



# NOAA ARL Monthly Activity Report



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## Highlights

1. **HIGHLIGHT -- Hurricane Research.** During September there were two deployments of the NOAA P3 N43RF using the BAT probe to acquire measurements of winds and turbulence in the hurricane boundary layer. In early September, N43RF was deployed to Barbados to fly through Hurricane Frances as the storm passed north of St. Croix on its westward track. Several passes were made on the periphery of the storm at 1500 ft above the surface. Data collected on these passes will be used to characterize the transfer of energy through the top of the boundary layer. In Hurricane Jeanne, N43RF deployed out of MacDill AFB and made only a few low-level runs before recovery in Jacksonville for a mandatory engine chemical wash. Unfortunately the structure of Jeanne did not allow for repeated flux runs at low levels, so data collected in this storm are marginal at best. These

two deployments underscore the necessity for a long-range plan to attain a series of measurements in hurricanes over a number of years. Despite the setbacks related to storm structure and flight patterns, the instrumentation performed reasonably well, and we were able to collect useful data. (J. French)



Jeff French adjusting the ARL BAT probe.

The surface-mounted Extreme Turbulence (ET) probe enjoyed several successful deployments in September. During Hurricane Frances, three probes were set up. Wind speed and direction were determined 50 times per second (50 S/s) by sampling the distribution of pressure over 400 mm diameter spheres. Electrical problems ended the active probe's data collection after 12 hr. The passive probes collected data for 72 hours in this slow-moving storm.

Two ET probes were set up for hurricane Ivan. This time both probes recorded data throughout the storm. Once quality assurance is completed, we expect to have a set of three-

component velocity measurements resolving turbulence well into the inertial subrange. (R. Dobosy and P. Hall, with R. Eckman and T. Strong, ARL/FRD, Idaho Falls ID)

**2. Highlight -- Large input of Mercury to the Chesapeake Bay?** Two ARL Divisions have been collaborating with the Oxford Laboratory of NOS to measure mercury in air and precipitation at Oxford and Wye on the Eastern Shore of the Chesapeake Bay. At both sites, ambient air concentrations of Reactive Gaseous Mercury (RGM), total gaseous Hg, and particulate Hg were measured, along with Hg wet deposition, and a range of meteorological quantities. At Oxford, SO<sub>2</sub>, CO, and O<sub>3</sub> concentrations were also measured. Wye is an AirMon-Dry and NADP site and so additional collocated measurements are available for that site. The process of assembling all the measurement data is underway. Once completed, the data will be analyzed, to assess deposition rates and to facilitate model evaluation. Concentrations of RGM were markedly higher than had previously been measured in ARL field programs in Tennessee and over the Gulf of Mexico, indicating comparatively high deposition rates to the area surrounding Chesapeake Bay. [mark.cohen@noaa.gov](mailto:mark.cohen@noaa.gov), [winston.luke@noaa.gov](mailto:winston.luke@noaa.gov), [paul.kelley@noaa.gov](mailto:paul.kelley@noaa.gov), [steve.brooks@noaa.gov](mailto:steve.brooks@noaa.gov)

## Silver Spring

**3. EMEP Mercury Modeling Intercomparison Project.** Work has intensified on Phase III of the International Mercury Modeling Intercomparison project. In this phase, each of the participating models are estimating ambient Hg concentrations and dry and wet deposition at ~10 monitoring sites throughout Europe. Each model is also estimating the total deposition to Spain, Italy, and the United Kingdom. For each of these three countries, the models are estimating the proportion of the total deposition arising from anthropogenic sources within the country. Monthly total deposition and

average concentrations estimated by each model for 1999 are being compared against estimates of the other models, and, where measurement data exist (e.g., wet deposition at monitoring sites) against field data as well. [mark.cohen@noaa.gov](mailto:mark.cohen@noaa.gov)

**4. *Wildfire Smoke Forecast Updates.*** There has been renewed interest in the wildfires smoke forecast demonstration system currently running on a developmental basis at NCEP. The intent is to expand the system to predict PM<sub>2.5</sub> using the Forest Service's Blue Skies emission framework. We have obtained and installed the Blue Skies code. An interface was created to generate a HYSPLIT control file combining the NESDIS fire locations and Blue Skies emission estimate. Testing awaits resolution of questions regarding the configuration of relevant data bases. To be compatible with other Blue Rains products, hourly national forecasts are now being produced in addition to the regional graphics. Also the model domain has been expanded to cover Alaska and Central America, requiring the simultaneous use of both the 12-km ETA products for the CONUS and the global 1-deg GFS output for the other regions of interest. [roland.draxler@noaa.gov](mailto:roland.draxler@noaa.gov)

**5. *HYSPLIT Training Workshop.*** A training workshop was conducted on September 14-15 that was designed to review all aspects of the PC version of the model's configuration and operation. Eighteen participants registered for the workshop, many of which came from local and state air quality and emergency management agencies. The training workshop resulted in several good suggestions, which resulted in changes to the Graphical User Interface. These include automatic default settings for dry and wet deposition, and maintaining the display menu window after a graphic is created. [roland.draxler@noaa.gov](mailto:roland.draxler@noaa.gov)

**6. *Angell Archives at NOAA Central Library and American Institute of Physics.*** Presentations and articles prepared for the Jim Angell 80<sup>th</sup> Birthday Symposium (held Nov. 2, 2003, in Silver Spring) were transferred to the NOAA Central Library in Silver Spring, and to the American Institute of Physics' Center for History of Physics in College Park, MD. Audio tapes of the proceedings, published summary articles, and PowerPoint presentations will be archived there for future researchers. The NOAA Central Library also holds audio recordings of oral history of some of the early staff of the ARL Headquarters Division. [dian.siedel@noaa.gov](mailto:dian.siedel@noaa.gov)

**7. *AMS Committee on Climate Variability and Change.*** The committee has been busy with several activities over the past few months, including planning the 16<sup>th</sup> Symposium on Global Change and Climate Variations (to be held January 2005), planning a joint conference with the AMS Committees on Middle Atmosphere and Atmospheric and Oceanic Fluid Dynamics (to be held June 2005), updating of its terms of reference and changing its name (formerly Committee on Climate Variations), developing a committee web site, and planning a short course on climate for the 2005 AMS Conference on Broadcast Meteorology. Dian Seidel chairs the committee. [dian.seidel@noaa.gov](mailto:dian.seidel@noaa.gov)

**8. *Mt. St. Helens.*** The Mt. St. Helens volcano came back to life with some venting of steam and small amounts of ash. For planning purposes, VAFTAD (Volcanic Ash Forecast Transport and Dispersion) forecasts from future hypothetical eruptions of Mt. St. Helens are now included on the web at <http://www.arl.noaa.gov/ready-bin/vaftadtst.pl>. In addition, a twice-daily matrix of

HYSPLIT forecasts, displayed somewhat differently from that on the VAFTAD page, for hypothetical eruptions of Mt. St. Helens to two different heights, using both NCEP Global Forecast System (GFS) and Eta meteorology, is available to the Washington Volcanic Ash Advisory Center (VAAC). [barbara.stunder@noaa.gov](mailto:barbara.stunder@noaa.gov)

## **Boulder**

**9. SURFRAD/ISIS.** All SURFRAD instrument exchanges have been completed for 2004. A new quality assurance program for SURFRAD is now well in place. This ensures that equipment that wears out over time is replaced on a regular basis. This year, all ventilator fans, UPS fans, UPS batteries, and solar tracker backup batteries were replaced.

New UVB standard instrument calibrations have been provided. These are used to calibrate SURFRAD UVB instruments. On September 2, 2004, the SURFRAD data set from September 24, 1997 to September 2, 2004 were reprocessed using the new base calibrations and an improved UVB data processing algorithm. [john.a.augustine@noaa.gov](mailto:john.a.augustine@noaa.gov)

**10. Beta Version of a New CUCF Database Developed.** The Central UV Calibration Facility of the Surface Radiation Branch calibrates several different types of UV instruments for many UV Monitoring and Research agencies in North America and beyond. The number of instruments that the CUCF calibrates has steadily increased over the years. The CUCF is calibrating over 50 UVB broadband radiometers a year, 50 UV rotating shadowband instruments a year, performs numerous field calibration audits per year, and provides several national and international agencies with horizontally calibrated 1000W quartz tungsten halogen lamps. With the increase in instruments through the CUCF laboratories and the increase in the number of calibrated lamps provided to agencies, the CUCF needed a new database system to manage the data generated. Nobuki Matsui has developed a beta version of a new CUCF database with a web interface that is ready to be tested. [nobuki.matsui@noaa.gov](mailto:nobuki.matsui@noaa.gov), [patrick.disterhoft@noaa.gov](mailto:patrick.disterhoft@noaa.gov), [kathy.o.lantz@noaa.gov](mailto:kathy.o.lantz@noaa.gov), [charles.m.wilson@noaa.gov](mailto:charles.m.wilson@noaa.gov)

## **Oak Ridge**

**11. Canaan Valley.** The Chesapeake Community Modeling Program is developing an integrated Chesapeake Bay watershed model. Suitable available models were discussed at a meeting at the Center for Marine Biotechnology in Baltimore MD. Plans for a 500-acre long-term ecological research site near Canaan Valley, WV continue to be defined in discussions among the Canaan Valley Institute's science staff. Atmospheric deposition monitoring and its affects on terrestrial and aquatic systems are an integral part of the planned studies. The proposed study area is a relatively high-altitude, well-defined drainage with no apparent land-borne sources of pollution. Integration of this site into larger regional and national ecological studies was discussed at a meeting with the Mid-Atlantic Regional Ecological Observatory (MAREO) group in Front Royal, VA. (Vogel)

**12. University of Alabama Sky Arrow Instrument Integration.** Cooperation between NOAA/ARL and the University of Alabama (UA) in using Alabama's Sky Arrow has been smoothed by the completion of a Memorandum of Understanding. A press conference to announce the agreement

was hosted by UA in Tuscaloosa. Richard Artz, Deputy Director of ARL, along with Steve Brooks, Ron Dobosy, Ed Dumas, and Laureen Gunter from NOAA/ATDD attended. (Brooks, Dobosy, Dumas, and Gunter, with R. Artz, ARL HQ)

## **Research Triangle Park**

**13. Community Multiscale Air Quality (CMAQ) Modeling System - 2004 Release.** The 2004 version of the CMAQ (v4.4) modeling system was released. The model archive was updated and tested. In addition, a 2001 annual simulation was re-run with the release version of the model. The 2004 CMAQ model release includes a version of the Plume-in-Grid submodel capable of simulating aerosol processes, as well as some code optimizations for horizontal advection and diffusion suggested by the recent Sandia National Laboratories collaboration. (Shawn Roselle, 919 541 7699; Jeffrey O. Young, 919 541 3929; James Godowitch, 919 541 4802)

The code for computing deposition velocities for secondary organic aerosols and their precursors was generalized to facilitate additions of model species that are not part of either the gas-phase or aerosol mechanisms. All documentation relative to this and other model changes was also finalized for inclusion in the model archive and model release notes. (Gerald L. Gipson, 919 541 4181)

The first simulation of an entire annual cycle using the CMAQ mercury model was completed during September. This simulation was performed in two segments, one beginning in January 2001 and the other beginning in July 2001. A 10-day model spin-up period was used for each time segment and continuity between time segments at the June 30 - July 1 interface has been demonstrated. The simulated annual total wet deposition of mercury has been compared to observations from the Mercury Deposition Network. A Pearson correlation of 0.80 was found between the simulated and observed values of total mercury wet deposition at 52 sites across the United States and Canada. Dry deposition was also simulated by the CMAQ mercury model. It showed that in many areas of the model domain, dry deposition represents a significant fraction of the total deposition of atmospheric mercury. Analysis of these results is continuing to refine the model evaluation to a seasonal basis and to identify any relationships that might exist between model accuracy and climatic variation. (Russell Bullock, 919 541 1349)

**14. NOAA/EPA Air Quality Forecast Model Developments.** Results from three modeling streams being run this summer at the NOAA National Centers for Environmental Prediction are being assessed: ozone forecasts over the northeast United States, ozone forecasts over the eastern United States, and ozone and PM forecasts over the eastern United States have been continually analyzed on a daily basis. Guided by these analyses, diagnostic simulations to test alternate model formulations to improve the representation of the effects of clouds on photolysis attenuation have been performed. The specification of below-cloud attenuation of the photolysis rates based on radiation fields from the meteorological model was explored. In this approach, the attenuation factor was derived as the ratio of the radiation reaching the surface to the clear sky value. Simulations with this alternate formulation result in improvements in model predictions (reductions in model high bias) at the low O<sub>3</sub> range. Refinements to the methodology and testing over a wider range of conditions is underway. (Rohit Mathur, 919 541 1483)

**15. Emission Inventory Assessment Readied for NARSTO Review.** NARSTO's Emission Inventory Assessment has progressed through numerous preliminary drafts and is available for review by the NARSTO community. Motivated by recommendations in NARSTO's PM and Ozone Assessments as well as by findings from the October 2003 Emission Inventory Workshop in Austin, Texas, this Assessment's primary goals are to set the stage for future inventory development, as well to facilitate efficient and reliable inventory application for atmospheric-process evaluation and for pollution management. Intended for a diverse audience of planners, policy makers, and scientists, the Assessment provides a staged presentation, which:

- describes a "vision," in the form of a desired future state of emission-inventory science and applications;
- provides a location and access resource for all important, currently existing North American inventories;
- analyzes deficiencies and uncertainties in current inventories;
- establishes the foundations of a rigorous approach to quantifying and reporting uncertainties in emission estimates;
- describes evolving measurement and interpretive technologies, which are potentially applicable for future emission-inventory development and/or verification; and
- outlines findings and recommendations for advancing from the present state of emission-inventory development to the visionary state described above.

This Assessment's review schedule will be similar to those of the earlier NARSTO documents. The current draft is intended primarily for review by members of the NARSTO community; but comments are welcome from any interested individual, regardless of NARSTO affiliation. Comments, which should be sent electronically to Diane Fleshman (diane@owt.com), will be compiled and used to prepare a subsequent draft, which will be subjected to an extended review by a smaller number of selected, independent scientists. The resulting comments will be processed into a final draft, which will be published as a NARSTO document subsequent to approval by the Executive Assembly. This version contains essentially all of the technical material intended by its authors; however, it does not include an executive summary. Based on past experience with the PM and Ozone Assessments, we anticipate substantial modifications to occur as a result of the review process.

Comments for this review stage are due by October 29, 2004. The document, "Improving Emission Inventories for Effective Air-Quality Management Across North America," can be downloaded from <http://www.cgenv.com/narsto/>. (J. David Mobley, 919 541 4676)

## **Idaho Falls**

**16. New York City Study.** Work has begun in preparation for the New York City Study to begin in March 2005. Three field deployments are anticipated, each lasting three weeks. A standard operating procedure (SOP) is being prepared to aid in the training of analysts and serve as a reference guide for the analysis of sulfur hexafluoride (SF<sub>6</sub>) by gas chromatography. The instruments are being optimized to shave off any excess analysis time. Purge times, injection lengths, etc. are being tested for the greatest efficiency of analysis. The goal is to analyze and verify the data for all 100 cartridges per test within at least one 10-12 hour day.

Much of this month entailed the ordering and receipt of new upgraded instrumentation for the tracer analysis facility. A new gas divider for making calibration standards in-house was purchased, as were new columns, gas scrubbers, and other consumables. Upgrades are being made to the analysis software to fix known bugs and incorporate needed features that should make the analysis process more efficient. (Debbie Lacroix, 208 526 9997, and Roger Carter)

**17. Smart Balloon.** Existing designs had to be modified to accommodate the inclusion of the new ozone sensor from the University of New Hampshire. A new lightweight, low-power aspirator and radiation shield have been developed to provide very accurate temperature and relative humidity measurements. A new very low power digital temperature and relative humidity sensor will be used to help maintain the necessary small size and keep the weight to just a few grams. Testing of the new aspirator indicates the accuracy to be within 0.2 C. (Randy Johnson, 208 526-2129)

**18. Pentagon Shield.** The final SF<sub>6</sub> tracer data were provided to the sponsor, which completes FRD's obligation. The data have been removed from FRD computers and stored in a secure area for future analysis. (Kirk Clawson, 208 526 2742 and staff)

**19. DMCC Assist Visit.** The DOE Meteorological Coordinating Council (DMCC) conducted an assist visit on September 8 and 9, reviewing FRD's contribution to DOE-ID's meteorological program. Walt Schalk from NOAA/DOE-NTS and Carl Mazolla from Shaw Environmental represented the DMCC. They met with FRD and DOE staff, the INEEL Emergency Preparedness manager, and representatives of the State of Idaho INEEL Oversight Program, among others. They inspected mesonet towers, instrumentation, and data handling processes. The initial findings of the visit included three noteworthy practices, which indicates a stellar performance by FRD. The summarized noteworthy practices are: 1) The meteorological program is run very efficiently and all INEEL customers expressed strong satisfaction with FRD, 2) FRD operates a top-notch mesonet data quality assurance plan, and 3) the data recovery for the mesonet exceeds 99%, far above the 95% required by DOE orders. (Kirk Clawson, 208 526 2742 and staff)

**20. Emergency Operations Center (EOC).** ARL staff are on call, for operational duty in the unlikely event of an INEEL emergency. Three separate EOC requalification sessions were held this month on the 8<sup>th</sup>, 15<sup>th</sup>, and 29<sup>th</sup>. Six FRD staff participated and were requalified as emergency response operations staff. Thus, three-fourths of the staff have attended the seminar. The remainder will attend the final session next week. The training covered a number of topics including event classification, notifications, log keeping, usage of communications equipment, and recovery operations. A brief tabletop exercise was held as part of the training. (Jason Rich)

**21. INEEL Support.** Work is proceeding on the mesonet telemetry upgrade. New radios are being installed along with new Campbell Scientific CR23 data loggers, replacing the older wide-band radios and CR10 data loggers. This upgrade also requires new data acquisition software. The system upgrade should be completed by the end of the year deadline. (Brad Reese, 208 526 5707)

## **Las Vegas**

**22. *Urban Atmospheric Research Program (UAR)*.** SORD personnel are collaborating with ATDD and CIASTA staff to accelerate studies of air pollution and dispersion affecting the Las Vegas valley. At this time, a preliminary agreement that been reached to use two ozone sensors from ATDD to monitor ozone concentrations upwind of Las Vegas, to provide information which might indicate the role of local emissions in determining the high ozone concentrations that are experienced there.

In support of the UAR program, ARL/CIASTA modeling runs have been continued on a routine basis, with the results being archived. The grid used is 2 km. It is planned to modify the modeling program to make use of an extended mesoscale monitoring network, generated using the existing ARL network in southern Nevada as a basis.