



NOAA ARL Monthly Activity Report



August 1999

Bruce B. Hicks, Director
Air Resources Laboratory

Highlights

1. *ARL Awards for 1998.* Two prizes have been awarded –

ARL Paper of the Year, to T. P. Meyers, P. Finkelstein, J. Clarke, T. G. Ellestad, and P. G. Sims, for “A Multilayer Model for Inferring Dry Deposition Using Standard Meteorological Measurements,” published in the Journal of Geophysical Research, 33 (D17): 22,654-22,661. This award is especially pleasing because it represents a collaborative effort of two ARL Divisions – Oak Ridge and Research Triangle Park.

ARL Accomplishment of the Year, to Steve Perry (Research Triangle Park), for his incorporation of the latest PBL concepts into a new plume dispersion model (AERMOD) now available to the modeling community in general.

2. *The Groâ Egrett is operational.* The ARL experimental aircraft observational group (now headquartered at Idaho Falls but also involving scientists at Oak Ridge) has completed a study of turbulence in the stratosphere, using a Groâ G520T Egrett high altitude research aircraft operated by Airborne Research Australia (ARA). The aircraft (as shown) carries three ARL-designed and constructed high frequency turbulence probes. (See items 22 and 29 below.)



The ARA Groâ G520T Egrett high altitude research aircraft with three BAT probes.

3. AGU Chapman Conference on Water Vapor in the Climate System. The American Geophysical Union's Chapman Conference on Water Vapor in the Climate System will be held October 12-15 in Potomac, MD. The meeting, convened by Dian Gaffen and Becky Ross (ARL) and John Gille (NCAR), will bring together a diverse group of scientists with a common interest in the role of water vapor in the atmosphere. (See item 5 below).

4. Participation in the 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). 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. Several ARL groups are collaborating in the BRAVO study (see items 12, 32 below).

General

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

Sustain Health Coasts: 6
Advance Short-Term Warnings: 2, 4, 7, 14
Seasonal to Interannual: 8, 9.
Decadal to Centennial: 3, 5, 10, 11, 12, 13
Crosscutting: 1

Silver Spring

5. AGU Chapman Conference on Water Vapor in the Climate System. The American Geophysical Union's Chapman Conference on Water Vapor in the Climate System will be held October 12-15 in Potomac, MD. The meeting, convened by Dian Gaffen and Becky Ross (ARL) and John Gille (NCAR), will bring together a diverse group of scientists with a common interest in water vapor. Chapman conferences are small (approx. 100 participants), highly-focused meetings on topics of current scientific interest. The present conference is a follow-up to the 1994 Chapman Conference on the same topic, also convened by ARL. Five years ago, the focus was on water vapor in the lower troposphere. At that time, the notion that the water vapor (particularly in the upper troposphere) might have a negative feedback on the greenhouse effect had just been put forward, and much of the discussion focused on this controversy. Two sessions at the upcoming meeting will explore this issue, which has seen significant progress in the past five years.

A second highlight will be on the global hydrological cycle and its potential intensification in a changing climate. An intensification of the water cycle could be associated with more frequent extreme precipitation events, such as flood-producing heavy rains and drought. This will be examined both from contemporary and paleoclimatic perspectives. Water vapor is postulated to play an important role in the recently discovered rapid climate changes in the geologic record, and therefore to be critical to understanding the potential for abrupt climate changes in the future.

A third focus will be on water vapor in the upper troposphere and lower stratosphere (UT/LS). Because of the combination of the important radiative role of water vapor in the upper troposphere and the difficulty of

measuring humidity in that region, it has been the subject of considerable research activity in recent years. Indeed, the World Climate Research Program's Stratospheric Processes and their Role in Climate program is currently preparing a scientific assessment of water vapor in the UT/LS, which will be highlighted at the meeting.

A special section of JGR-Atmospheres devoted to conference-related papers is planned. For more information about the meeting, see <http://www.agu.org/meetings/cc99bcall.html>. (dian.gaffen@noaa.gov)

6. 4 km Chesapeake Bay forecast evaluations. The use of RAMS for the Coastal Marine Demonstration Project (CMDP; an NOS-led program sponsored by the Naval Research Laboratory) has demonstrated that one- to two-day prediction of local-scale atmospheric phenomena (e.g: bay breezes and channeling) is now possible. Local forecast offices found the 4 km forecasts especially valuable for marine forecasts and locations of pre-convective convergence zones.

Evaluations of wind directions were particularly encouraging for days dominated by local forcing, often when afternoon up-Bay wind channeling is evident. This is a dominating feature during the summertime over the Bay and is forced by the land-water gradients in friction and heat. CBRAMS frequently predicted this feature while models with coarser resolutions could not. A detailed quantitative evaluation of the CBRAMS against a special wind mesonet over the Chesapeake Bay was also begun and will be described in a paper scheduled for the next AMS annual meeting. (jeff.mcqueen@noaa.gov , Glenn Rolph, Jay Titlow, Wind Hotline)

7. READY Update - Southeast Asia. Given recent forest fires in parts of Southeast Asia, the READY web page <http://www.arl.noaa.gov/ready/asiafire.html> has been updated with links to pre-computed HYSPLIT trajectories and AVN forecast maps. The products are updated 4 times a day in parallel with the NCEP AVN model output. (barbara.stunder@noaa.gov and Glenn Rolph)

Boulder

8. SURFRAD. The old solar trackers operated by SURFRAD (and by ISIS) are not Y2K compliant. A purchase order for new solar trackers has been placed, with the swap scheduled to occur soon. (augustine@srb.noaa.gov)

9. Collaborattion with the Department of Energy (DOE), Atmospheric Radiation Measurement (ARM), Atmospheric Radiation Cloud System(ARCS). Chris Cornwall traveled to the DOE's ARM/ARCS site on the island of Nauru to perform radiometer calibration and maintenance tasks for two weeks in August. The trip was part of the ongoing ARM effort in the Tropical Western Pacific. ARM also has data collection sites on the North Slope of Alaska, and the Southern Great Plains of Oklahoma. For more information on the ARM program or any of the data collection sites, check out <http://www.arm.gov/>. (cornwall@srb.noaa.gov)

10. Long-Term climatology of stratospheric aerosol extinction. A long-term climatology of stratospheric aerosol extinction at 320-nm has been developed. The 1956-1997 time-series of monthly-mean zonally averaged values for 10-20, 20-30, 30-40, and 40-50°N latitude bands are based on pyrhelimetric, lidar, sun-photometer and satellite spectral data. The data were assessed and converted to the UV-wavelength most appropriate for correcting Umkehr measurements. The conversion method is derived using our bounded

domain concept of optical properties of stratospheric aerosols. A vast collection of in-situ aerosol size-distribution measurements were used for this study. A set of aerosol error corrections for the Umkehr retrieved ozone profiles was developed. The method is based on the Umkehr retrieval of the change in the synthetic Umkehr measurements due to the presence of elevated stratospheric aerosols. Results of this study are expected to improve the quality of trend analyses done on a long term Umkehr ozone profile record. Also, the aerosol data produced from this study will be archived at the World Ozone and UV Data Center at Toronto, to be used by investigators working with the Umkehr data. (Irina Petropavlovskikh, 303 497 6279 and Amy Stevermer, 303 497 6417)

11. World Umkehr Network. A groups of specialists in Umkehr ozone measurements (from NCAR, CMDL, and SRRB) met recently to discuss the problem of shifts seen in the measurement records of the World Umkehr Network. These shifts were recently uncovered and brought to the attention of European and U.S. ozone scientists by SRRB personnel in their effort (supported by the DOE) to identify the uncertainties in the Umkehr measurement record. Ozone profiles are retrieved from the Umkehr measurements much in the same way as ozone profiles are retrieved from the NESDIS SBUV satellite upwelling radiance measurements. Statisticians performing trend analyses on the retrieved Umkehr ozone profiles contend with the shifts using a method of intervention analysis. The causes of the measurement shifts have been noted to be mostly related to instrumental changes such as re-calibration or replacement. Unfortunately, a direct Dobson calibration procedure for the Umkehr mode has never been established. Because the Umkehr ozone profile record now plays a substantial role in assessments of the status of the ozone layer (i.e. trends and satellite comparisons) by world organizations such as UNEP, attempts to improve the reliability of the record are well justified. Our future effort with the Umkehr will involve a consortium of NASA and NOAA scientists with the objective of unifying the satellite and ground-based observations for consistency, leading to improving the reliability of the conclusions drawn from the combined data. (Irina Petropavlovskikh, 303 497 6279 and John DeLuisi, 303 497 6824)

Oak Ridge

12. BRAVO/Big Bend. ATDD is one of several ARL collaborators involved in the BRAVO project. ATDD provided trajectory (forward and backward) calculations, using the ARL Hysplit-4 model, through the month of August. Additional model calculations were performed to predict concentrations from releases at four sites provided by Dan White, of the Texas Natural Resource Conservation Commission. Results from Hysplit-4 trajectory and concentration model runs are provided through web access on the ATDD site. ATDD is archiving all relevant model input and output information. (pendergrass@atdd.noaa.gov)

13. Canaan Valley. Plans to install an Atmospheric Integrated Research Monitoring Network (AIRMoN) station within Canaan Valley, WV are nearly finished. A research-grade site is planned to assess pollutant deposition to the region. Ozone has been found at continuously elevated concentrations during the summer in preliminary observations obtained from the U. S. Forest Service's Timber and Watershed Laboratory. These observations from a ridge top near the proposed AIRMoN site contribute to emerging evidence of ozone's damage to vegetation and adverse impact on human health in the higher Appalachians. This experience relates closely with the East Tennessee Ozone Study (ETOS). Many ETOS results for the Great Smoky Mountains, recently presented at scientific briefings in Oak Ridge, appear relevant to the mid-Atlantic Highlands as well. (vogel@atdd.noaa.gov)

14. CASES-99. There will be a multi-divisional ARL presence at the CASES-99 experiment on the stable boundary layer, to be held near Wichita, Kansas, in October. The aircraft systems will be provided by the ARL Idaho Falls group. Surface observational capabilities are being provided by Oak Ridge. A series of aircraft test flights was performed at Idaho Falls, Idaho to check out the software that will be used during CASES. A number of problems were encountered, and most of these have been addressed. (eckman@atdd.noaa.gov, Ed Dumas, Tim Crawford)

Testing of the new microbarograph systems was begun during August. In the original design, the reference chamber contained a steel bar in order to increase thermal inertia. However, this bar severely depleted the reference chamber volume, and increased the sensitivity of the system to temperature changes in the tubing connecting the reference chamber to the differential pressure gauge. Steel pellets appear to work much better. Construction of all 6 units is on track, and will be completed in time for field testing before CASES-99. (nappo@atdd.noaa.gov, David Auble)

15. Dynamical/Photochemical Modeling. A 500 MHz 21264-based Alpha workstation has been delivered and will soon be used for LESchem coupled large-eddy/photochemical simulations. Subsequent tests indicate that LESchem runs *eight times faster* on the Alpha than on the 300 MHz PC originally used. This means that a sample 2-hr LESchem simulation which required 5 days to run on the PC now requires only 15 hours to complete on the Alpha. (herwehe@atdd.noaa.gov)

16. East Tennessee Ozone Study (ETOS). Meteorology and ozone monitoring efforts continued through August. Several periods of high ozone readings, exceeding both the old and new EPA ozone standards, were observed at most ETOS monitoring sites throughout the month. Additional monitors were installed at selected mid-valley locations to confirm unusually high readings at selected sites. The ETOS science team met to review July's data, and in particular, the ozone measurements conducted with the NOAA/ARL Twin Otter research aircraft. (pendergrass@atdd.noaa.gov)

The highlight of the month's activities was a briefing provided on August 26 to local Congressional House and Senatorial staff members. The scientific briefing was hosted by NOAA/ATDD with presentations by ATDD staff and representatives from the National Park Service and The University of Tennessee. The agenda included a tour of the National Park Service's Look Rock monitoring site with additional discussions of ETOS program goals provided by NOAA/ATDD staff. A separate briefing on ETOS and ATDD activities in general was provided on August 27 for staff of the Oak Ridge office of U. S. Rep. Zach Wamp, who was unable to attend the earlier group briefing. (pendergrass@atdd.noaa.gov, Barbara Shifflett, Ray Hosker, Tilden Meyers)

Ozone concentrations were measured from the air during the last week of August for the ETOS '99 field intensive campaign. A rented Cessna 172 aircraft flew down the western edge of the Great Valley from Rockwood to Chattanooga, crossed the valley at Chattanooga, and came up the eastern side toward Sevierville. We also flew down the middle of the Valley toward the Georgia border. A further flight to the north sampled O₃ concentrations on a large loop from Rockwood to Scott County, TN, Middlesboro, KY, Morristown, TN, Look Rock, and back to Rockwood. Preliminary results show extremely high concentrations of ozone down the middle of the Great Valley, south of Knoxville toward Chattanooga. Lower concentrations

were measured north of Rockwood, but increasing to the northeast of Knoxville. Additional flights are planned for early September and early November. (dumas@atdd.noaa.gov, Randy White, Will Pendergrass)

On-site tower and ozone instrument maintenance continued in support of ETOS. Preliminary quality assurance of data collected to this point has been completed, and a CD-ROM of all data collected during the summer is nearing completion. The data will be analyzed this fall and winter. A number of potential sites have been scouted and identified as guided by data gaps observed in this summer's measurements. Paperwork is being processed to obtain site permissions from various state (TN) agencies for potential measurement locations. (birdwell@atdd.noaa.gov, Randy White, Will Pendergrass)

17. Mercury in the Arctic. August completed our first full year of total gaseous mercury monitoring at Barrow, Alaska. In collaboration with the EPA, we have begun work on mercury speciation measurements, also at Barrow. The speciation techniques and the current Barrow results were discussed at length during a week long meeting at the EPA facility in Research Triangle Park, North Carolina. (brooks@atdd.noaa.gov, Tilden Meyers, Ray Hosker, S. Lindberg-ORNL)

18. NSF Multi-User Environmental Research Aircraft. ATDD has been instrumental in equipping the new experimental Sky Arrow aircraft now flying for San Diego State University. The aircraft project has been brought to a successful conclusion with operational measurement flights of the completed aircraft in Barrow, Alaska. In addition to the NOAA/ATDD-developed Mobile Flux Platform (MFP), the aircraft carried the advanced ADAR 5500 multispectral imaging system. During August, the DOE Atmospheric Radiation Measurement (ARM) site, the NOAA/CMDL site, the NSF study sites, and the International Tundra EXperiment (ITEX) sites were fully imaged at 0.5 m resolution. This was the first high resolution spectral imaging conducted within the Barrow region and will be a valuable dataset for the Barrow scientific community. The late summer fluxes obtained with the aircraft ATDD/MFP system will be combined with the fluxes measured with the Long-EZ aircraft system during June/July of 1998 to produce an overall picture of fluxes during the snow-free season. (brooks@atdd.noaa.gov, Ed Dumas)

19. Southern Oxidants Study. ATDD has been a participant in the Nashville field program of the NOAA Health of the Atmosphere Program. In early August, instrumentation was removed from the three flux tower systems operating within the Nashville area, after obtaining at least 30 days of data to characterize the surface energy balance, carbon, and ozone fluxes. Nearly all of the data have been reduced for final analysis. (meyers@atdd.noaa.gov)

20. Spatial Variability Study. Flux measurements over the complex barrier-island environment around Manteo, NC were made from the NOAA Twin Otter airplane. Fluxes of momentum, latent and sensible heat, O₃, CO₂, and condensation nuclei were measured. An additional three-channel instrument, developed by Winston Luke of ARL HQ, was flown in test mode measuring NO, NO_x, and NO_y. Ten flights were made during the Spatial Variability Study. After flying to Knoxville, three more flights (bringing the total to six) were made in support of the East Tennessee Ozone Study. Frequent in-flight failures of the Novatel GPS card forced the use of the low resolution, low frequency Trimble TANS Vector position and velocity in calculations. However, improved data analysis algorithms have given a six-fold increase in the spatial resolution of results: from 1.5 km to 250 m. (gunter@atdd.noaa.gov, Robert McMillen)

21. SURFRAD and ISIS. ISIS Level 1 data for 1995 and the first half of 1996 have been published in Supplement XV by the World Radiation Data Center (WRDC), St. Petersburg, Russia. This publication makes the United States' contribution to WRDC current. (matt@atdd.noaa.gov)

22. U. S. Air Force Refractive Turbulence Study. *In-situ* turbulence measurements were made using ATDD instrumentation from the Australian-owned slow, high-altitude Groâ Egrett airplane. Turbulent temperature fluctuations influence the propagation of electromagnetic radiation by changing the index of refraction. Over 20 hours of measurements were made in the region of strong shear below the winter subtropical jet over Adelaide, South Australia. On 6 August, we found the strongest turbulence yet, comparable in strength to the buoyancy-driven mixed layer, but 10 km aloft. The ride in the airplane was very rough. Preliminary examination of the spectra indicates turbulence, not waves. Remarkably, we found this strong turbulence over Adelaide, not off Japan, where we sampled a much stronger jet last February. Perhaps such regions of extreme turbulence are small, and we happened to find one on 6 August. (dobosy@atdd.noaa.gov)

23. Rocket Exhaust Dispersion Study. A new Model Validation Program (MVP) study was started in August, to look at the performance of mesoscale model simulations at Cape Canaveral. Two versions of the RAMS model have been used at the Cape to forecast the local winds and boundary-layer structure. The aim of the new project is to take an objective look at how well the simulations agree with observations obtained during the three MVP experiment sessions at the Cape. An emphasis will be placed on the models' ability to forecast mean winds, turbulence, and surface fluxes. (eckman@atdd.noaa.gov)

Research Triangle Park

24. Hurricane Floyd response. Moved by the incredible devastation caused by Hurricane Floyd, ASMD members contributed nearly \$1200 to the American Red Cross for aid to the North Carolina flood victims. This amount was matched dollar-for-dollar by the local Carolina Power and Electric Company.

25. Climatology of CASTNet concentration data. The spatial and temporal variability of ambient air concentrations of SO_2 , SO_4^{2-} , HNO_3 , NO_3^- , NH_4^+ , and O_3 obtained from EPA's Clean Air Status and Trends Network (CASTNet) has been examined using principal component and time series analyses. Utilization of Kaiser's varimax orthogonal rotation delineated species-specific "influence regimes" or subregions whose concentrations exhibit statistically unique, homogeneous characteristics. Depending on the species, either two (NO_3^-), three (SO_2 , SO_4^{2-} , NH_4^+ , O_3) or four (HNO_3) homogeneous subregions were identified. Spectral density analysis of the time series associated with each species' subregions revealed differing periodicities or cycles and varied levels of noise. Such analysis is useful in that it (1) reveals the regional nature of the different chemical species; (2) facilitates understanding of the probable mechanisms responsible for their unique behavior among subregions; and (3) identifies stations that are either redundant or unique in their behavior, allowing decision makers to reduce and/or supplement the network, thereby increasing its cost-effectiveness. (Brian Eder, 919 541 3994)

26. Hazardous Air Pollutant Exposure Model (HAPEM). An initial test application of the new Hazardous Air Pollutant Exposure Model (HAPEM) has focused on Contra Costa County, CA for the years 1994 to 1998. To satisfy input data requirements, daily values of atmospheric mixing heights were computed using

radiosonde observations from Oakland, CA and surface observations at San Francisco International Airport. (Larry Truppi, 919 541 1340)

27. Air toxics modeling. A guidance document, “Air Dispersion Modeling of Toxic Pollutants in Urban Areas - Guidance, Methodology and Example Applications,” has been completed. The document presents generalized guidance and overview of air toxics dispersion modeling for an urban area. In two case studies - Phoenix and Houston - the impacts of five potential cancer-causing air toxics were examined: benzene, 1,3-butadiene, formaldehyde, polycyclic organic matter (POM), and hexavalent chromium (chromium VI).

The results of the modeling analyses show some significant differences between the two cities studied. For Phoenix, the mobile sources were clearly the dominant source of emissions for four of the five pollutants; the mobile source emissions also exhibited the strongest temporal variations, reflecting the diurnal patterns in road traffic, as well as some influences of meteorology on emission estimates. While the Houston inventory showed emissions from mobile sources that were comparable in magnitude to Phoenix, major source (also called point source) emissions from Houston were significantly higher than major source emissions for Phoenix. Benzene emissions from major sources were almost 100 times higher for Houston than for Phoenix, and 1,3-Butadiene emissions were about 700 times higher. The modeling analysis for Houston exhibited some significant "hot spots" associated with the larger sources of emissions for certain pollutants.

These applications illustrate a methodology that may be applied to similar urban-wide analyses of point and area sources of air toxics. Further insight into the applicability of such models on this scale of analysis may be gained in future studies by comparing modeled concentrations to monitored concentrations, a task begun in the study for Houston. (Joe Touma, 919 541 5381)

28. Release of a 1-km vegetation data base. Regional air quality models need accurate characterization of vegetation cover to estimate biogenic emissions and dry deposition. However, most satellite-derived data sets, while providing good spatial resolution, do not resolve vegetation species and crop types. Isoprene emissions vary among tree species, with extremely high emissions from oaks but negligible emissions from maples. ASMD scientists have constructed a 1-km vegetation data base for North America. The USGS 1-km land use/land cover (LULC) data set derived from AVHRR satellite imagery has been coupled with forest inventory data from the US Forest Service and the 1992 agricultural census. The 1990 Census has been used to denote urbanized regions. Each 1-km pixel includes percent forest cover, percent crop cover, FIPS code, and the USGS LULC class. In the United States, each pixel is further divided into tree species and crop types. This data set provides much greater spatial resolution than earlier county-based land use data sets developed for biogenic emissions calculation. It should provide a more accurate basis for vegetation-sensitive calculations for regional air quality models such as the Community Air Quality (CMAQ) model. The data set can be accessed at <ftp://monsoon.rtpnc.epa.gov/pub/beis2/landuse>. (Thomas Pierce, 919 541 1375)

Idaho Falls

29. Refractive Turbulence. New this month is the FRD Refractive Turbulence Research Project funded by the Air Force. This project expands the cooperative effort with Airborne Research Australia (ARA), Atmospheric Turbulence and Diffusion Division (ATDD), and Phillips Laboratory. Our goal is to provide global stratospheric turbulence measurements to support the design and testing of the Air Force's Airborne Laser (ABL). Accurate, high frequency (50 Hz) measurements of the three components of fluctuating wind

velocity, moisture and air temperature will be carried out in various theaters of interest to the Air Combat Command. The data will also be used in studies that evaluate the atmospheric refraction propagation effect on various civilian and military communication systems.

Under previous efforts at ATDD, three Best Aircraft Turbulence (BAT) probes were installed on ARA's Groâ G520T Egrett high altitude research aircraft. As shown above, one probe is mounted under each wing and a third probe at the top of the tail. This symmetrical three-probe installation, when combined with the Egrett's slow 50 m/s flight speed, allows stratospheric turbulence measurements to be made that were never before possible. This month we participated in the operation of the Egrett, which collected 25 hours of data. Our future work will include improving high-altitude temperature sensor response, conducting an intercomparison of other sensors used in the ABL program, and modifying the LongEZ for high-altitude operation. The LongEZ has been chosen as the instrument test platform for the instrument intercomparison study. (tim.crawford@noaa.gov, Jeff French)

30. Development of Smart Balloons Capability for Hurricane Research. A joint project is about to commence between FRD and the University of Hawaii, to study the inflow boundary layer of Atlantic hurricanes using FRD smart balloon technology. Presently our work is focused on:

- A. Design a slightly larger balloon that will allow the transponder to be held inside the spherical balloon.
- B. Determine how best to place the transponder and gas tight enclosure inside the balloon.
- C. Develop a satellite data link.
- D. Select a transponder GPS receiver engine and embedded controller with low power operations. One of the major criteria for transponders.
- E. We are considering an alternative to the currently proposed differential correction scheme. The alternative approach is to use one of our Omnistar receivers with differential correction data received from all of the satellites visible over north America. This data could then be sent over the communications link to our balloon GPS receiver to increase the accuracy of the balloon altitude. (randy.johnson@noaa.gov)

31. FRD SURFRAD Station. Cooperative efforts with SRRB are underway to establish a SURFRAD or ISIS Level 1 station at FRD. Talks are in progress with SRRB personnel to use existing FRD and SRRB instruments. FRD has 4 PSP's, 1 PIR, and 3 NIP's which can be used to establish the station. SRRB has offered a solar tracker sometime in the future, as old trackers are replaced with new ones. Meteorological data are already available at the proposed Grid 3 installation site. Funding constraints for the remaining instruments, of course, are a major concern. (kirk.clawson@noaa.gov)

32. BRAVO update. Samples from BRAVO have been analyzed and the tracers are found to be present, as expected. Perfluorocarbon concentrations are running at about 2.5 to 5 parts per quadrillion (ppq). The background is about 1.5 ppq. Analysis is continuing. For more information on BRAVO or to view results as they become available visit <http://www.noaa.inel.gov/frd/Projects/bravo.html>.

33. Emergency Operations Center Support (EOC). There were two range fires at the Idaho National Engineering and Environmental Laboratory site during August. The first was on August 6, caused by a lightning strike from an isolated afternoon thunderstorm. The EOC staffing alert notification was given at 16:45 MDT; FRD provided meteorological support. The fire was brought under control around 20:00 MDT. Approximately 6000 acres were burned. This was an especially difficult fire to fight since surface winds varied from southwesterly (large scale synoptic flow) in the early evening to easterly (shallow, cold air thunderstorm outflow from the Tetons) in the mid-evening to northerly (cold air drainage flow from the Yellowstone basin due to radiational cooling) in the late evening.

On August 19, three small brush fires were started on the INEEL by afternoon thunderstorms. The EOC alert was given at 13:10 MDT. The three fires quickly merged into one large fire, fanned by outflow from the thunderstorms. The fire was contained around 20:30 MDT. No facilities were threatened, however, approximately 40,000 acres or 60 square miles were burned. This accounted for about 7% of the total INEEL area. This was the largest fire in the 50 years of INEEL history. For more information on the brush fire stories, see <http://www.inel.gov/cgi-bin/newsdesk.cgi?a=116&t=template.html>. (jerry.crescenti@noaa.gov, Dianne Hoover, Jerry Sagendorf and Kirk Clawson)

34. Support of INEEL Emergency Planning. Three more INEEL emergency response drills were conducted during August. In addition to providing support to the DOE Emergency Operations Center (EOC), FRD staff also provided support to the State of Idaho Oversight Program. Oversight has the responsibility to interface with state and county emergency response personnel when INEEL accidents and wildfires affect the offsite public, including the five counties bordering the INEEL. Each county has an INEELViz workstation sans MDIFF modeling capability. Oversight wanted the capability to send INEELViz model results to each county from the EOC, without enabling the model on each workstation. To accomplish this, INEELViz was modified to send model output to the FRD web server, thereby allowing county EOC operators to view the model results through their web browsers. Only the INEELViz workstations in the DOE/EOC will have this model output web link capability. Thus, every major player in an INEEL emergency will have access to the same model results. The ability to annotate the model output was also added. (brad.reese@noaa.gov)

35. INEEL Monitoring and Surveillance Committee (MSC) Chairmanship. Kirk Clawson has been elected by the INEEL MSC membership to serve as the chairman. The MSC group brings together a diverse group of people who have interest in environmental monitoring on and around the INEEL. The purpose of the organization is to foster communication among the widely dispersed membership. Membership includes personnel from DOE, the State of Idaho, Lockheed Martin Idaho Technologies Company, USGS, Environmental Science and Research Foundation, and the Shoshone-Bannock Indian Tribes. At the first meeting conducted by the new chairman, Neil Hukari gave a presentation entitled "INEEL Wind Flow Patterns from Cluster Analysis," and Jeff French gave a presentation entitled "Observations of Microphysics Pertaining to the Development of Drizzle in Warm, Shallow Cumulus Clouds." (kirk.clawson@noaa.gov, Neil Hukari, and Jeff French)

36. FRD's Research Activities. Over the last ten years, FRD has averaged six research projects per year with four being major field experiments. The research sites have included cities from Oregon to Florida, Canada to Mexico, as well as several international locations. To answer the question "what type of research projects were conducted" a list of FRD's activities over the last three decades has been compiled. For a brief

glimpse of some of these diverse and very interesting projects, visit our site at <http://www.noaa.inel.gov/news/OldProjects.html>. (joyce.silvester@noaa.gov)

Las Vegas

37. *Cloud-to-Ground (CG) Lightning.* Intense thunderstorms occurred on and near the Nevada Test Site (NTS) during August. The majority of the cloud-to-ground lightning on the NTS occurred between the 20th and 27th. The areas affected most by cloud-to-ground lightning were Areas 12, 16, 17, and 19. The most active day was the 24th when several strong storms occurred over Areas 16, 17, 19, and in the northwest corner of Area 6. The lightning from the thunderstorm in Area 16 started brush fires on the 24th. Another intense storm struck near the Device Assembly Facility (DAF) and Control Point One (CP-1) on the 27th. The peak monthly flash density measured on the NTS by the SORD lightning detection system was 8 fl/km² in Area 19. Another noteworthy thunderstorm occurred near the DAF and U1a Complex between 1700 and 1800 PDT on the 27th. This storm produced 6-8 fl/5 km² near these two facilities. (Darryl Randerson, 702 295 1231)

38. *NOAA Cooperative Institute for Atmospheric and Terrestrial Applications (CIASTA).* The HYSPLIT and RAMS capabilities available at ARL in Silver Spring have been largely duplicated in Las Vegas, on the University of Nevada-Las Vegas (UNLV) National Supercomputing Center for Energy and Environment (NSCEE) 14 processor SGI Origin 2000 workstation. (Darryl Randerson, 702 295 1231, Jim Sanders, 702 295 2348, Walt Schalk, 702 295 1262, and Doug Soule', 702 295 1266)

39. *NOAA Integrated Surface Irradiance Study (ISIS).* On August 30 a dense layer of smoke from Southern California forest fires moved over Southern Nevada, rapidly reducing visibility to 8 to 10 km and raising local health concerns in Las Vegas. During smoke plume passage over the Desert Rock Meteorological Observatory (DRA) on the NTS, visibility decreased to 10 km at 1600 UTC. Solar radiation data from the NOAA/ARL ISIS station at DRA demonstrated the depletion in the direct solar beam and in the downwelling (global) radiant energy. Global input was depleted by 10-20% during smoke passage. The direct solar beam at DRA was depleted even more, 30 to 35% between 1500 and 1700 UTC. (Darryl Randerson, 702 295 1231)

40. *Hazardous Materials (HAZMAT) Spills Center (HSC).* SORD is working with DOE in preparation for the NIGHTHAWK Project to be conducted in August-September. This is a continuation of the of multiple-year effort of development, characterization, and testing of remote sensors of chemical effluents. Chemical releases used the existing wind tunnel to provide a large diameter, well characterized, open air, plume containing various concentrations of chemical vapors and a 50-foot tall, hot air, stack source. This test series included sensors on aircraft flying at various altitudes, anywhere from near the surface to above 50,000 feet. SORT support has included twice daily operation-specific weather forecasts and a weather and climate briefing for the H.C. Safety Panel. (Jim Sanders, 702 295 2348)