2009, to conduct annual maintenance visits at CRN sites.

Shifflett, B., Ann Arbor, MI, June 22-25, 2009, to attend the OAR Management Conference.

White, J.R., Washington, DC, June 25-27, 2009, to conduct an unscheduled maintenance visit at the National Academy of Sciences UrbaNet site.

cc:

Abelquist, E.
Artz, R.
Bach, W. D.
Baldocchi, D.D.
Berlinrut, D.
Cunningham, D.C.
Dahlman, R. C.
Fine, S.
Hanna, S.R.
Hicks, B.B.
Hildebrand, S.G.
Holland, M.
Hosker, R.P.
Jacobs, G.
Lunn, P.W.
Mann, R.
Michalsky, J.
Mills, D.
Mills, G.A.
Page, A.
Petty, R.
Radcliffe, L.
Randerson, D.
Riches, M.R.

Roddye, L.C.M.
Wilson, K.B.
Womack, J.