NOAA ARL Monthly Activity Report

March 1999

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Highlights

1. Around-the-world Balloon Flight. At last, success! ARL scientists were somewhat peeved that the first successful balloon circumnavigation of the globe did not have pre-arranged ARL trajectory support. However, it now appears that the success was partly due to the team's reliance on our products, anyway. The balloon trajectory was forecast using the READY system, relying on the AVN forecast products. A letter just received from the team emphasizes that "the READY service is very much needed and thanks to the US open web policy we are more and more relying on US forecast products." These are very welcome sentiments to receive from Europe. (bruce.hicks@noaa.gov)

2. Medal and Award Recipients. NOAA/ASMD scientists figured prominently among the recent recipients of EPA awards. Congratulations to each of the people involved.

EPA Gold Medal Award: Norm Possiel -- For outstanding dedication, initiative, innovation, and significant contributions for conducting numerical grid model applications to evaluate the effects on ozone concentrations of reducing nitrogen oxides emissions through the NO_x SIP Call Rulemaking.

EPA Silver Medal Awards: Daewon Byun, Joan Novak, and Jeff Young -- For outstanding team research achievement in the development and evaluation of the Models-3 Computational Framework and the Community Multi-Scale Air Quality Modeling System.

EPA Bronze Medal Awards: Bill Benjey, Frank Binkowski, Jason Ching, Robin Dennis, Brian Eder, Jim Godowitch, Steve Howard, Sharon LeDuc, Tanya Otte, Tom Pierce, Jon Pleim, Shawn Roselle, Ken Schere, Alfrieda Torian, and Gary Walter -- For outstanding team research achievement in the development and evaluation of the Models-3 Computational Framework and the Community Multi-Scale Air Quality Modeling System.

EPA James W. Akerman Award: Steve Perry -- For exemplary collaboration with the pesticide industry's Spray Drift Task Force to provide cost-effective methods for evaluating risk to spray drift pesticides.

EPA Scientific Achievement Award: Robin Dennis -- For superior scientific accomplishment in modeling air and water nutrient loads to the Chesapeake Bay for the Chesapeake Bay Program Office 1997 Re-evaluation.

General

The topics that are presented are sorted according to their contribution to the NOAA Strategic Plan, as follows . . .

Sustain Health Coasts: 8
Short-term Forecasting and Warnings: 1, 9, 10, 18, 19, 20, 21, 22, 28, 29, 30, 31, 32, 33, 34
Seasonal to Interannual: 11
Decadal to Centennial: 4, 5, 6, 7, 12, 14, 15, 16, 17, 23, 24, 25, 26, 35, 36
Crosscutting: 2, 3, 13, 27, 37

3. National Geographic Society (NGS) Acid Rain Kids Network. For many years, ARL has worked with the National Geographic Society in their Acid Rain Kids Network, a program to help educate schoolchildren about environmental science. The last two modules of the 1999 NGS Acid Rain Kids Network were conducted during February and March. Approximately 15 schools participated in each module, primarily from the northeastern United States, but also from Europe and other regions of North America. NGS is in the process of restructuring the Kids Network program; it is anticipated that a number of the modules — including acid rain and weather units — will be adapted for use directly from the NGS web site. It is not known if unit scientists will remain as a part of the new program (richard.artz@noaa.gov)

Silver Spring

4. AIRMoN. In conjunction with the Canaan Valley Institute in West Virginia, a new site will be added near Davis, West Virginia. Efforts are currently underway to find a suitable location for both wet and dry deposition sampling, and to find a station operator. The primary focus of the initial effort will be to track the nutrient problem in the Highlands region.

Data analysis has begun for the information collected during the preservative field test conducted at the Oak Ridge AIRMoN station. The laboratory analysis is now complete. The next task will be to create a joint data set composed of many small samples collected during a period of extended drought. A first look says that U.S. and Australian observers take different approaches to pooling samples for analysis. Comparisons between the larger events should be much more straightforward. (richard.artz@noaa.gov)

5. Progress with the Precipitation Chemistry Quality Assurance Program. A further step has been taken in integrating the Japanese-led East Asia Network (EANet) with the Global Atmosphere Watch. The U.S. Geological Survey operates a five laboratory precipitation chemistry interlaboratory comparison. Currently, the Illinois State Water Survey, the Atmospheric Environment Service, and the Ontario Ministry of the Environment participate in the program. Following consultation with USGS and the ARL-funded quality assurance program operated out of the State University of New York at Albany, it was suggested that laboratories in Europe and Asia be contacted for possible inclusion in the program. To date, we have been successful in adding the East Asia Network coordinating laboratory at the Japan Environmental Sanitation Center to the program. A European addition is still pending. (richard.artz@noaa.gov)

6. NAS Panel on Reconciling Temperature Observations. The National Academy of Sciences (NAS) has convened a Panel on Reconciling Temperature Observations under the Board on Atmospheric Sciences and Climate. The panel will deal with the apparent discrepancies in global air temperature trends among various datasets, including surface observations, radiosondes, and satellites (Microwave Sounding Unit). Dian Gaffen is serving on this 10-member panel, which met March 9-10 at the National Climatic Data Center in Asheville, NC. A report is expected by Fall 1999. (dian.gaffen@noaa.gov)

7. SPARC Water Vapor Assessment. The SPARC (Stratospheric Processes and their Role in Climate) community is preparing an assessment of water vapor observations in the upper-troposphere and lower stratosphere. The assessment is motivated by the importance of water vapor in this region to the greenhouse effect, the role of water vapor in stratospheric chemistry (as a precursor of odd-hydrogen), and the utility of water vapor as a tracer of stratospheric dynamics and stratosphere-troposphere exchange. Recent research has shown a possible multi-year to decadal increase in water vapor in this region, and in the mesosphere, but discrepancies among measurements make interpretation of these results problematic. Dian Gaffen is preparing material on radiosonde humidity observations and on lower-tropospheric water vapor changes. (dian.gaffen@noaa.gov)

8. RAMS Forecasts to Drive Chesapeake Bay Wave and Oceanographic Models. A non-hydrostatic 4 km forecast model is now running on the NOS SGI 8 processor Origin 2000 for the NOPP-Coastal Marine Demonstration Project. The parallelized RAMS codes were implemented and configured to correctly run on the multi-processor. As currently configured, turnaround for a 4 km full cloud microphysics Chesapeake Bay forecast nested within a 16 km east US grid is 3 hours for a 30 hr forecast. The forecasts produced are sufficiently detailed to show local circulations with considerable clarity. Evaluation of the forecast products is about to commence. The configured run domain and a sample forecast is shown.

Evaluations will use data from NWS and local NOS bay mesonets. (jeff.mcqueen@noaa.gov and Coastal Marine Demonstration Project bay team)

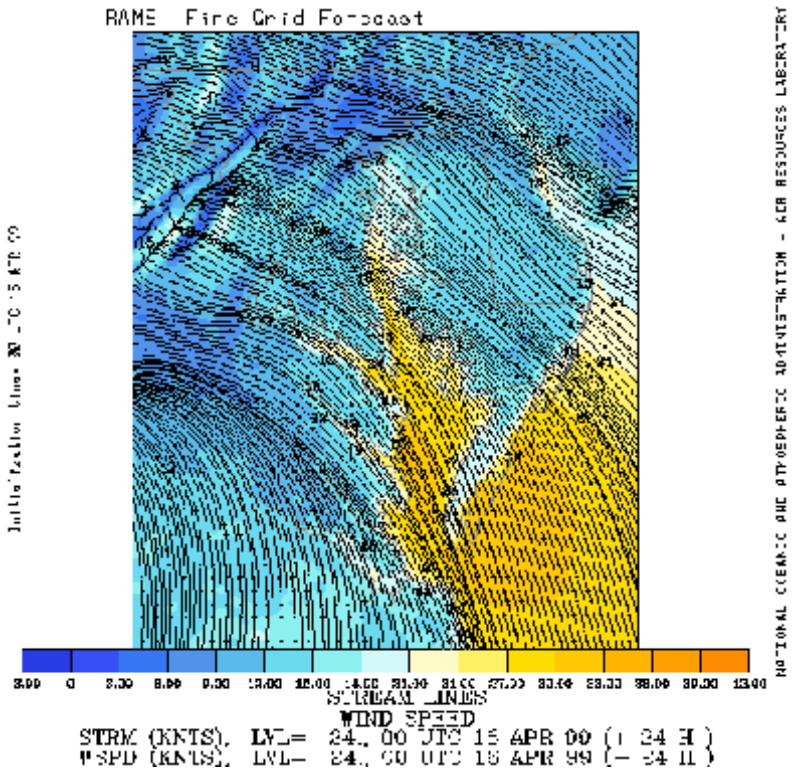

Figure: 4 km (82x102x28) ARL-RAMS forecasts of wind speeds (kts) and streamlines. Note pronounced windspeeds along the Bay and rivers; these are not as evident in the models with coarser grids. The convergence in western VA and MD is forced by a frontal system moving in from the northwest.

In a parallel activity, the Stolenga-Warner visibility parameterization for clouds, water vapor, rain, snow and ice crystals was added to the ARL-RAMS for use by the Bay community during the Coastal Marine Demonstration Project. Visibility along with precipitation rate, cloud water mixing ratio, and net short and long wave fluxes were added to the RAMS output products and are available at http://www.arl.noaa.gov/ready/cbramsanim.html. (jeff.mcqueen@noaa.gov, tom.gross@noaa.gov, glenn.rolph@noaa.gov)

9. Real-time Dispersion Predictions Available on READY for U.S. and Canadian Nuclear Power Plants. Work continues to produce a highly detailed dispersion forecast for every operating commercial nuclear power plant in the U.S. and Canada four times each day. HYSPLIT uses the Rapid Update Cycle (RUC-2) METEOROLOGICAL data to produce a 6 hour forecast with output available on the READY web server of 1-hour averages. ARL will use these products to brief NRC in the event of a nuclear accident at one of it's regulated facilities. Dose estimates are currently being produced and additional radioactive species are now being incorporated. The products are password protected on READY. (glenn.rolph@noaa.gov and roland.draxler@noaa.gov)

10. Volcanic Ash Update. The VAFTAD model is now fully transferred to the NWS. After having run VAFTAD operationally on an ARL computer for about the past 7 years, VAFTAD operational runs now are done by NCEP using the NCEP Crays. In parallel with this implementation, changes were made to the ARL volcano web pages. Specifically, VAFTAD graphics issued by NOAA, in support of Washington and Anchorage VAAC (Volcanic Ash Advisory Center) duties, are on a separate web page from the set of daily VAFTAD runs for hypothetical volcanic eruptions. The hypothetical eruptions page has output from both standard and "reduced ash" runs easily available in tabular format. The "reduced ash" runs have shown good results for recent small eruptions. Differences between the standard and reduced ash runs reflect some uncertainty in the amount of ash in the eruption column. See http://www.arl.noaa.gov/vaftad.html. (barbara.stunder@noaa.gov)

Boulder

11. SURFRAD. There has been considerable attention recently to the problem of maintaining the calibration of UV sensors deployed in SURFRAD and ISIS. The UVB standards are routinely calibrated by SRRB's Central UV Calibration Facility using simultaneous UV spectroradiometer data recorded at Table Mountain. Prior to this, the factory-supplied calibration valid for a solar zenith angle of 40 degrees was applied to SURFRAD field data, regardless of the solar zenith angle that the measurement represents. The new method upgrades the calibrations using data from side-by-side comparisons that are carried out at Table Mountain before the field instruments are deployed. Although this method has been developed and tested, it has not yet been implemented in the real time processing. When it is implemented, the entire SURFRAD record will be reprocessed to update all of the UVB data. (John Augustine, 303 497 6415)

SRRB has begun the installation of production Yankee Environmental Systems Total Sky Imagers (TSI's) at the SURFRAD sites. TSI's are currently installed and operating at the Rock Springs facility in Pennsylvania and at the Table Mountain facility near Boulder. A TSI installation is planned for late April or early May for the Desert Rock site north of Las Vegas. The goal is to install TSI's at the other sites this year when the annual SURFRAD instrument swap-outs are performed. In the upcoming months, hourly images from the installed instruments will be available via SRRB's web site http://www.srrb.noaa.gov. (Gary Hodges, 303 497 6460)

12. Collaboration with the DOE/ARM Program. SRRB has had a long history of close interaction with the DOE/ARM program. In general, the studies are progressing well. Future emphasis of the ARM program will be on

1. H2O column, lower and upper troposphere profiles, condensed phases.
2. Cloud microphysics for stratus, single layer cirrus, other cirrus and mixed phases.
3. SCM boundary layer fluxes.
4. SCM lateral boundary fluxes.
5. More model and parameterization testing. (John DeLuisi, 303 497 6824)

13. The David Skaggs Research Center. SRRB moved from the University of Colorado, east campus, to the David Skaggs Research Center (DSRC) located on the NIST campus at 325 Broadway in Boulder. The actual move started on 15 March, four weeks into the overall ERL move plan. Thorough planning and excellent cooperation within SRRB allowed us to accomplish the task of moving labs and offices in one week...packing and unpacking not included. Computer downtime was a matter of hours. Though short on office space in the new building, we gained a small amount of laboratory space. In particular, SRRB has an interior lab/work area, with all utilities, associated with the roof-top research area shared with CMDL. The new building web page: http://boulder.noaa.gov/building.html. (Dennis Wellman, 303 497 6266)

Oak Ridge

14. Arctic Studies. Analysis of results from Arctic Transitions in the Land-Atmosphere System (ATLAS) study show strong correlations of carbon dioxide fluxes to ecosystem type (e.g., coastal tundra, Barrow and tussock tundra, Atqasuk) and environmental variables (e.g., Normalized Difference Vegetation Indices (NDVI), and temperatures). Specific results included near zero fluxes over frozen lakes and the Beaufort Sea, large variations in sensible and latent heat fluxes along the transects, strong sink activity in June followed by a lesser sink and near neutral exchange rates by late July, and coastal effects on temperatures and fluxes extending to approximately 22 km inland. (brooks, dumas@atdd.noaa.gov)

15. Turbulent Exchange near the Polar Front. Turbulent heat fluxes determined by eddy-correlation from measurements near the polar-front jet off Japan were computed and sent to the Air Force Research Laboratory. These and other *in-situ* measurements, made during a cooperative experiment with Airborne Research Australia, using their unusual high-altitude, low-speed Grob Egrett reconnaissance airplane, will support exploration of the dynamics of turbulent temperature (hence index of refraction) fluctuations in the free atmosphere. Such fluctuations influence propagation of electromagnetic waves, including light and radar, needed for remote sensing and other purposes. (dobosy@atdd.noaa.gov)

16. Multi-User Environmental Research Aircraft. On March 4, 1999, San Diego State University took delivery of a new FAA-certified Sky Arrow Environmental Research Aircraft (ERA) produced by Iniziative Industriali Italiane. The aircraft was specifically developed and produced to carry the NOAA/ATDD-designed Mobile Flux Platform and remote sensing instruments. A major task of this NSF-funded aircraft program was to produce an affordable, all-climate, transportable aircraft, fully certified by the U.S. Federal Aviation Administration and available to the scientific community. The SDSU aircraft carries the ATDD Mobile Flux Platform and remote sensing instrumentation including the ADAR 5500 multispectral imaging system. The aircraft will begin measurement operations in the Barrow region in May 1999 for the San Diego State University/ATDD Arctic Transitions in the Land Atmosphere System (ATLAS) study. (brooks, dumas@atdd.noaa.gov)

17. CO_2 Air-Surface Exchange Monitoring. Data processing for fluxes of carbon, water, and energy with supporting meteorological data from 1995, 1996, and 1997 is being finalized. Data have been put on the ftp site: ftp.atdd.noaa.gov in directory pub/fluxnet with filenames: wbw1995.dat, wbw1996.dat, wbw1997.dat. These data should be accessible to AmeriFlux, FLUXNET and GEWEX colleagues. (baldocchi@atdd.noaa.gov)

18. CASES-99. In preparation for the ARL participation in the 1999 Cooperative Air Surface Exchange Study (CASES), a general purpose Fortran 90 code for the analysis of aircraft turbulence data, has been converted to run on 32-bit PC's. The code will allow more direct comparison of results from different aircraft. The conversion was made in cooperation with the University of Colorado. (mcmillen@atdd.noaa.gov)

In addition, a Setra Systems Model 264 Low pressure Transducer was purchased. This differential pressure transducer has a range of ± 250 Fbars and a sensitivity of 0.1 Fbars / mV. Initial testing and evaluation has begun. (nappo@atdd.noaa.gov)

19. Dynamical/Photochemical Modeling. The LESchem model source code, which deals with the trace gas surface emissions and deposition, was repaired to properly account for the vertical grid resolution when converting from trace gas number density flux to number density tendency. Plus, in order to better conserve trace species mass, several modifications were made to the LESchem code so that the trace gas concentrations would have units of number density when in the chemical reaction solver (SMVGEAR II), and units of volume mixing ratio when being advected and diffused in the meteorological (RAMS) portion of LESchem. A 2-hour midday simulation using this latest version of LESchem was then completed, and postprocessing of the model results revealed much more realistic trace gas mixing ratios and distributions than was seen in the previous simulations. (herwehe@atdd.noaa.gov)

20. East Tennessee Ozone Study (ETOS). Planning continues for the summer of 1999 and 2000 ozone study to be conducted in the East Tennessee Valley. The science working group met in March to review meteorological and air quality monitoring sites for this summer's scoping study. Current participants in the study include NOAA/ATDD, NWS (Morristown, TN), The University of Tennessee, Knox County Air Pollution Control, Chattanooga-Hamilton County Air Pollution Control, and the National Park Service (NPS). Representatives from the States of Tennessee and North Carolina Air Pollution Control departments attended the March meeting.

The ETOS working group identified four additional meteorological sites along the Cumberland Plateau which should provide a western inflow boundary. The working group also recommended three additional sites for ozone measurements (two Cumberland Plateau sites and Buffalo Mountain). One goal of ETOS is to explore the spatial variability of local ozone measurements; there are distinct differences between valley bottom and ridge top sites (elevation differences of 100 m). With ozone samplers provided by The University of Tennessee, a matrix of sampler locations with roughly 8-10 kilometers spacing was identified on the Oak Ridge Reservation. These samplers will be operated July and August to provide a measure of within grid and grid-to-grid variability. For ETOS 2000, a larger network of samplers will be deployed upwind and downwind of the City of Knoxville. The current deployment schedule has both additional meteorological and ozone monitoring to be installed during the last week of April and first week of May. The next working group meeting will be held May 27 with the proposed primary discussion topic concerning data use by the NPS and regional air pollution control boards. (pendergrass@atdd.noaa.gov)

A preliminary flight plan for aircraft studies was presented at the March 11th ETOS meeting. The aircraft program has two objectives: to characterize the vertical extent of the boundary layer during ozone events; and to characterize spatial distribution of ozone concentration between fixed sites on ridges and valley floor. Flights will originate on the Cumberland Plateau, about 250 m above the floor of the Tennessee Valley. Ozone concentrations will be measured in horizontal traverses across the valley and in vertical spirals at strategically chosen points. The pattern will be repeated morning, afternoon, and evening. The necessary measurement equipment is expected to be available by August, in time for the second intensive campaign. (gunter@atdd.noaa.gov)

21. Urban Dispersion Studies. Additional urban turbulence measurements were made at the Nashville/Lebanon and Knoxville/University of Tennessee Agriculture Campus sites on 16-17 March, 1999. Wind speed and wind direction measurements were also retrieved from three locations surrounding Nashville (Bowling Green, KY; Jackson, TN, and Decatur, AL). These data will support analysis of the rural vs. urban speed/direction discrepancies. The measurement phase of this portion of the project is now complete with a final report anticipated to be completed by May. (gunter@atdd.noaa.gov)

The Roadway program has been modified to (1) correct a number or errors, (2) provide for explicit calculation and printing of wake and atmospheric velocities and TKE components, and (3) incorporate a logarithmic grid (similar to that used in Roadway-2). Reasonable results were then obtained. Results from the two models are being compared. (rao@atdd.noaa.gov)

22. U. S. Air Force Rocket Exhaust Dispersion Study. Final statistical evaluations of the turbulence algorithm contained within the REEDM model were completed in March. These evaluations were based on Long-EZ aircraft data collected during the MVP sessions at Cape Canaveral. As discussed in last month's Activity Report, one of the evaluations involved testing the benefits of using on-site turbulence measurements rather than REEDM's current algorithm based on Turner stability classes. Near the coast, the measurements performed significantly better than the REEDM algorithm. Further inland, the measurements were still better in estimating the horizontal turbulence fluctuations, but actually did somewhat worse for the vertical fluctuations. One possible explanation for this is that the variation of the vertical fluctuations with height in a convective boundary layer tends to be more complex than that of the horizontal fluctuations. Vertical extrapolations of the vertical fluctuations may, therefore, be more error prone. (eckman@atdd.noaa.gov)

Research Triangle Park

23. Science Algorithms of the EPA Models-3 Community Multiscale Air Quality. The Science Algorithms of the EPA Models-3 Community Multi-Scale Air Quality (CMAQ) Modeling System are now available and can be found on the web page http://www.asmdnerl.epa.gov/models3/index.html under "Documentation." This CMAQ Science Document contains the key science features and options that embody the CMAQ system, and address specific scientific and technical issues involved in the development and application of the Models-3/CMAQ system; collectively, it provides the scientific basis and point of reference for the state-of-science captured in the July 1998 initial release of the CMAQ.

Models-3, a flexible software framework and its Community Multi-Scale Air Quality (CMAQ) modeling system form a powerful third generation air quality modeling and assessment tool designed to support air quality modeling applications ranging from regulatory issues to science inquiries on atmospheric science processes. It took a six-year investment and commitment by more than 100 individuals from NOAA and EPA, and by interested scientists and model developers from the environmental and information

communities, to develop the current Models-3 framework and the CMAQ air quality modeling system. Consequently, the CMAQ system can now address tropospheric ozone, acid deposition, visibility, fine particulate, and other air pollutant issues in the context of a "one atmosphere" perspective where complex interactions between atmospheric pollutants and regional and urban scales are confronted.

A fundamental development concept is that the Models-3/CMAQ be an open system; thus, the full participation and involvement of the scientific and modeling communities in the growth and use of Models-3/CMAQ are highly encouraged. As described in the science document, the Models-3/CMAQ system has flexibility for incorporating scientific and modeling advances into CMAQ processors, for testing of alternative modeling techniques for science processes, and for extending its current capability to handle multimedia environmental issues. Additionally, the community of users should be vigilant in performing evaluations against improved databases and measurement technology to assess the realism of model performance and to measure the strengths and weaknesses of the current state-of-science as presented in the CMAQ modeling system. Thus, in anticipation of current and future efforts to improve the Models-3 modeling systems, we recognize the CMAQ science document as a living document that will require updating as the state-of-science progresses. (Daewon Byun, 919 541 0732, and Jason Ching, 919 541 4801)

24. Major Enhancement to CMAQ Model. A major enhancement to the Community Multiscale Air Quality (CMAQ) Chemistry-Transport Model (CTM) codes has been completed. The enhancement enables users to build and execute these codes on either workstations, high-end vector, or parallel supercomputers without modifying the codes. This means that only one set of codes needs to be maintained, reducing the potential for errors and inconsistencies when science upgrades are coded and introduced into the system. These so-called "single source" codes currently can be built and executed only on distributed memory parallel architectures using message passing as the means of inter-processor communication. Future development will focus on extending the capability to shared memory parallel architectures, as well as workstation clusters. (Jeff Young, 919 541 3929)

25. Dry Deposition Research Changing Focus. Now that the very successful five-year field program in deposition velocity measurement has come to a close, the focus of our efforts has shifted from measurement to modeling and analysis. Three scientists have joined our staff to help with this activity. They are Dr. Bart Brashers, a NOAA/NRC Post-Doctoral Fellow and boundary layer meteorologist, who is concentrating on improvement of the aerodynamic aspects of deposition velocity models; Dr. Yihua Wu, a UCAR Post-Doctoral Fellow, an agricultural meteorologist and modeler, who will be concentrating on putting photosynthetic models into deposition velocity models; and Dr. Montserrat Fuentes, a member of the faculty of the Statistics Department of North Carolina State University and a visiting scientist under a UCAR fellowship, who will be using Models-3/CMAQ output to help understand the spatial structure of Castnet and Airmon data. Dr. Fuentes will be bringing one or ore graduate students into the research program as well, and it is hoped that the effort will lead to several Ph.D theses. (Peter Finkelstein, 919 541 4553)

26. Cooperative Work with the University of Paris. On March 15, Ms. Fanny Minvielle arrived at the Fluid Modeling Facility (FMF) for a two-month visit. Ms. Minvielle, a student at the University of Paris XII, is using the large FMF wind tunnel to conduct research on resuspended dust from desert environments. Specifically, she is testing the effect of sparse vegetation on aerodynamic properties of the desert surface. Since the effect of porosity is poorly known along with the effects of solid roughness in sparse density, she will test six roughness patterns and measure aerodynamic roughness length. The research is part of a joint Centre National Recherche Scientifique (CNRS) and National Science

Foundation (NSF) research grant. The research is of direct interest and will be used for resuspension work and desertification studies being conducted at FMF. Researchers involved with Ms. Minvielle are Dale Gillette, Robert Lawson, and Roger Thompson. (Dale Gillette, 919 541 1883)

27. U.S./Russia Working Group Meeting. During March, ASMD was visited for one week by Prof. Zhenya Genikhovich and Dr. Elena Rusina from the Voeikov Main Geophysical Observatory in St. Petersburg, Russia. This meeting was the annual U.S./Russia Working Group 02.01-10 Meeting on Air Pollution Modeling, Instrumentation, and Measurement Methodology. (Frank Schiermeier, 919 541 4542)

Idaho Falls

28. SHOWEX 99 Spring. The Shoaling Waves Experiment (SHOWEX 99 Spring) was successfully conducted during a three-week period in March at the Field Research Facility (http://frf.usace.army.mil) located in Duck, North Carolina. The collaborative effort included Tim Crawford and Jerry Crescenti (FRD), Ed Dumas (ATDD), Jielun Sun (NCAR), Larry Marht and Dean Vickers (Oregon State University), and Doug Vandemark (NASA). The SHOWEX scientific research team also collaborated with scientists and engineers participating in an overlapping experiment (EOPACE) that was studying aerosols generated by plumes associated with breaking waves in the surf zone.

Existing models for surface wind stress in the shoaling zone fail because of their inability to properly account for wave age, shoaling, and internal boundary layer development. The fetch-dependent wave field in this region can not be adequately studied with information on the spatial variation of the mean wind and surface stress fields. This can only be accomplished with a low-flying research aircraft equipped with turbulence monitoring sensors.

The primary objective of SHOWEX (http://mist.oce.orst.edu/shoaling/shoaling.html) was to measure the spatial variation of the mean wind, surface stress, and spectral wave fields in the shoaling zone. A second objective was to study the relationship between the spatially varying mean wind, surface stress, and wave fields to model the effects of wave age, shoaling, and internal boundary layer development on the drag coefficient and momentum transfer between waves and the atmosphere.

The NOAA LongEZ airplane was successfully used to acquire these data needed to meet the SHOWEX objectives (see Figure). A total of 23 missions (75 flight hours) were flown under various atmospheric and wave field conditions. LongEZ flight legs included parallel and perpendicular runs at various altitudes with respect to the coastline as well as numerous slant and spiral soundings. The LongEZ also acquired meteorological information on the boundary layer structures over Albermarle and Currituck Sounds. Several flights were flown over Lake Mattamuskeet in an attempt to further understand internal boundary layer development. (jerry.crescenti@noaa.gov and tim.crawford@noaa.gov)

29. Big Bend Regional Aerosol and Visibility Observational Study (BRAVO). A tour was conducted of prospective tracer release sites, to be used during the BRAVO study, July to October 1999. Participants in the tour were representatives of the Air Quality Division, National Park Service; Region 6 EPA, and three representatives from PROFEPA, the Mexican EPA. The tour group started in the Dallas-Fort Worth area and visited the Montecello and Big Brown power plants and the Big Brown Coal mine. All these facilities are operated by Texas Utilities. In Houston, the Parrish power plant operated by Houston Lighting and Power Co. was visited and San Antonio has the San Miguel power plant operated by the Texas Rural Electrification Cooperative. Also, a stop was made in Austin to visit the Texas Natural Resources Conservation Commission (TNRCC). In San Antonio the tour was joined by two representatives of Desert Research Institute and one representative of the NOAA Environmental Technology Laboratory (ETL). From San Antonio, the group went to Piedras Negras, Coahuilla, Mexico, which is just across the border from Eagle Pass, Texas. They visited the Carbon II power plant operated by the Commission Federal de Electrad (CFE), a department of the government of Mexico, and the associated coal mine operated by Altos Hornos de Mexico Sociedad Anonima (AHMSA) a private corporation. From Piedras Negras, they proceeded to Monclova, Coahuilla touring the steel mill also operated by AHMSA. In Monterey they visited an oil fired power plant and looked for sites to locate a RASS system. The tour group then flew to Tampico for the day to visit another oil fired power plant. All together they visited seven power plants, two coal mines, and a steel mill. (tom.watson@noaa.gov and randy.johnson@noaa.gov)

30. FRD Support of Non-proliferation and Anti-terrorism Projects. Preparations for the AFTAC project field deployment are well underway. The project, which has been scheduled to begin on April 12 may have to be postponed until the weather improves. Recent rain and snow have slowed the normal snow melt and made many dirt roads impassable. These roads are needed for placement of the new samplers AFTAC is testing and for real-time tracking of the SF_6 plume by FRD's mobile analyzers. The tracers will be released from the FRD Grid-3 Tracer Stack. FRD's modeling capability will also be utilized and tested. The experiment will aid the USAF in their efforts to support non-proliferation of chemical agents and to reduce terrorism threats on U.S. soil. (kirk.clawson@noaa.gov)

31. Lawrence Livermore National Laboratory Building Wake Study. FRD will be collaborating with Lawrence Livermore National Laboratory (LLNL) to conduct a building wake study in June. Plans call for SF_6 to be released from a 100-ft line source upwind from two buildings on the LLNL campus. Five of FRD's mobile analyzers will be used to measure SF_6 concentrations. Four vans will be mobile, while the fifth will be stationary and will sample SF_6 from multiple heights in the building wake. LLNL will simultaneously be evaluating SF_6 plume IR imaging cameras in the near wake of the buildings. (kirk.clawson@noaa.gov)

32. INEEL MEteorological Monitoring Network (mesonet): A review of the systems collecting and distributing data from the INEEL mesonet has been completed. A number of minor problems were discovered and corrected. INELViz, the software used to display the Mesonet data at workstations around the INEEL, was also reviewed and a number of Y2K problems corrected.

A remote controlled camera has been installed at the INEEL for direct observation of site conditions by forecasters in the FRD office in Idaho Falls. The camera uses a dedicated telephone line to transfer the video image to the FRD office. The pan/tilt mount and the zoom lens may be operated from the FRD office. The camera gives the forecasters current information on sky/cloud conditions, precipitation, and snow cover. It is proving to be a valuable asset. (roger.carter@noaa.gov)

On February 9, data collection from the INEEL MEteorological network suddenly and unexpectedly completely ceased. The problem was traced to a failed repeater on top of Jumpoff Peak, a 9,000 ft snow-covered mountain about 60 miles west of Idaho Falls. Ice accretion proved to be the culprit. The heavy weight of the ice destroyed the antenna and cable. On February 12, an attempt to reach the repeater site with a snow cat failed when the snow cat was unable to climb the snow drifts. On February 18, FRD personnel were able to reach the repeater using snowmobiles. A temporary antenna was installed. On February 24, an attempt to install a new, 20 foot long, high gain antenna failed. Finally, on March 2, the installation was successfully completed. Although nearly a month passed before the antenna could be installed, nearly all data from the 30+ station mesonet were collected with either an alternate radio polling method or by hand. (kirk.clawson@noaa.gov; roger carter@noaa.gov;randy.johnson@noaa.gov)

33. Emergency Operations Center (EOC) Support. On March 16 an exercise was conducted at the INEEL Emergency Operations Center. This was in preparation for moving Three Mile Island radioactive waste from the north end of the INEEL to INTEC for processing. The purpose of the exercise was to demonstrate that the EOC is fully prepared to handle emergencies should they occur. NRC personnel attended the exercise as observers. (jerry.sagendorf@noaa.gov and kirk.clawson@noaa.gov)

Las Vegas

34. Activities at the Hazardous Materials (HAZMAT) Spills Center (HSC). SORD provided meteorological support of the ORCA project conducted at the HSC during March 1-5, 1999. The purpose of this project was to collect quantitative spectro-graphic and radiometric data of stack emissions from individual and mixtures of chemicals. Emissions were monitored from a WB-57 aircraft flying at altitudes up to 60,000 feet, and from other aircraft flying at 2,000 to 10,000 feet. (Jim Sanders, 702 295 2348, and Duty Forecasters)

35. SUNRISE 99 Exercise. SORD personnel are supporting the DOE SUNRISE 99 Exercise that will be held during June 1999. SORD personnel have produced the meteorological data that will be used for the exercise. Additionally, SORD personnel have helped design the accident scenario and modeled the hypothetical chemical hazard associated with the exercise. (Doug Soule', 702 295 1266, and Jim Sanders, 702 295 2348)

36. Project MOHAVE. On March 16 the final report for Project MOHAVE was transmitted to the sponsoring organizations (Environmental Protection Agency, National Park Service, Southern California Edison Company & Electric Power Research Institute), marking the successful completion of a multi-million dollar, 7-year visibility impact assessment program. NOAA/ARL staff were responsible for the overall design, management, and reporting for this congressionally-mandated study of the visibility impacts of the Mohave Power Plant in Grand Canyon National Park. The study employed air quality and MEteorological measurements made at over 30 locations in four states (CA, NV, AZ, and UT), as well as artificial tracer released from the power plant and several other locations in the region during 1992. The report is available (www.epa.gov/region09/air/mohave.html) on the EPA web site. (Marc Pitchford, 702 895 0432)

37. SORD Web News. Rainfall data has been added to the SORD WWW site. The data include both daily and monthly summaries of rainfall for 16 climate rain gauge sites on the NTS. These data are available for years as far back as 1957 and is current as of March 1999. Monthly rainfall data is available

in Quattro Pro, MS Excel and ASCII text. To access the data go to the SORD web site (http://www.sord.nv.doe.gov) and click on the "Climate" hyper-link. A map with the locations of the rain gauges is displayed. (Jim Sanders, 702 295 2348)

SORD has installed text-to-speech software on the external web site to provide voice output of weather forecasts and warnings to DOE and NTS users. This software provides the capability to "browse" a web site via a telephone. With this capability we can provide weather forecasts and warnings for the

NTS, as well as forecasts for the Las Vegas Valley and recreational areas via the telephone. (Jim Sanders, 702 295 2348)