



# NOAA ARL Monthly Activity Report



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Bruce B. Hicks, Director  
Air Resources Laboratory

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## Highlights

**1. *Ammonia in the Coastal Environment.*** ARL is leading the planning of the Third Shared Resources Conference – Airsheds and Watersheds: the Significance of Ammonia in Coastal and Estuarine Areas, to take place 15/16 November at Dewey Beach, Delaware. In common with the previous conferences in this series, the meeting will bring together scientists, regulators, and private interest groups in an attempt to navigate a path towards a coherent strategy for addressing the emerging problem of reduced nitrogen over-enrichment along the east coast. ([margaret.kerchner@noaa.gov](mailto:margaret.kerchner@noaa.gov))

**2. *SURFRAD Hits the Cover of BAMS.*** SURFRAD will be featured as the cover article of the October issue of the Bulletin of the American Meteorological Society. The editors chose a photograph of the Desert Rock SURFRAD station for the cover picture. ([john.augustine@noaa.gov](mailto:john.augustine@noaa.gov))

## Silver Spring

**3. *Extension of Extreme Heat Time Series.*** Ozone Action and Physicians for Social Responsibility have extended the dataset created by Dian Gaffen and Becky Ross to investigate variations in climate extremes. The original dataset covered 1948-1995 and showed evidence of increases in the frequency of summertime extreme heat events in the U.S., as reported in a 1998 paper in *Nature*. The two non-governmental organization updated the dataset through 1998 and found very similar results to those presented in the original study, as would be expected. The extended dataset was announced via a press conference in early August which was covered by several newspapers, particularly in the southern states, which have been subjected to intense heat waves this year. ([dian.gaffen@noaa.gov](mailto:dian.gaffen@noaa.gov))

**4. *Workshop on Adjusting Radiosonde Temperature Data for Climate Monitoring: October 11-12, 2000.*** Dian Gaffen and Tom Peterson (NOAA/NESDIS/NCDC) are organizing a workshop on methods being developed to adjust long time series of radiosonde temperature data for climate monitoring purposes. Radiosonde data are affected by changes in instruments and methods of observations, and these inhomogeneities strongly affect resulting temperature trend estimates. Several groups have developed methods to adjust the data, but they have not been validated or intercompared. The workshop will be held October 11 and 12 at the National Climatic Data Center in Asheville, NC. A paper documenting the workshop results is planned. ([dian.gaffen@noaa.gov](mailto:dian.gaffen@noaa.gov))

**5. *Climatology, Extremes, and Summer Heat Stress in China.*** A project on China's late 20<sup>th</sup> Century climatology and extremes is near completion. A paper on climatology and trends was accepted by the *Journal of Climate*, and second paper on extremes and trends is being submitted to *Advances in Atmospheric Sciences*. Julian Wang recently traveled to China to present those results to the International Conference on Climate and Environment Variability and Predictability in Shanghai and to several seminars held by provincial bureaus of the China Meteorological Administration (CMA). During his visit, Dr. Wang participated in discussions with scientists at several research institutes and CMA representatives to continue and to expand the study. As a result of those discussions, a collaborative research proposal is now under development, to be funded from both U.S. and Chinese funding agencies. ([julian.wang@noaa.gov](mailto:julian.wang@noaa.gov))

**6. *Toxic Gas Dispersion in Florida.*** Assistance was given to the Duval County, Florida, Health Department, in dealing with a serious water contamination problem. A tank cleaning procedure resulted in

the evaporation of a toxic solvent, and the subsequent atmospheric transport and absorption of the solvent in a nearby drinking water aeration system. The result was an unacceptably high level of the solvent in the drinking water leaving the aeration system. A screening-level modeling analysis was carried out, showing that the incident – as described above – was consistent with expected atmospheric fate/transport of the pollutant, as well as its expected behavior in the aeration system. ([mark.cohen@noaa.gov](mailto:mark.cohen@noaa.gov))

**7. *Mercury in Florida.*** Laboratory tests and characterizations of the trace gas detectors fielded by ARL in support of the recent SPeciated Atmospheric Mercury (SPAM) Experiment, conducted on the NOAA Twin Otter, were concluded. Tests included multi-point calibrations of the UV ozone photometer against ARL's secondary ozone standards and multi-point calibrations of the CO, SO<sub>2</sub>, and NO<sub>x</sub> detectors; an investigation of humidity effects upon CO and SO<sub>2</sub> measurements; and careful evaluation of ARL's 3-channel NO detector for linearity of response, artifacts, sensitivity, and conversion of NO<sub>y</sub> compounds. The molybdenum converter used during the flights was determined to convert NH<sub>3</sub>, an interfering compound in NO<sub>y</sub> measurement, with an efficiency of approximately 30% in moist air. This level of conversion is unacceptable, and is higher than typically reported in the literature. The converter is being redesigned and will be re-evaluated. ([winston.luke@noaa.gov](mailto:winston.luke@noaa.gov))

**8. *Research Strategy for Atmospheric Deposition -Gulf of Mexico Program.*** An expert panel of technical experts has been assembled to provide guidance for formulating a research strategy on atmospheric deposition issues for the Gulf of Mexico Program (GMP). The federal co-leads for this effort are Drs. John Ackerman (EPA Region IV) and John Sherwell (MD Department of Natural Resources). The panel has formulated and authored a multi-tiered, priority-ranked strategy for resolving the major uncertainties of the atmospheric deposition issue in the Mississippi river basin, open Gulf waters, and Gulf estuaries. The panel's summary document is to be delivered to the GMP in September. ([winston.luke@noaa.gov](mailto:winston.luke@noaa.gov))

**9. *Sea Grant Chesapeake Bay Wave Study.*** The Sea Grant Chesapeake Bay wave modeling experiments were completed in August with cooperation from U. MD-CES. 4 km CBRAMS was coupled with the GLERL wave model run at 400 m horizontal resolution for the Sea Grant Wave Experiment (July 22-28, 1998). RAMS was modified to ingest roughness lengths produced by the wave model. A script was written to allow hourly coupling between the models by ingesting the wave model z0, running RAMS which outputs the wave modified over-water winds for input to the wave model for the next hour. CBRAMS produces hourly grib files for interaction with the wave model and history files to restart the model every hour. A cursory analysis shows some small differences in speeds over water (1-2 m/s). A more thorough analysis is being prepared with the University of Maryland. ([jeff.mcqueen@noaa.gov](mailto:jeff.mcqueen@noaa.gov), [lin@hpl.umd.edu](mailto:lin@hpl.umd.edu))

**10. *Air Quality Assessments of High Ozone and Particulate Pollution Episodes for Vermont.*** Work continued on creating high resolution meteorological and air quality simulations for the VT-NH to assess local air quality and ecosystem health. The 3 and 9 km reanalyses from June 1 -August 15, 1999 have been completed. The 9 and 3 km grids can be reached from the Hysplit archive or READY archived meteorology web menus. ([jeff.mcqueen@noaa.gov](mailto:jeff.mcqueen@noaa.gov) and [richard.artz@noaa.gov](mailto:richard.artz@noaa.gov))

## **Boulder**

**11. *SURFRAD.*** Plans have been made to install a small (6' by 10') building at the Fort Peck SURFRAD station during the instrument exchange in the first week of October. The primary purpose of

the shelter is to house the computer for the Total Sky Imager, which will be installed adjacent to the building. The structure will be insulated, and forced-air ventilation will be installed to cool the interior in the warm season. (John Augustine, 303 497 6415)

**12. *The Quadrennial Ozone Symposium.*** The Quadrennial Ozone Symposium was held in Hokkaido University in Sapporo Japan on July 3-8th, 2000. Three representatives from SRRB attended and gave oral presentations at the symposium. Kathleen Lantz spoke on simultaneous spectroradiometer measurements during the "1997 North American UV Spectroradiometer Intercomparison," Irina Petropavlovskikh presented results from her work on Umkehr retrievals of ozone profiles entitled "Umkehr Retrieval Algorithm: On the Importance of a Priori Information," and Betsy Weatherhead presented two talks on her work in the statistical assessment of detecting trends. Irina Petropavlovskikh also presented two posters: one reported shifts in Umkehr measurement time series and associated errors propagating in the Umkehr ozone profile retrievals, and the other was on methods for correction of stratospheric aerosol errors in Umkehr retrieved ozone profiles. Both posters received a good amount of attention from the international community. The primary purpose of the symposium was to summarize current understanding on the state of stratospheric and tropospheric ozone globally and locally, and the resulting environmental impacts. (Betsy Weatherhead, 303 497 6653, Irina Petropavlovskikh, 6279, Kathleen Lantz, 7280)

## **Oak Ridge**

**13. *Salt Lake City Dispersion Program.*** A new experimental procedure for measuring atmospheric surface pressure perturbations was tested at ATDD. In this method, the pressure reference chamber is held at near-constant temperature by immersion in an ice-bath. Comparison with the original method, i.e. no temperature control, shows that temperature changes in the reference chamber can produce unrealistic, low-frequency pressure perturbations. However, the high-frequency signals remain only slightly affected. The main advantage of the new technique is that now we need to reset the reference pressure only hourly instead of every 15 minutes. The new method not only simplifies the analysis, but allows the observations of very-low frequency perturbations. ([nappo@atdd.noaa.gov](mailto:nappo@atdd.noaa.gov), Auble)

**14. *Refractive Turbulence Study.*** Refractive turbulence in the upper atmosphere influences transmission of light and other electromagnetic waves of military interest. Its measurement *in situ* requires temperature sensors of fast response at high sensitivity and low temperatures. A promising approach, led by T. L. Crawford, is being taken at FRD using a fine wire thermocouple to measure at high sensitivity and frequency with respect to a reference mass of greater thermal inertia whose temperature is monitored by a thermistor. These sensors are enclosed in a housing that provides an environment of known pressure and reduced airflow. The housing allows direct measurement of the heating due to compression of the air and reduces spurious signal caused by strain on the sensor. An alternative approach, designed by Dr. Krzysztof Haman of the University of Warsaw, Poland, fully exposes a thin wire to the airflow, allowing extremely fast response. Results from this probe have been impressive, though there is no direct measure of the air compression around the wire and no protection from strain. ([dobosy@atdd.noaa.gov](mailto:dobosy@atdd.noaa.gov))

**15. *Mercury in Florida.*** Large spikes in condensation nuclei counts and nitrogen species concentrations were seen 50 to 200 km offshore at 3000 m and above during the January mercury study using the Twin Otter. These were examined more closely in June. Corrections to plume width were made for the flight path's angle across the plume and the plume's cylindrical shape. The average plume was 400 m wide, in an average wind speed of 6 m/s with average  $\sigma_v$  (crosswind component) of

0.02 m/s. Extrapolation back to zero plume width suggested a typical age of 63 minutes. During this time the material typically drifted about 22 km, clearly originating in every case from well offshore. The sources of the plumes are evidently commercial air traffic into and out of southern Florida or the Bahamas. ([mcmillen@atdd.noaa.gov](mailto:mcmillen@atdd.noaa.gov))

**16. *Satellite Sensing of Pollutants.*** A feasibility study on the use of remote sensing techniques in the detection of air pollutants was initiated. Recent developments in satellite technology may allow better monitoring of air quality issues using remote sensing technology. ([birdwell@atdd.noaa.gov](mailto:birdwell@atdd.noaa.gov))

**17. *Southern Oxidants Study.*** Four flux and meteorological sites were established for the Houston 2000 Air Quality Study. Two were in the city, and two were at rural sites. Fluxes of momentum, heat, moisture, and CO<sub>2</sub> were measured, along with standard meteorological measurements and ozone concentrations. The period was very hot and dry and should provide some extreme cases of ozone concentration. Except for a few sporadic periods at one urban and one rural site, all data were recovered. This was impressive, given that one of the urban sites was in an area of high crime. It promises to be a great data set. ([gunter@atdd.noaa.gov](mailto:gunter@atdd.noaa.gov))

**18. *Rocket Exhaust Dispersion Study.*** Over 145 megabytes of infrared “movies” showing dispersion in a coastal environment, from SF<sub>6</sub> tracer releases of the Model Validation Program (MVP) Session 2 field experiment in Florida were added to the MVP Data Archive FTP Server. Five new MVP reports were also added to the MVP Data Archive. Four MVP reports were refreshed using better compression methods. ([herwehe@atdd.noaa.gov](mailto:herwehe@atdd.noaa.gov))

## **Research Triangle Park**

**19. *Seventh Conference on Air Quality Modeling.*** John Irwin of the ASMD Air Policy Support Branch helped conduct the Seventh National Conference on Air Quality Modeling in Washington during June. The purpose of this periodic and legislatively-mandated conference was to share technical information on new air quality modeling systems (e.g., AERMOD, CALPUFF, ISC-PRIME) and to take public comments on a proposal concerning use of these models in regulatory applications. Specific federal agencies that participated included NOAA, National Park Service, US Forest Service, Federal Aviation Administration, Department of Energy, and National Science Foundation. Presentations were also made on behalf of a variety of environmental consulting organizations. The modeling systems were generally supported for regulatory use but specific recommendations on additions to those systems and on support requirements were made. Technical highlights from the conference were subsequently “simulcast” by the EPA Education and Outreach Group. (John Irwin, 919 541 5682, Mark Evangelista, 919 541 2803)

**20. *Physical Modeling of Urban Areas.*** The ASMD Fluid Modeling Facility has been engaged in physical modeling studies of the flow and dispersion in and around simulated urban areas in a collaborative effort with scientists at Los Alamos National Laboratory and Lawrence Livermore National Laboratory. The thrust of the effort is development of a data base for evaluation and refinement of 3-D fluid dynamics codes used to predict the transport and fate of pollutants released in urban complexes. In addition to flow visualization, quantitative measurements of the mean flow and turbulence statistics have been completed using both a 2-D and a 3-D array of model building structures. Most recently, measurements were completed to quantify the mean concentration field resulting from a continuous tracer release from a point source located within the 3-D array. The models assume a near-Gaussian lateral distribution within a few building rows downwind. The wind tunnel data is currently being analyzed to examine the verity of the

model assumption. In general, the combination of tracer concentrations, mean flow and turbulence measurements, and smoke visualizations provides a unique data set for examining important features of “neighborhood scale” flows and for evaluation of emergency response and human exposure models. (Steve Perry, 919 541 1896)

**21. Sensitivity Tests of Models-3 Community Multiscale Air Quality (CMAQ) Model on Transport Algorithms and Grid Resolution.** One of the goals of the Models-3 CMAQ system is to develop a community modeling paradigm that allows continuous improvement of the one-atmosphere modeling capability in a unified fashion. CMAQ’s current science subsystems are composed of the MM5 meteorological model, Models-3 Emissions Processing and Projection System (MEPPS), the CMAQ chemistry transport model (CCTM), and several interface processors. CMAQ’s modular design promotes incorporation of several sets of science process modules representing different algorithms and parameterizations of physical and chemical processes.

As a result of tests now completed, it has been shown that the selection of transport process modules is influenced by other model configurations. Comparison with observations, especially with secondary species such as O<sub>3</sub>, may not be sufficient to allow selection of the best modules. For example, comparison between surface layer ozone predictions and observations is not sufficient to determine which transport algorithms are superior. Factors such as the representation of emissions inputs, the treatment of plume-in-grid, the use of different chemical mechanisms, the selection of different chemical solvers, and the model grid structure (i.e., vertical and horizontal resolutions and domain size) all contribute to different model results. Establishment of the best configuration of science process modules in a comprehensive model will require balanced representations of transport algorithms with other physical and chemical processes. ASMD scientists involved in this project are: Daewon Byun, Avi Lacser, Jason Ching, Jon Pleim, Bill Benjey and Tanya Otte. (Daewon W. Byun, 919 541 0732)

## **Idaho Falls**

**22. Salt Lake City Dispersion Study – VTMX-CBNP 2000.** The field deployment phase of the VTMX-CBNP study will occur in only one month. The retrofitting of all whole-air samplers into new sampler boxes has been completed. The re-design and modifications to the mobile SF<sub>6</sub> analyzers are nearly complete (see below). Nearly all SF<sub>6</sub> sampling cartridges have been cleaned and analyzed for contamination, and have received a clean bill of health. In summary, the preparation phase continues on schedule. ([kirk.clawson@noaa.gov](mailto:kirk.clawson@noaa.gov) and staff)

A new TGA-4000 SF<sub>6</sub> continuous analyzer system was used for background checks in Salt Lake City, Utah in preparation for the VTMX study. A couple of sources were identified but should not present a big problem for the study. The new TGA system performed very well. The operator had only a couple of minor suggestions and no major problems were identified. The new system allows the TGA to be installed in an automobile seat using a standard seat belt to fasten it. This will allow it to be installed a number of different vehicles. It also offers easier operation and computer controlled calibrations. ([roger.carter@noaa.gov](mailto:roger.carter@noaa.gov))

**23. Refractive Turbulence Study 2000.** Initial field work for RTS00 was completed during a 3 week period from 31 July to 18 August. Nearly 19 hours of data were collected in 9 flights using the LongEZ based out of Idaho Falls airport. The principal objective for this first of two deployments scheduled for 2000 is to determine characteristics of three different airborne temperature probes: the BAT probe (thermistor), the Ultra-Fast Temperature (UFT) probe (fine wire in free-stream), and the Fast, Ultra-

Sensitive Temperature (FUST) probe (thermocouple in reduced-flow chamber). Work continues on data analysis. Currently this focuses on determining recovery factors, resolution, and response for each device. This information is critical to assess how best to obtain the necessary measurements for phase 2 of RTS00, scheduled for late October/early November of this year. ([jeff.french@noaa.gov](mailto:jeff.french@noaa.gov), Tim Crawford, Ron Dobosy)

**24. INEEL Emergency Operations Center (EOC) Support.** Yet another range fire burned 5000 acres on the INEEL from August 5 to 6. An isolated shower produced a single bolt of lightning which ignited the fire during the late afternoon on August 5. The EOC was activated soon after the fire was discovered several miles west of the Environmental Breeder Reactor 2 (EBR-2) facility. Jeff French started the first shift on Saturday evening. He was then relieved by Kirk Clawson at midnight, who was then relieved by Jerry Crescenti at 8 a.m. Sunday morning. Jeff French returned to the EOC on Sunday afternoon at 4 p.m. for several more hours until the fire was brought under control. All three meteorologists provided timely short-range weather forecasts to EOC personnel. ([jerry.crescenti@noaa.gov](mailto:jerry.crescenti@noaa.gov), Jeff French, Kirk Clawson)

A simple wildfire model has been developed for use in the INEEL Emergency Operations Center (EOC). It requires as input the wind speed, wind direction, and fuel moisture content. From these inputs, the model estimates the maximum spread rate and flame length for both grass and sagebrush fuel models. The model code is based on the fireLib function library, developed with support from the U.S. Forest Service. Initially, there were plans to develop a more sophisticated model based on high-resolution vegetation and terrain maps. However, experiences from this summer's wildfires made it clear that detailed real-time information on the fire's location and spatial distribution are difficult to obtain and are subject to frequent revisions. Also, the rapid evolution of the fires means that the information is often out-of-date by the time it reaches the FRD desk in the EOC. The new simple model is compatible with the information typically available within the EOC. ([richard.eckman@noaa.gov](mailto:richard.eckman@noaa.gov))

**25. INEEL Mesoscale Modeling.** The length of the daily MM5 forecasts being run at FRD has been increased to 15 hours to better cover the period of maximum afternoon winds. The model is now being initialized at 0900 UTC (0300 MDT), and the forecast is run out to 0000 UTC (1800 MDT). The run usually takes about 3.5 hours to complete on the DEC Alpha workstation. Another enhancement that was completed in August was to modify MM5 to use data from the FRD Mesonet in its initialization. Tests performed so far indicate that using the Mesonet observations in the initialization mainly affects the first few hours of the simulation. Beyond that, the simulations with and without the Mesonet data are usually quite similar. ([richard.eckman@noaa.gov](mailto:richard.eckman@noaa.gov))

**26. AMS Short Course Agenda Finalized.** In response to the lack of an instrumentation curriculum at most universities with meteorology programs, the AMS Measurements Committee is organizing a one-day short course on meteorological instrumentation and observation techniques. The focus of the course is on the basics of *in situ* monitoring and will be oriented towards undergraduate and graduate students. This course will be offered on Sunday, January 14, 2001 in conjunction with the 81st Annual Meeting of the American Meteorological Society in Albuquerque, New Mexico. To learn more about short course or the activities of the AMS Committee on Measurements, go to its web site at <http://measure.noaa.inel.gov>. ([jerry.crescenti@noaa.gov](mailto:jerry.crescenti@noaa.gov))

**27. ARL Booth at AMS Annual Meeting.** Planning for the ARL Booth as part of the exhibit hall for next year's 81st Annual Meeting of the American Meteorological Society in Albuquerque, New Mexico to be held January 14-19, 2001 is ongoing. The booth is an excellent opportunity to "show off" to the rest

of the meteorological community the great research ARL does. One volunteer from each ARL division as well as ARL Headquarters is being asked to help in the development of this booth. Next year's Annual Meeting will represent a significant departure from previous annual meetings. The conference and symposium structure has been modified to create a scientific meeting that better serves the broad spectrum of attendees, with fewer conflicts and with opportunities for presentations that cover much of the breadth of the atmospheric and related oceanic and hydrologic sciences. A major emphasis will be placed on societal impacts. An ARL presence would at least keep some focus on air quality and climate issues.

Barbara Shifflett (ATDD) has agreed to take the lead coordinating the contributions from the various ARL divisions. The ARL staff involved so far include Bruce Hicks (HQ), Barbara Shifflett and Kimberly Hill (ATDD), Evelyn Poole-Kober and Dennis Atkinson (ASMD), and Jerry Crescenti and Tim Crawford (FRD). ([jerry.crescenti@noaa.gov](mailto:jerry.crescenti@noaa.gov), Tim Crawford)

## Las Vegas

**28. Nuclear Enterprise Project.** The Third Nuclear Enterprise Project workshop was held in College Station, TX, on August 22-23, 2000. Focus was on influence diagramming for power generation and on issues related to nuclear proliferation. The Project is being lead by Dr. V. Reis, Science Applications International Corporation (SAIC), Director of the Center for Nuclear Strategies. A report on this meeting has been prepared. (Darryl Randerson, 702 295 1231)

**29. Fallout Model Modifications.** During the past several months, SORD scientists have been investigating a procedure to improve predictions of the ARL/SORD fallout model (PIKE). SORD is leading this complex research project because the PIKE model was developed by SORD and because SORD personnel serve as NOAA meteorological technical matter experts for DOE, Nevada Operations Office (DOE/NV), national defense programs conducted at the Nevada Test Site. The effort is being driven by the need to provide DOE test management (during nuclear test exercises) with radiological projections in terms of total effective dose estimates (TEDEs) and comparable protective action guidelines (PAGs). The evacuation and relocation PAGs are driven by projected TEDE doses and doses to the thyroid and to the skin. The evacuation PAG is expressed as 1 to 5 rem (acquired over four days). Past test guidelines specify that if average offsite populations could receive whole body gamma exposures (TYE) in excess of 170 mR/yr, test execution will be postponed. The research effort has been focused on using PIKE model radiological output parameters and converting them to TEDEs. By reviewing the gross fission products (in H+12 hr Curies) generated during the PIKE experiment, decaying each nuclide for four days, specifying that  $1 \text{ Ci} = 10^{-6} \text{ (uCi/cc)/hr}$ , the TEDE and CDE (thyroid) can be calculated. Analysis shows that  $790 \text{ mR TYE} = 1.0 \text{ rem}$  in 4 days for the threshold TEDE and  $540 \text{ mR TYE} = 5 \text{ rem}$  for the CDE thyroid. (Darryl Randerson, 702 295 1231, and Doug Soule', 702 296 1266)

**30. DOE Meteorological Coordinating Council (DMCC).** Final preparations were made for the DMCC/Subcommittee on Consequence Assessment and Protective Actions (SCAPA)/Nuclear Utility Meteorological data User Group (NUMUG) conference to be held in Las Vegas, October 16-20, 2000. Arrangements were made to have the Mechanical Engineering Department, UNLV, host the DMCC and SCAPA meetings. The final DMCC conference agenda was prepared along with a listing of hotels located near UNLV, and appropriate maps were all assembled and mailed to the DMCC membership and speakers. The theme of the conference is "Advances in Meteorological Applications that Protect Safety and Health." (Darryl Randerson, 702 295 1231)