



NOAA ARL Monthly Activity Report



June 1999

Bruce B. Hicks, Director
Air Resources Laboratory

Highlights

1. *ETOS Update.* The East Tennessee Ozone Study is capturing a lot of attention. As at the time of this writing, Cove Mountain (in the Great Smokies) has just reported its highest ever hourly ozone level -- 127 ppb. The Twin Otter (carrying a full complement of ozone and nitrogen-species chemical equipment plus eddy-flux gear) is stationed in Tennessee, ready for some exploratory flights. The ATDD surface network currently includes 22 meteorological and 13 ozone observing stations. (pendergrass@atdd.noaa.gov)

2. *High-definition Forecasting for the Mid-Atlantic.* ARL is presently posting 4-km resolution forecasts for the Chesapeake Bay region on its web site, and is making the products available to NWS offices in the region. In cooperation with an NOS study of the Chesapeake Bay, a tweaked-up ARL version of RAMS is driven by Eta model outputs. A 30-hr forecast takes three hours to prepare. The following comment from one of the local weather offices was unsolicited, and is in thorough agreement with our own view: "***The use of the RAMS mesoscale model data is probably the most significant new guidance product I've seen since I've been here.***" (See item 8 below)

3. *Start of the Big Bend Regional Aerosol and Visibility Observational (BRAVO) Study.* The Big Bend Regional Aerosol and Visibility study (BRAVO) is a field program designed to determine the sources of haze episodes which reduce visibility at Big Bend National Park (BBNP), Texas. The cause of these episodes is sulfate aerosol formed from gaseous sulfur emissions resulting from the combustion of coal. The worst periods of visibility degradation occur from July to the end of October. Monitoring will begin for the BRAVO Study on July 1, 1999. ARL/SORD provides technical management for BRAVO, and ARL/FRD is contributing tracer expertise. Throughout June air quality, meteorological (NOAA-ETL) and tracer monitoring equipment was deployed at numerous locations in Texas where they will be operated for four months. Perfluorocarbon tracer material will be released from several locations including Eagle Pass, TX, to study flow from the nearby Carbon I and II power plant in Mexico, the Big Brown power plant, a power plant in the Houston area and from a tower in San Antonio. BRAVO participants include: U. S. Environmental Protection Agency, Region 6; U. S. National Park Service; U.S. Department of Energy, Brookhaven National Laboratory; Texas Natural Resources Conservation Commission; University of California, Davis; Desert Research Institute, University of Nevada.

Three automated systems to release perfluorocarbon tracers have been installed at a site in Eagle Pass, Texas. One system will release tracer continuously. The other two systems will release tracer for twelve hours, from 20:00 to 8:00 on alternate days. This staggered tracer release will provide a time stamp so tracer released during nighttime periods can be distinguished at the receptor sites. Tracer release will begin on July 5. A fourth system will be installed at the Big Brown power plant in early July. Data from the release

systems will be collected over phone lines. The results will be used to determine the sources of sulfate which cause the haze episodes at Big Bend. A description of the project is at <http://www.noaa.inel.gov/frd/Projects/bravo.html>. (Marc Pitchford, 702 895 0432 tom.watson, randy.johnson@noaa.gov and staff)

4. Update on Chapman Conference. Preparations for the upcoming ARL-organized AGU Chapman Conference on Water Vapor in the Climate System continue on schedule. Letters to the invited speakers were prepared and sent out and a design for a conference logo was contributed by one of the program committee members. Abstract deadline for the conference is July 12. (rebecca.ross@noaa.gov)

General

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

Sustain Health Coasts: 8, 19, 21, 30

Short-term Forecasting and Warnings: 1, 2, 8, 24, 26, 27, 29, 31, 32, 33, 35, 37

Seasonal to Interannual: 10, 18, 22

Decadal to Centennial: 3, 4, 5, 6, 7, 11, 12, 13, 14, 15, 16, 17, 20, 25, 38, 39

Crosscutting: 9, 23, 28, 34, 36

Silver Spring

5. The Transport and Deposition of Toxic Substances to the Great Lakes. A cooperative project to identify the likely origins of dioxin, atrazine, and cadmium deposited to the Great Lakes is nearing completion. GIS support is provided by the Ontario Ministry of Environment and Energy, the Ontario Ministry of Natural Resources (MNR), and the US EPA. Examples of some of the graphical products developed include an animated depiction of the time-course of atrazine emissions in the U.S. and Canada for 1991 and a poster summarizing the results obtained.

A new inventory of U.S. cadmium emissions (for 1996) has been obtained from the U.S. EPA. This inventory is being evaluated for possible use in this project. It is being compared with a 1990 and a 1993 inventory for the U.S. developed by the EPA. Substantial inconsistencies between the inventories have been discovered in this evaluation, leading to some uncertainty in the most appropriate inventory information to use. A literature review of fate and transport modeling issues relevant to cadmium is being prepared, and modeling of cadmium with HYSPLIT has begun. (mark.cohen@noaa.gov)

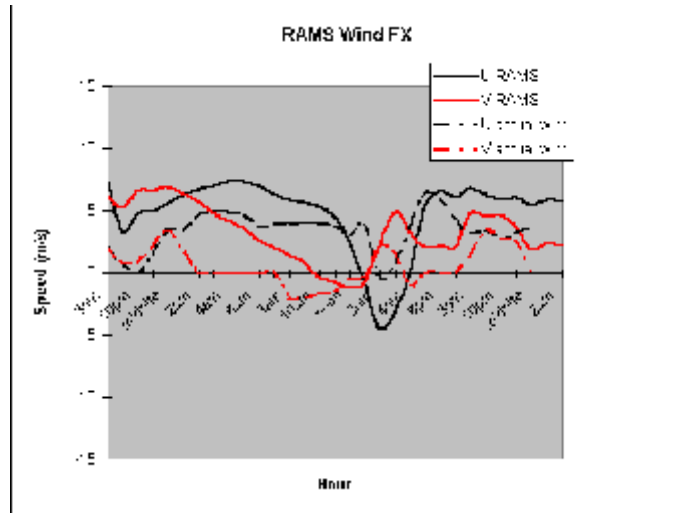
6. SPARC Water Vapor Assessment. The second phase of work has begun on the Water Vapor Assessment of the Stratospheric Processes and their Role in Climate (SPARC) programme. Co-authors met in Fairfax, VA, June 7-9, 1999. Chapter 1, which presents the suite of observing systems for measuring upper-tropospheric and stratospheric water vapor, is near completion. Chapter 2, comparing observations from different instruments, and Chapter 3, discussing the distribution and variability of water vapor, are now being prepared. Dian Gaffen has contributed a section on radiosondes to Chapter 1 and is now preparing a section on lower-tropospheric water vapor trends for Chapter 3. (dian.gaffen@noaa.gov)

7. Tropical Tropopause Study. A collaborative study of the tropical tropopause with Bill Randel and Fei Wu (NCAR/Atmospheric Chemistry Division) is underway. The new ARL radiosonde-based climatological dataset will be compared with the NCEP reanalysis tropopause product. Preliminary results show a systematic bias between the radiosonde and reanalysis depictions of the pressure and temperature of the tropopause, but reasonably good agreement with respect to seasonal and interannual variations, at least for the period 1979-97. (dian.gaffen@noaa.gov)

8. RAMS Forecasts Drive Chesapeake Bay Wave and Oceanographic Models. The ARL RAMS forecast system is now producing 4 km and 16 km resolution forecasts for the Chesapeake Bay region. The model is run at 00 and 12 UTC on an 8 processor SGI Origin 2000 workstation. The latest forecasts and more information can be found at: <http://www.arl.noaa.gov/ready/chbmdl.html>

These predictions represent an early and experimental attempt at non-hydrostatic atmospheric model forecasting of a coastal region. Further evaluation of this product is ongoing with a special emphasis to occur this summer during the NOPP Coastal Marine Demonstration Project. An example of a real-time evaluation from Dewey Beach, DE mesonet on June 9, 1999 is shown here -- RAMS accurately predicted the wind shift from synoptically driven westerly to a temporary on shore sea breeze during the afternoon hours. (jeff.mcqueen@noaa.gov, glenn.rolph@noaa.gov)

The 4 km forecasts are now ingested directly into the Wakefield, VA, Sterling VA and Mt. Holly, NJ NWS WFO forecast offices. The prediction are analyzed by N-Awips software at the WFO's for use in their coastal wind/wave forecasts. Preliminary comments have been very favorable, although they reveal a need to improve the balance between the synoptic and local scales. Some comments received highlight the surprise that many participants are having in a model's ability to forecast what were previously thought to be chaotic atmospheric phenomena. Some of the comments received are --



- , *The wind direction at 25 m is pretty much right on most of the time. This is a VERY important thing and has ramifications to our marine forecast.*
- , *Sea breezes and their associated convergence zones are well-depicted in the wind data.*
- , *The 4 and 16 km RAMS model runs from both 00Z and 12Z June 9th provided an excellent forecast for the lower Bay and Norfolk area. The model initially forecast a northerly wind surge behind a surface trough/weak front for the afternoon of June 9th across the southern Bay and Norfolk area lasting only for 4 to 6 hours. The model then forecast the winds to turn around to the south*

by 00Z. This is something rarely observed at Norfolk behind a northerly wind surge. However.....the model verified nicely.

, I'm impressed, RAMS caught the shift from HOT, mix-down west winds to a "temporary" sea-breeze during the mid-afternoon at Dewey Beach. Not as strong as RAMS predicted, but, none-the-less, it caught it.

The last comment is from a private-industry user of the ARL product. (jeff.mcqueen@noaa.gov)

9. READY Update. A new READY product is proving quite popular. Pre-computed forward and backward trajectories for the Southeast U.S. are updated twice-daily using the Eta forecast model output. Access to these maps and the corresponding Northeast U.S. maps is available from the graphical interface at http://www.arl.noaa.gov/ready/traj_pick.html. These products are used primarily for boundary-layer ozone forecasting by State and Local agencies. (barbara.stunder and glenn.rolph@noaa.gov)

Boulder

10. SURFRAD. Radiosonde soundings have been interpolated from the national network to the SURFRAD stations and to the ARM SGP Central Facility for 0000 and 1200 UTC for all of 1998. Interpolated soundings for January 1998 were sent to NASA Langley to be used for validation of the CERES instrument aboard the NASA EOS TRMM satellite.

On June 8, the Bondville SURFRAD station endured a close lightning strike. The data logger and several instruments were affected. Some instruments were damaged extensively, and the collection of supporting data has been interrupted. A complete overhaul of the station is scheduled for July. (John Augustine, 303 497 6415)

11. The Central UV Calibration Facility. There are two competing manufacturers of broad-band UV instruments used in US networks. The Central UV Calibration Facility has three of each that are used as standards for calibrating test instruments from the USDA, SURFRAD, and ISIS UVB monitoring networks. The official procedure for calibrating the triad of Solar Light (SL) instruments is to compare the triad output against a precision spectroradiometer collocated at the Table Mountain Test Facility (TMTF). Between calibrations there are several procedures for continually "gauging" the stability of the standards.

During June, the Solar Light standard radiometers were evaluated by (1) internal comparisons to see if any one has drifted relative to the others, and (2) comparisons against the second triad of instruments (Yankee Scientific -- YES). The results indicate that the three SL standards have not changed relative to each other and the standard SL triad has not changed significantly relative to the YES standard triad since 1997 (the SL triad calibrations changed by between 0% and 5% which is within the error for this kind of analysis). (Kathleen Lantz, 303 497 7280)

12. The Ultraviolet Region. The cooperative surface UV validation work with NASA TOMS scientists is producing some interesting results. Comparison of TOMS estimations of surface UV irradiance with data from Yankee UVB1 instruments located at some of the SURFRAD stations suggests that for conditions of no snow cover, TOMS might overestimate UV irradiance by 20 to 25% for all conditions (10 to 15% for

clear-sky). The presence of snow can cause UV differences on the order of 200 to 1000%, as seen at Ft. Peck. (John DeLuisi, 303 496 6824)

The same sort of ground-truthing is under way for GOES data. Preliminary conclusions are that the offset is less than 5%. In all such comparisons, interference from snow cover is clearly a factor to contend with. However, in the solar broadband region, the differences are not as profound as the UV. (David Theisen, 303 497 6260 and John DeLuisi 303 497-6824)

Oak Ridge

13. Carbon Cycle Studies. ATDD continues to monitor CO₂ fluxes at several sites. During June, forest floor eddy correlation data were presented to a science team meeting on the terrestrial carbon balance. In related work, a collaborative study with scientists at ORNL, focusing on methods for estimating long-term evapotranspiration at Walker Branch Watershed, was initiated. The methods include eddy covariance, watershed catchment balance, sap flow, and soil moisture budgets. (wilson@atdd.noaa.gov)

14. Canaan Valley. Establishment of an AIRMoN-wet and an AIRMoN-dry deposition site in Canaan Valley, WV is progressing. Sites have been identified within the Canaan Valley National Wildlife Refuge, and preliminary approval has been obtained from the U.S. Fish and Wildlife Service. The wet deposition site is intended for integration into the National Atmospheric Deposition Program (NADP). Supporting documents describing the site and its surroundings have been submitted to the NADP Office for approval under NADP site criteria. Meanwhile, two underground instrument/equipment shelters are being acquired to make the AIRMoN sites relatively unobtrusive. Instrumentation is also being gathered and readied for deployment as soon as the sites' infrastructure is in place. (vogel@atdd.noaa.gov)

15. Dynamical/Photochemical Modeling. A coupled dynamical/photochemical scenario was studied, to represent the case of a NO_x-rich urban boundary layer plume drifting over an adjacent forested area, and to examine the effect of segregating the primary trace gas sources while still having a horizontally homogeneous situation. The LES version of this scenario showed how quickly the initial NO was converted over to NO₂ and other odd nitrogen species early in the simulation, but then later scavenged out due to the lack of a source for new NO. But the availability of the urban NO helped increase the ozone concentration in the convective boundary layer from its initial 40 ppbv to around 55 ppbv after two hours. A comparison of the mesoscale, first-order closure version of this scenario with the LES version will be reported next month. (herwehe@atdd.noaa.gov)

16. Urban Dispersion. A model to address the dispersion of pollutants generated by traffic is being refined. It was decided to use data from a 1975 GM Experiment to evaluate and improve the model. (rao@atdd.noaa.gov)

17. Arctic Mercury. Episodic springtime depletions of mercury at Barrow, AK continued up to snowmelt (June 12-13). Then gaseous mercury concentrations shot up, averaging 2.3 ng-m⁻³ for the five days after snowmelt, compared to 1.4ng-m⁻³ for the five days before snow melt. Emissions from the melt water, the newly exposed vegetation, and organic surface layers are thought to produce the enhancement. Recent results from the mercury study in Barrow were presented at a recent AMAP workshop in Bergen, Norway. (brooks, meyers@atdd.noaa.gov)

18. Mobile Flux Platform (MFP). A new version of the MFP electronics package has been completed. Details about the new system are available in the HTML-based documentation of the Mobile Flux Platform web pages. Go to [www.noaa.inel.gov/frd/Capabilities/Bat/BAT\\$sensor\\$guide.htm](http://www.noaa.inel.gov/frd/Capabilities/Bat/BAT$sensor$guide.htm) for information about the new system. (atable@atdd.noaa.gov)

The MFP is a mainstay of the new experimental aircraft, the Sky Arrow. The data system for San Diego State University's Sky Arrow has been completed and sent to San Diego. E. J. Dumas finished instrument installation in San Diego and made a familiarization flight in the Sky Arrow with a Pacific Aerosystems flight instructor. (brooks, dumas@atdd.noaa.gov)

19. Shoaling Study. Simultaneous measurement of atmospheric turbulence and of certain ocean-surface characteristics has been made possible from a low-cost airplane by advances in precise high-frequency GPS navigation and laser ranging. The configuration developed and tested using the experimental Long-EZ airplane was presented at the Fourth International Airborne Remote Sensing Conference and Exhibition, held jointly with the 21st Canadian Symposium on Remote Sensing, in Ottawa, Canada, 21 - 24 June 1999. Such capability greatly benefits the investigation of the air-sea interface, a difficult dynamic boundary of global extent between two fluids. (dobosy@atdd.noaa.gov)

20. Southern Oxidants Study. In mid June, three flux tower systems were installed around the Nashville area to characterize the energy, carbon, and ozone fluxes for the three dominant land uses (grassland, forest, agriculture). A grassland site was located southeast of Nashville near Murphreesboro, TN. Near Dickson, TN, a tower was located near Montgomery Bell State Park to measure fluxes over a mixed forest. A large farm near Keysburg, Kentucky, just north of the Tennessee state line, is the location where a flux tower was placed in order to characterize the energy balance over typical agricultural land use. These towers will be operated continuously for approximately one month. (meyers, hall@atdd.noaa.gov)

21. Spatial Variability Study. Final preparations are being made for the Spatial Variability Study at the Outer Banks, NC. The study is designed to test theories about the Bowen ratio (of sensible to latent heat fluxes) over saturated surfaces, to quantify the effects of spatial variability on surface fluxes, and to explore exchange rates in the coastal region. The team will be leaving July 18 for Tampa to install the instruments on the NOAA Twin Otter. Forty hours of airborne measurements at Manteo, NC are planned. Completion of field work is expected by August 20. (gunter@atdd.noaa.gov)

22. SURFRAD and ISIS. The standard operations of the Integrated Solar Irradiance Study (ISIS) network continued. The regular processing of June ISIS Level 1 and Level 2 data is complete. Hourly flagged data have been transmitted to the National Climatic Data Center. Bondville, IL SURFRAD data through July 1, 1999 have been processed and will be included in GEWEX data files. Preparations are under way to replace solar trackers where the existing equipment is not Y2K compliant. (matt@atdd.noaa.gov)

Research Triangle Park

23. Volunteer Support to the International Special Olympics. Two Division meteorologists, Russ Bullock and Tom Pierce, were instrumental in organizing volunteer weather forecasting support for the 10th Special Olympics World Summer Games which were held in the Raleigh-Durham area from June 26 to July 4, 1999. Approximately 7,000 athletes from 150 countries participated in the Special Olympics, making it the largest

multi-sporting event to be held in the world during 1999. Of special concern to the Special Olympics officials were the dangers from lightning, heat stress, and ozone. Russ and Tom dusted off their forecasting skills, gave up their free time, and provided on-site support at the cycling, tennis, and marathon venues.

They helped to lead a 20-person volunteer team that included meteorologists from the National Weather Service and North Carolina State University. Sharon LeDuc also participated in the Games by working at the RDU airport welcome center for one day where she greeted athletes and their families and advised them on local transportation. Sharon spent a second day coordinating traffic on the North Carolina State University campus, again interacting with the athletes and their coaches and families. (Frank Schiermeier, 919 541 4542)

24. *Meteorological Program Guidance Update.* Updates to the June 1987 EPA document, "On-Site Meteorological Program Guidance for Regulatory Modeling Applications" (EPA-450/4-87-013) have been completed. The updated document (like its predecessor) provides guidance on the collection of meteorological data for use in regulatory modeling applications. It is intended to guide Regional Offices and States in reviewing meteorological monitoring plans for proposed new pollution sources, and as the basis for advice and direction given to applicants by the Regional Offices and States. To facilitate this process, recommendations applicable to regulatory modeling applications are summarized at the end of each section.

The most significant change is the replacement of Section 9 with more comprehensive guidance on remote sensing and conventional radiosonde technologies for use in upper-air meteorological monitoring; previously this section provided guidance on the use of sodar technology. Another significant change is the addition the section on quality assurance of material covering data validation for upper-air meteorological measurements. These changes incorporate guidance developed during the July 1999 workshop on upper-air meteorological monitoring. (Desmond Bailey, 919 541 5248)

25. *Revised Version of Models-3/CMAQ.* A revised version of the Models-3/CMAQ system was released on June 30, 1999. Models-3 consists of a sophisticated computational framework for environmental models allowing for much flexibility in the communication between component parts of the system, in updating or replacing components, and in the graphical-user interface. With the current release, the major components of the system consist of a meteorological model (MM5), an emissions model (MEPPS), and a chemical-transport model (CMAQ). The revised Models-3 framework (Version 3.0) is operational on SUN workstations (OS: Solaris 2.6), and also contains the IBM DX Explorer graphics/analysis software, as well as Vis-5D and PAVE visualization packages.

The Community Multiscale Air Quality (CMAQ) model is the principal component within the Models-3 system. The current release of CMAQ-Version 2 contains several user options in terms of choice of science components, including numerical advection schemes, chemical kinetic mechanisms, and chemical solution schemes. The Meteorology-Chemistry Interface Processor (MCIP) allows for the adaptation of several meteorological models to CMAQ. The current CMAQ model provides simulation capabilities for photochemical oxidants, particulate matter, and acid deposition. A specific configuration of the CMAQ (Air Management Version), using the Carbon Bond IV chemical mechanism, is currently being tested on a July 1995 episode in the northeast United States.

The Models-3/CMAQ system is available in two forms. Complete information can be found on the Models-3 web site: <http://www.epa.gov/asmdnerl/models3>. An installation tape may be ordered through the web site. In addition, a unix-script version providing access to the model components, but not the Models-3 framework, may be downloaded directly from the web site. The user manual, tutorial, and science documentation may also be downloaded from the web. (Ken Schere, 919 541 3795, Joan Novak, 919 541 4545)

A major upgrade to the aerosol component of Models-3/CMAQ has been completed. The new version includes prediction of the integral surface area for the Aitken and accumulation modes. This is in addition to the prediction of constituent mass and integral number in each mode. The new model now represents the size distribution in each mode as log-normal with variable geometric mean diameter and geometric standard deviation. This new model demonstrates high accuracy in test problems using a simplified box model. The new method is described in Chapter 10 of the Models-3/CMAQ science documentation. Upon completion of testing in the three-dimensional CMAQ domain, the new codes will be available on the ASMD web site. (Frank Binkowski, 919 541 2460)

26. *EMPACT in Contra Costa County, CA.* An Environmental Monitoring for Public Access and Community Tracking (EMPACT) project involves ASMD, EPA, and Contra Costa County, CA, in which the county is being assisted in setting up a mobile monitoring van with real-time air measurements and air concentration modeling as support to ongoing community monitoring of air toxics. This project is a pilot study of methods to enhance community air toxics monitoring, incident response, and response-planning capabilities of the county. The initiation of monitoring and modeling under this project will begin September 1999 near a major petrochemical refinery. Portable air toxics measurement instruments have been evaluated for installation in a mobile monitoring van. Emission inventories and source profiles are being set up to support real-time air dispersion modeling. Voice and data communications between the van and a home base station will be established to support potential application of modeling output not available from a laptop PC in the van. A Geographical Information System based on ArcView is being developed. The Army Research Laboratory's micrometeorological High Resolution Wind model at a 100 m resolution is being tested to support wind transport of air pollutants from nearby source locations downwind through neighborhoods whose air quality may be adversely impacted by such releases. (Alan Huber, 919 541 1338)

27. *Human Exposure Micro-environments.* The development of micro-environmental models is ongoing to support the development of total human exposure models. Total human exposure is being separated into multi-pollutants within a sequence of micro-environments (i.e. inside garage, inside automobile, outside near a roadway, inside an office) that humans sequentially experience each day. Applications using a Silicon Graphics Incorporated Onyx2 computer with Fluent Incorporated Computational Fluid Dynamics Software (CFD) are being developed in support. Modeling complex distributions of pollutant concentrations within each micro-environment is feasible using high performance computing whose output can be directly used to better understand exposure events and can lead to development of better simplified model approximations for general application. Specific projects such as modeling an urban building complex and the roadway micro-environment are ongoing. The studies include two vehicles moving in tandem along a roadway and a single vehicle moving in general roadway traffic.

Meteorological measurements within the lower atmospheric boundary layer are important to initializing numerical simulation models of pollutant transport near pollutant sources within human exposure micro-environments. Meteorological instrumentation to support measurements of wind and turbulence in the lower

boundary layer (up to 100 to 200 m) are being procured. The system will include a portable Doppler SODAR to provide a vertical profile of the wind velocity and turbulence from 15 meters up to 200 meters at 5-meter height resolution and 10-minute averaging intervals. The system will also include a portable 10-m tower instrumented for wind measurements at 2, 5, and 10 meters and temperature at 2 and 10 meters. Operation of these instruments is expected to begin late in calendar year 1999. (Alan Huber, 919 541 1338)

28. Russian Anniversary Conferences. Frank Schiermeier represented scientists at the Laboratory level from both NOAA and the EPA in responding to invitations to participate in the jubilee, symposium, and international conference that were held during June in St. Petersburg, Russia, in commemoration of the 150th Anniversary of the A.I. Voeikov Main Geophysical Observatory (MGO), the 200th Anniversary of the Birthday of Academician A.Ya. Kupfer, the Founder and First Director of the MGO, and the 165th Anniversary of the Establishment of the Russian Hydrometeorological Service. In honor of these commemorations, President Yeltsin signed an edict decorating a group of MGO scientists with the Order of Honour, Order of Friendship, and Honoured Meteorologist of the Russian Federation. (Frank Schiermeier, 919 541 4542)

Idaho Falls

29. Cluster Analysis of Southeast Idaho Wind Fields. A cluster analysis of the wind fields in southeast Idaho is being performed using data collected from the INEEL mesoscale meteorological network. The natural clusters are identified using iterative adjustment of clusters. The analysis for the year 1997 was completed in March and showed seven natural clusters or wind field patterns. The years 1994 and 1995 were completed this month. 1994 showed the same seven clusters as 1997. 1995 had only six natural clusters, which matched well with six of the clusters from 1997 and 1994. The fact that one cluster was missing may have been due to a much smaller number of points being available from 1995 caused by anemometer icing. The analysis will be performed for 1996, 1998, and then a combination of several years.

The goals of this analysis are to provide climatology information about the region and to develop wind forecasting aids. For example, the 1997 analysis showed that 37% of the wind fields fell into clusters with significantly reduced wind velocities around the north end of the INEEL. This could be significant for siting of facilities such as the satellite launch facility being proposed for the INEEL. Also, statistics such as average duration of each cluster and probabilities of one wind field type evolving into each of the others may prove to be valuable aids to forecasters. (roger. carter@noaa.gov)

30. Shoaling Waves Experiment (SHOWEX). FRD is collaborating with Scripps Institute of Oceanography to develop a new Wave Breaking and Dissipation measurement system for the November SHOWEX. The Modular Aerial Sensing System (MASS) will measure the kinematics and dynamics of breaking waves in the transition zone between deep-water breaking and depth-limited breaking on the continental shelf. MASS will allow the geometry, kinematics, and statistics of breaking leading to whitecaps to be measured using video imagery from the LongEZ. Image sequence analysis will be used to determine $L(c)dc$, the length per unit area of breaking crests in the velocity range $(c, c+dc)$. The intent is to correlate this fundamental statistical distribution function and its moments with bottom topography and with wind and wave variables, including the wave directional spectrum. See www-mpl.ucsd.edu/people/melville/MASS.htm for more information and an exciting animation video of a breaking wave. (kmelville@ucsd.edu, tim.crawford@noaa.gov)

31. Radar Wind Profiler Repair. During a routine check of the 915-MHZ radar wind profiler located on the INEEL, it was discovered that three of the four audio speakers used for temperature profiling were inoperable. In addition, the supports for the radar antennas were deteriorating. The speakers have been repaired and placed back into operation. We are planning to construct new supports for the radar antennas that will be less subject to weathering. (roger.carter@noaa.gov)

32. INEEL Emergency Planning Support. At the request of the INEEL Emergency Planning group, a set of "fake weather" data was constructed for use in an emergency response drill. During the drill, participants will switch their INEELViz workstations to a special mode and the "fake weather" will be displayed instead of real time measurements. The drill is designed to practice response to a wild fire near a major INEEL facility. The winds included in the "fake weather" will move the fire towards a particular part of the facility that the planning group wants involved in the drill. The drill will be repeated five times this summer with different participants. This method of using specially tailored weather conditions in emergency response drills has been used for several years at the INEEL because this feature was built into the FRD designed INEELViz meteorological display program. It allows participants to access and respond to weather data exactly as they would in a real emergency while still offering the advantage of using pre-chosen conditions for the drill. (roger.carter@noaa.gov)

33. INEELViz Reliability. Over the past several years, we have made a conscious effort to make the distribution of meteorological data via INEELViz as reliable as possible. For one week this month, the telephone line carrying our Internet connection experienced frequent errors. This caused numerous lost connections and errors while accessing the Internet. Thanks to the redundancy and error handling built into the system, the INEELViz workstations distributing data to the emergency response centers around the INEEL continued to operate without a single reported problem. (roger.carter, brad.reese@noaa.gov)

34. Publications. The perception of many outside of FRD has been that the FRD staff has been so involved doing field studies and taking measurements, that they have not had the time or opportunity to write about them. Not so! The first FRD publication came out just months after the division was established, and there has been a constant stream of them since. A list of many of the FRD staff publications has been compiled and posted on the FRD web site. Our publication record covers nearly 50 years - from 1950 to 1999 - and shows the Division's widely diverse research activities and accomplishments during the last half-century. There is also a glimpse of work-in-progress that will appear in the next half-century. You can view the list at <http://www.noaa.inel.gov/frd/pubs.html>. (joyce.silvester, tim.crawford@noaa.gov)

Las Vegas

35. Cloud-to-Ground (CG) Lightning Study. The cloud-to-ground lightning flash density climatology for Southern Nevada for June through September, 1993 through 1998, was completed as a contour chart. Preparations for the 1999 lightning season have been completed. (Darryl Randerson, 702 295 1231, and Jim Sanders, 702 295 2348)

36. NOAA Cooperative Institute for Atmospheric and Terrestrial Applications (CIASTA). A number of collaborative research projects were funded in June through CIASTA, a NOAA joint institute with the University and Community College System of Nevada. Titles of these projects include: Development of Potential Temperature Analysis for LAPS (\$9.7K); Operations and Services of the Regional Climate Centers

(\$2,445K); UCAN Development (\$115K); CCN Measurements in INDOEX (\$75K); BRAVO Study Technical Management Assistance and Technical Support (\$300K); and Task I, Administration and Visiting Fellows Program (\$150K). (Marc Pitchford, 702 895 0432, and Barbara Pierce, 702 295 1233)

Mesoscale modeling meetings were held with University of Nevada-Las Vegas fluid dynamics professors to plan for the implementation of regional-scale, high resolution models for Southern Nevada. (Darryl Randerson, 702 295 1231, and Walt Schalk, 702 295 1262)

37. Nevada Test Site (NTS) Space Shuttle Project. Surface meteorological data continue to be collected to support future potential space shuttle launch programs on the NTS. These data are being collected to provide vital baseline climatological data for this part of the NTS. (Doug Soule, 702 295 1266)

38. High-altitude research aircraft. Edwards AFB and NASA are planning on testing the X-33 aircraft with flights from Edwards AFB to Dugway Proving Grounds in Utah during the summer of 2000. The NTS will be near the flight path of the X-33. Edwards and NASA have requested high altitude data from SORD in support of this project. Both climatological and operational data are needed for the project. Upper air summaries are available for the NTS and will be provided to them. Additionally they need very high altitude weather data during the flight tests, which SORD will provide by taking radiosonde observations. If needed, larger balloons will be used to reach higher altitudes. (Doug Soule, 702 295 1266, and Ray Dennis, 702 295 1263)

39. Interagency Monitoring of PROtected Visual Environment (IMPROVE) Network Expansion on Schedule. The IMPROVE Steering Committee met at the Desert Research Institute in Reno, NV, on June 10th and 11th. Major topics of discussion were the ongoing expansion of the IMPROVE network with the addition of about 80 new aerosol monitoring sites, and the creation of Associate Membership as a means for interested government organizations to gain access and influence with the IMPROVE Program. The expansion is proceeding on schedule (all 110 sites operating by 1/1/00), with most of the new site locations identified. Most of the IMPROVE "protocol sites" that are in or near class I areas have been found to be suitable for the new IMPROVE sites. The Steering Committee unanimously approved the proposal for Associate Membership. To be an Associate Member a government organization must operate at least one monitoring site following IMPROVE protocols and share that data. Associate Members have the same access to IMPROVE services as full members and have an equal voice in deciding technical issues. The Steering Committee unanimously voted to accept the State of Arizona as the first Associate Member. (Marc Pitchford, 702 895 0432).