



# NOAA ARL Monthly Activity Report



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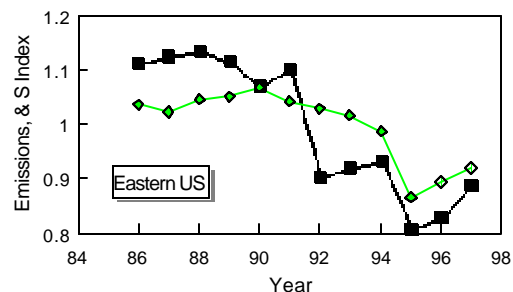
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## Highlights

### 1. AIRMoN Data Reveal Success of Emissions Cutbacks.

An analysis of AIRMoN data has shown that air quality in the eastern USA has responded well to emissions reductions mandated by the Clean Air Act. The trend with time of air quality over the period of operation of the AIRMoN network (starting in 1986) has been about 3% per year in atmospheric sulfur. The diagram shows the results obtained. The sulfur data (squares) are derived from both air concentration and precipitation chemistry data, for sites in the eastern US.



Emissions data (diamonds) are those reported by the EPA, for the entire nation. Both the emissions and air quality data sets are normalized by reference to long-term average values. Changes in air quality correlate well with emissions, except for the early 1990s (for reasons that have yet to be uncovered). [bruce.hicks@noaa.gov](mailto:bruce.hicks@noaa.gov)

**2. Shoaling Waves Experiment (SHOWEX).** The Shoaling Waves Experiment (SHOWEX) started in November, at the U. S. Army Corp of Engineers Field Research Facility located in Duck, North Carolina (see <http://frf.usace.army.mil>). The collaborative effort included Tim Crawford, Jeff French, and Jerry Crescenti (FRD), Ed Dumas (ATDD), Jielun Sun and Sean Burns (NCAR), Larry Mahrt and Dean Vickers (Oregon State University), Doug Vandemark (NASA), and Ken Melville and Peter Matusov (Scripps Institute of Oceanography).

Existing models for surface wind stress in the shoaling zone fail because of their inability to account for wave age, shoaling, and internal boundary layer development. The fetch-dependent wave field in this region cannot be adequately studied without 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 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 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. Further details can be found at <http://cheyenne.rsmas.miami.edu/showex/showex.htm>.



*N3R at the First Flight Airport for SHOWEX-99*

Following receipt of approval from NOAA, the LongEZ (N3R) research aircraft was used to acquire the data needed to meet the SHOWEX objectives. Missions were conducted out of First Flight Airport (FFA) in Kill Devil Hills, North Carolina. When necessary, Dare County Regional Airport (MQI) was used when N3R conducts nocturnal flights. N3R's first research flight was on November 11. A total of 22 missions (82.5 flight hours) were flown through November 30 under various atmospheric and wave field conditions.

On several occasions, N3R flew "box" formations with the Office of Naval Research Center for Interdisciplinary Remotely-Piloted Aircraft Studies (CIRPAS) Twin Otter (see <http://web.nps.navy.mil/~cirpas/>). N3R and the Twin Otter also flew the same flight legs at different altitudes during Synthetic Aperture Radar (SAR) satellite overpasses.

Several advanced in situ and remote sensors were mounted on N3R for SHOWEX. These included a pressure port anemometer for the measurement of wind velocity, fast response temperature probes, an infrared gas analyzer (IRGA) for the measurement of water vapor, chilled-mirror dew point sensor, and upward and downward looking radiometers. Three laser altimeters (mounted as a triangular array) were used

to accurately measure sea surface height. In addition, a downward looking scatterometer (DLS) was also included. This compact, low-power 36 GHz radar is used to study changes in small-scale ocean wave roughness and how they relate to changes in oceanic and atmospheric conditions. Details on the DLS can be found at <http://rows.wff.nasa.gov/dls.html>. Scripps Institute of Oceanography's Modular Aerial Sensing System (MASS) was also installed on N3R. This system records visual and infrared images of ocean surface whitecaps and the temporal evolution of breaking waves. A breaking-wave animation can be viewed at <http://www-mpl.ucsd.edu/people/melville/MASS.htm>. [jerry.crescenti@noaa.gov](mailto:jerry.crescenti@noaa.gov) (Jeff French and Tim Crawford)

## Silver Spring

**3. Dust Storm Modeling.** The Hysplit model is being modified to address dust storms, in a collaborative effort with the Army focused on refining understanding of exposure conditions during the Gulf War. The dust resuspension module has been upgraded to be consistent with recent changes to Hysplit and tested using interpolated ECMWF analysis data (Jan-Aug 1991). The results were consistent with measurements (100's to 1000's  $\mu\text{g}/\text{m}^3$ ). PM 10 measurement data were obtained from the Army, for several locations. [roland.draxler@noaa.gov](mailto:roland.draxler@noaa.gov) (Jeff McQueen and Dale Gillette)

**4. NASA Workshop on Climate Change of the Past Fifty Years.** The NASA Goddard Institute for Space Studies (GISS) is planning a series of climate simulations of the past 50 years. To guide both the model runs and the interpretation of the results, GISS hosted a mini-workshop Nov 22-23, 1999 in New York. Discussion focused on 1) key elements of climate change over the past half century; 2) the availability and quality of observational datasets for comparison with simulations; and 3) the sensitivity of model simulations to imposed climate forcings, representation of the ocean, and representation of the stratosphere. Dian Gaffen presented recent observational results pertaining to tropospheric temperature, lapse rate and water vapor changes, and a poster showing pertinent ARL datasets. Melissa Free presented results on the observed influence of volcanos on temperature. [dian.gaffen@noaa.gov](mailto:dian.gaffen@noaa.gov)

**5. National Research Council Panel Report.** The NRC Panel on "Reconciling Observations of Global Temperature Change" has finalized its report, which is now scheduled for public release on Jan. 13, 2000 at the AMS Meeting in Long Beach. The report deals with the apparent discrepancy between trends based on *in situ* surface temperature observations and satellite-based tropospheric temperature data. Three NOAA scientists serve on the 11-member panel: Tom Peterson (NESDIS/NCDC), Norm Grody (NESDIS/ORR), and Dian Gaffen (OAR/ARL). Together these three represent the three main temperature data sources: surface, satellite, and radiosonde. [dian.gaffen@noaa.gov](mailto:dian.gaffen@noaa.gov)

**6. Volcanic Ash Dispersion Forecasting.** With a near-continuous "moderate" (up to about 25,000 ft) eruption of Tungurahua, Ecuador, throughout the month of November, 1999, VAFTAD graphics were issued 49 times. Next was another volcano in Ecuador, Guagua-Pichincha, with 7 eruptions, and finally, one eruption each of Popocatepetl, Mexico, and Soufriere Hills, Montserrat.

The final Y2K changes to VAFTAD and the associated meteorology (AVN) programs have been implemented on NCEP's Cray5, after having been delayed due to the NCEP Cray3 fire. [barbara.stunder@noaa.gov](mailto:barbara.stunder@noaa.gov)

## **Boulder**

**7. SURFRAD.** Professor Earhard Raschke from the Max Planck Institute in Germany, will visit SRRB on January 4, 2000 to review SURFRAD in the context of international programs. John Augustine and John DeLuisi will lead him through the operation of SURFRAD and discuss issues that he brings up. A five-year proposal for the continuation of the SURFRAD network has been prepared for OGP, at their request. At the February meeting of their the Climate Observation Advisory Panel, the future of OGP's support of SURFRAD will be decided.

As part of completing the SURFRAD Y2K compliance program, new solar trackers were installed at Goodwin Creek on November 3 and at Desert Rock on November 30. (John Augustine, 303 497 6415)

**8. Brewer Umkehr Meeting.** John DeLuisi and Irina Petropavlovskikh attended a special topical meeting on the Brewer Umkehr method. This meeting was hosted by the Canadian Atmospheric Environment Service and the WMO. About a dozen specialists from WMO, Greece, Canada, Japan and the U.S. attended the meeting. U.S. participants were from ARL, CMDL, EPA, NASA, U. Georgia and Alabama. Presentations were concerned with the present status of the traditional ozone profile retrieval methods, suggestions for trying some new techniques, and to determine the areas where improvements were needed. The SRRB's special interest is in the total ozone calibration and the routine Umkehr measurements being made by the EPA Brewers. These measurements have the potential to provide the U.S. with a large number of useful ozone data sets at 22 sites. Some members of the group expressed concern that the EPA ozone measurements were not being considered a necessary product of the network. Petropavlovskikh and DeLuisi gave presentations on the status of the Dobson Umkehr work and modeling sky radiance with high-precision radiative transfer vector codes. The participants at the meeting agreed to be identified as members of a special working group concerned with the Dobson and Brewer Umkehr. (John DeLuisi, 303 497 6824, and Irina Petropavlovskiki, 303 497 6279)

**9. Central UV Calibration Facility (CUCF).** The CUCF is responsible for performing yearly field calibration audits of a subset of the Brewer UV Spectroradiometers of the EPA Network. These field visits also encompass routine maintenance of the instruments and an oversight of operations. From September through November the calibration field audits were performed across the country. The calibration data are now being processed and archived. The CUCF is in the process of preparing the reports of the visit and comparisons to previous calibrations. (Patrick Disterhoft, 303 497 6355)

**10. Congressional Visit.** U. S. Representative Mark Udall will visit SRRB on December 21. He was invited by Dr. James Slusser from the Colorado State University to visit the Central UV Calibration Facility. Mr. Udall is the representative from Boulder's congressional district. Dr. Slusser is SRRB's point of contact with the USDA on matters concerning the CUCF. His invitation to Congressman Udall is part of a lobbying effort to keep the USDA's UV program, which funds the CUCF, afloat in the 2001 budget. (John Augustine, 303 497 6415)

## **Research Triangle Park**

**11. Hazardous Waste Identification Rule (HWIR) Development.** Over the last several years, ASMD has been participating in the Hazardous Waste Identification Rule workgroup. The team has been developing a multimedia, multi-pathway risk assessment tool that will be used by the EPA's Office of Solid Waste (OSW) to determine how best to dispose of waste material. The system was delivered to OSW at the end of October and the rule has been published in the Federal Register and is now available for public review and

comment. The system will continue to undergo internal and independent testing during the winter and spring. (Donna Schwede, 919 541 3255)

**12. American Geophysical Union (AGU) Conference Presentation.** An invited talk was given during the Fall Meeting of the American Geophysical Union (AGU). The talk, “Regional photochemical modeling for the Ozark Isoprene Experiment (OZIE)”, was featured at the atmospheric sciences session on biogenic volatile organic compounds (VOCs). Slides from the presentation may be viewed at [www.epa.gov/asmdnerl/biogen.html](http://www.epa.gov/asmdnerl/biogen.html). (Tom Pierce, 919 541 1375)

**13. Models-3/CMAQ Demonstration Runs.** Model demonstration and evaluation runs are now underway for selected periods during July 1995 using the Community Multiscale Air Quality (CMAQ) Modeling System. Emission inventory and other problems that were identified in earlier model runs have now been resolved. The focus of these evaluation runs will be on ozone and fine particles in the eastern United States. Data from two field experiments conducted at that time, the NARSTO-Northeast and the Southern Oxidants Study/Nashville campaigns, are being used for model evaluation, along with routine ozone and fine particle monitoring at AIRS and IMPROVE sites. The model has been configured to use 3 nested domain resolutions. A 36-km resolved grid covers the eastern U.S. Two 12-km resolved grids lie within the 36-km domain, one centered over the northeast states and one centered over Tennessee. Finally, 4-km resolved grids lie within the 12-km grids, covering the northeast urban corridor and the Nashville region of Tennessee. Diagnostic and operational model evaluation exercises will be conducted, as well as sensitivity tests exploring the effects of emissions changes, vertical grid resolution, chemical mechanism, and plume-in-grid treatment on model simulation results. (Ken Schere, 919 541 3795)

**14. Harmonization within Atmospheric Dispersion Modeling for Regulatory Purposes.** Since 1996, John Irwin has been working to draft a Standard Guide within the American Society for Testing and Materials (ASTM) Air Quality Committee’s Meteorology subcommittee (D22.11), that would outline concerns to be addressed in performing statistical performance evaluations of local-scale dispersion models. An initial draft standard was circulated in 1997, and new drafts have been offered annually. The guide promotes the philosophy that one should define a testable hypothesis, such as, which of several possible models is “closest on average” to an observed average result. Defining the testable hypothesis requires one to realize that most air quality models predict the average condition to be expected, not the fluctuations about the average. Once one has defined the model that is “closest on average,” then a test is made as to whether the differences seen in the performance of the other models are statistically significant in light of the inherent uncertainties. Coming to a final conclusion on statistical significance on differences seen is considered fundamental to promoting better model performance. This work was recently presented during a conference, held in Rouen, France. During the second day of the conference, workshops were held on special topics, and Helge Olesen of Denmark and John Irwin hosted a workshop devoted to the draft ASTM guide and the draft evaluation procedures. The next conference is tentatively planned for June 2001 in northern Italy. (John Irwin, 919 541 5682)

**15. SAIL 2000.** During 5-7 April 2000 at the Division facilities, Evelyn Poole-Kober, ASMD Librarian, will host SAIL 2000: Harness the Power of Information. SAIL (Southeast Affiliate of IAMSLIC Libraries) is the regional group of IAMSLIC (International Association of Aquatic and Marine Science Librarians and Information Centers). It is a professional organization of individuals interested in atmospheric, aquatic, and marine information science. The members of SAIL come from southeast Atlantic states, the Gulf coast, and the Caribbean Islands. They work for academia, governments, and non-profits organizations. Featured speakers for SAIL 2000 include professors from the University of North Carolina School of Information and

Library Science (SILS), School of Law, and Institute of Marine Science. The speakers are SILS Dean Joanne Marshall and SILS Professors Drs. Evelyn Daniel and Diane Sonnenwald; School of Law Professor Dr. Laura Gasaway; and Institute of Marine Science Professor Dr. Hans Paerl. (Evelyn Poole-Kober, 919 541 4536)

## **Idaho Falls**

**16. Hurricane Balloons.** A rain simulator has been constructed to help develop a capability for smart balloons to penetrate the rain bands surrounding hurricanes. It was found that a skirt of polyethylene film covering the upper half of the balloon and extend past its equator will serve to protect the balloon itself from absorbing water. Tests indicate that the modified balloons should be able to operate in rainfalls as high as 30 cm per hour. Actual precipitation rates are expected to be on the order of 8 cm per hour. Passing through rainbands will call for rapid adjustment of balloon lift. A new dual diaphragm miniature pump has been selected and tested. [randy.johnson@noaa.gov](mailto:randy.johnson@noaa.gov)

**17. Annual INEEL Exercise.** On Nov. 3, 1999, the INEEL held its annual emergency response exercise. Neil Hukari and Roger Carter staffed the two FRD positions at the Emergency Operations Center (EOC) during the exercise. The exercise scenario involved the injury of several people in a fire. The exercise went well and we were able to meet requests for meteorological support in spite of some computer equipment problems. (These were corrected subsequently.) [roger.carter@noaa.gov](mailto:roger.carter@noaa.gov) (Neil Hukari)

FRD also participated in two four-hour requalification training sessions held for all INEEL ERO teams. The sessions were held on Nov. 9 & 11 as part of the INEEL Emergency Plan/RCRA Contingency Plan required annual retraining. [dianne.hoover@noaa.gov](mailto:dianne.hoover@noaa.gov)

**18. Jackson Hole Protests Against AMWTF Continue.** As mentioned previously, residents of the Jackson Hole resort area are concerned that emissions from the planned Advanced Mixed Waste Treatment Facility will affect them. A lawsuit to block construction continues to draw the attention of DOE. All evidence indicates that the additional effluents from the operation of the AMWTF will be minuscule in comparison with current INEEL emissions, which themselves are so small that they cannot be measured directly. Current month activities included delivering a briefing of INEEL wind flows to the DOE general counsel. Next month the Idaho Department of Environmental Quality and the US EPA will be holding a series of open houses in the area to inform the public of the approval process of the AMWTF. Representatives from FRD have been invited to attend and serve as INEEL climate and dispersion experts. [kirk.clawson@noaa.gov](mailto:kirk.clawson@noaa.gov)

**19. Call for Papers for 11th Symposium on Meteorological Observations and Instrumentation.** A call for papers for the 11th Symposium on Meteorological Observations and Instrumentation (SMOI) has been issued to the scientific community. The 11th SMOI, sponsored by the American Meteorological Society (AMS) and organized by the AMS Committee on Measurements, will be held 14-19 January 2001 as part of the 81st AMS Annual Meeting in Albuquerque, New Mexico.

Presentations are solicited on all aspects of atmospheric measurements (*in situ* and remote), observations, quality assurance and quality control, instrumentation technologies, sensor performance, network design, and sampling strategies. Both research and operational instrumentation and measurement techniques are welcome.



Papers are solicited on the following areas, but are not limited to: new and evolving sensor technologies, airborne measurement platforms, sonic anemometers, meteorological measurements in harsh environments (e.g., over the ocean, in polar environments, mountainous terrain), long-term flux measurements, quality-assurance and quality control issues on the acquisition of data from in situ and ground-based remote sensors, solar radiometry, innovative lightning detection systems, optical sensors, air-sea interface measurements, and ground-truth measurement systems in conjunction with satellite remote sensors.

Deadline for abstracts is July 1, 1999. Abstracts are now submitted electronically (visit AMS Web site at <http://www.ametsoc.org/AMS> or refer to page 2143 of the Bulletin for the instructions on this new electronic procedure). AMS will provide instructions to authors of accepted papers. Camera-ready manuscripts (page length to be determined), including photos and diagrams, must be submitted by October 1, 1999 to AMS Headquarters. Page charges will be assessed to defray printing costs. Registrants will receive a preprint volume at the conference. For further information contact Jerry Crescenti at [jerry.crescenti@noaa.gov](mailto:jerry.crescenti@noaa.gov)

## Las Vegas

**20. Cloud-to-Ground (CG) Lightning Study.** The distribution of flash density with respect to terrain is being analyzed. The area of analysis includes the Spring Mountain Range, located south-southeast of the Nevada Test Site (NTS), and the Sheep Range, located north of Las Vegas, NV. The Spring Mountain Range is oriented approximately northwest-southeast and contains several peaks above 10,000 ft MSL, with the tallest peak being Mt. Charleston (11,918 ft). The Sheep Range is oriented roughly north-south, with the tallest peak being Sheep Peak (9912 ft).

A total of seven years of summertime (June through September, 1993-1999) CG flash data is being analyzed. Preliminary results indicate that the axis of maximum warm-season flash density does tend to be oriented over or near the axis of the two mountain ranges. However, the areas of maximum warm-season flash density are not located over the highest terrain. The largest flash densities (2 to 4 fl/km<sup>2</sup>/warm season) over the Spring Mountain Range are located over the extreme northern end of the range. In fact, the greatest flash density, 4 fl/km<sup>2</sup>/warm season, is located approximately 10 miles south of Mercury over terrain that is only 4300 ft MSL. A flash density of less than 1.0 fl/km<sup>2</sup>/warm season is found in the vicinity of the peaks above 11,000 ft MSL.

In the area of analysis, the most active, warm season, flash area was located just north of the small community of Blue Diamond, 20 miles west of McCarran International Airport and approximately one mile east of the Sandstone Bluffs that rise abruptly, 2000 ft from the valley floor (4000 ft MSL). A flash density of 7.6 fl/km<sup>2</sup>/warm season was detected here. This area of maximum flash activity might be driven by a single event or by strong updrafts that can form along the eastern face of the Sandstone Bluffs, develop into thunderstorms, and move eastward. Analysis of this data base will continue. (Darryl Randerson, 702 295 1231)

**21. DOE Meteorological Coordinating Council (DMCC).** A conference is being planned on "Advances in Meteorological Applications that Protect Safety and Health," to be held in Las Vegas in October 2000. (Darryl Randerson, 702 295 1231)