



NOAA ARL Monthly Activity Report



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Highlights

1. *Smart Balloon Test Success.* In preparation for a hurricane deployment in late August, a smart balloon test flight was conducted in July. The balloon was released from FRD in Idaho Falls and tracked 900 miles to Isabel, South Dakota. It was in flight for over 27 hours and performed flawlessly. A chase team following in a van tracked the balloon using GPS and a laptop. The team recovered the balloon and the entire instrument package. Development of a real-time web display of the balloon track and the raw data output were completed. The flight track and data for this test flight can be seen at <http://www.noaa.inel.gov/balloontrk> and <http://www.noaa.inel.gov/display>. (Randy Johnson, Shane Beard, Brad Reese)

Silver Spring

2. *NADP Interactions.* ARL has had a long association with the National Atmospheric Deposition Program (NADP). ARL's Maggie Kerchner is scheduled to take over as Vice Chair of the NADP. In the interim, she has the lead for arranging the Fall Technical meeting in Norfolk, Virginia. At this time, the focus of the Program's meeting will be Deposition of Pollutants to Coastal and Estuarine Environments, emphasizing linkages with the National Water Quality Monitoring Network and Integrated Observing Systems. margaret.kerchner@noaa.gov

3. *Changes in Cloud Properties.* In collaboration with Bomin Sun and Tom Karl, both at NOAA's National Climatic Data Center, a study of changes in cloud properties in the U.S. since 1950 is underway. The study employs surface-based NWS and military observations and attempts to determine which observations are useful from a climate perspective, given the major changes in the observing system due to the introduction of the Automated Surface Observing System (ASOS) in the early 1990s. ASOS severely reduced the height range and variety of cloud observations, and effectively brought to an end Jim Angell's long-term US cloudiness and sunshine monitoring efforts. dian.seidel@noaa.gov

4. *Climate Monitoring Requirements Study.* An analysis has been completed of the effects of changes in observing schedule on estimated temperature trends from upper-air observations. It is found that changes in the time of day of the soundings can introduce inhomogeneities in time series that lead to erroneous trend estimates. Changing the observation time has a greater effect than reducing the number of days per month on which observations are made. These results have now been included in a manuscript that addresses a variety of climate monitoring requirements for upper-air temperature. dian.seidel@noaa.gov

5. *Restoration of the Chesapeake Bay.* A high-level federal agency meeting is planned for October 7, at the U.S. EPA headquarters in Washington DC to discuss Chesapeake Bay restoration. NOAA will be represented by the Deputy Assistant Secretary. Input for the meeting is being prepared by ARL staff at NOAA's Chesapeake Bay Office in Annapolis. margaret.kerchner@noaa.gov

Boulder

6. *SURFRAD/ISIS.* All SURFRAD and ISIS pyranometers and pyrhemometers that needed calibration this year were calibrated at NOAA's Climate Monitoring and Diagnostics Laboratory (CMDL) calibration facility in Boulder, Colorado. Prior to this year, the SURFRAD and ISIS solar instruments were calibrated by the Department of Energy's National Renewable Energy Laboratory in Golden, Colorado. Both facilities use cavity radiometers that are traceable to the World Radiation Reference in Davos, Switzerland. john.a.augustine@noaa.gov

7. *Dobson Umkehr Measurements Dataset Reprocessed.* The reprocessing of the historical dataset of Dobson Umkehr measurements archived at the World Ozone and UV Data Center (WOUDC) in Toronto, Canada, has begun. The recently updated ozone profile retrieval algorithm (UMK04, GRL 2005) is being used. The new algorithm is designed to produce time-series of ozone data for a long-term climatological study, including ozone recovery. The reprocessed dataset will be archived at the WOUDC and made available for the upcoming WMO Report on the Ozone Assessment. irina.petro@noaa.gov

Oak Ridge

8. *Canaan Valley CO₂ Studies.* A new CO₂ sensor has been installed at the NOAA's/CVI's Air Quality Research Station on the Canaan Valley National Wildlife Refuge. The sensor's high-precision measurements of CO₂ concentration complement the measurements already being taken of CO₂ flux. Mercury content in samples of soil, stream sediment, and vegetation is being analyzed in a collaboration between the Canaan Valley Institute (CVI) and Duquesne University. The samples were collected from an area established for long-term ecological study on CVI land. Monitoring equipment for both wet and dry deposition of mercury is to be installed in the area this fall. This supports an integrated approach to understand mercury pathways through Highland watersheds. chris.vogel@noaa.gov and Tilden Meyers

9. Twin Otter Upgrades. Phil Hall traveled to Calgary, Canada to examine the British Antarctic Survey's Twin Otter aircraft currently undergoing air safety certification for a BAT Probe system. Their trail-blazing with certification and installation will benefit the similar work scheduled for October on NOAA's Twin Otter. (P. Hall)



10. Urban Dispersion Study. Planning continued for the Urban Dispersion Program, scheduled to begin in midtown Manhattan on August 6 (weather permitting). The study will last about three weeks, with up to six intensive observing periods (experimental days). A radar wind profiler, rawinsonde system, up to six minisodars on rooftops, and up to a dozen rooftop wind/weather instrument systems will supplement the existing NYC meteorological observation network. On IOP days, SF₆ and up to six perfluorocarbon tracers (PFTs) will be released and sampled. Some sampling will be conducted in a few select buildings to look at the transfer of airborne material into the HVAC systems of modern urban structures. Some subway sampling will also be conducted to examine the role of the subway system in moving airborne materials through the city. On IOP days, a network of ten or more 3-D sonic anemometers in tripods will be set up near the source locations to provide near-street-level wind and turbulence data. ATDD is providing staff and up to ten notebook computers to log sonic anemometer data, in collaboration with Brookhaven National Laboratory. ATDD will also operate a laser ceilometer borrowed from LLNL to record aerosol backscatter as an indicator of mixing layer depth. ray.hosker@noaa.gov, Lauren Gunter, LaToya Myles, and Tilden Meyers

Research Triangle Park

11. Earth Observations and Human Health Workshop. The Environmental Protection Agency and National Institutes of Environmental Health Sciences co-sponsored the Workshop and invited approximately 50 scientists—data producers, data organizers, and data users—to participate in the first data user workshop on Earth Observations and Human Health Sciences. Recognizing that the Global Earth Observation System of Systems (GEOSS) is the appropriate platform to use for studying the link between human health and air quality, the Workshop focused on the use of air quality data from NOAA and NASA satellites and the EPA/NOAA's Community Multiscale Air Quality (CMAQ) modeling system, to identify the link between air quality and heart disease and asthma attacks. The goal of the Workshop was to identify data user requirements and products that would allow GEOSS air quality and climatological data to be used in public health tracking, research, and planning, and clinical management of disease. The 10-year plan for GEOSS, which includes surface-based, airborne, and space-based monitoring networks, was endorsed in February 2005. The Strategic Plan for the U.S. Integrated Earth Observation System, released in May 2005, provides the framework for GEOSS. The workshop participants agreed to promote two multi-agency demonstration projects, bringing GEOSS to the front of air quality and human health issues. Working through NOAA's Satellite and Information Service, one of the demonstration projects involves using historic Geostationary Operational Environmental Satellite (GOES)-derived aerosol information along with similar data from NASA satellites, and offline EPA/NOAA's CMAQ modeling system. A second project proposes the use of Advanced Very High Resolution Radiometer Vegetation Health data to learn whether the release of pollen and other allergens from trees has an impact on asthma attacks in children. A follow-on workshop addressing the requirements for these two demonstration projects is planned for early FY-2006. Dr. S.T. Rao worked with the EPA on planning the first meeting and gave the opening talk entitled "Integrating Air Quality Data to Inform Human Health Decisions," which set the stage for the Workshop. st.rao@noaa.gov

12. Expansion of the Air Quality Forecast Guidance to Eastern United States. To date, air quality forecasts produced by NOAA's National Weather Service (NWS) and the Environmental Protection Agency (EPA) provided guidance for the northeastern United States only. Efforts to expand the guidance to cover 13 additional states, which include the Gulf States and Mississippi Valley as far west of the Texas Panhandle, have been successful. This expansion will be three times the size of the NWS initial operational domain, and will enable state and local agencies to issue enhanced and more geographically specific ozone air quality warnings to the public. During several months of real-time testing, the expanded capacity and the improved air quality forecast algorithms for cloudy conditions demonstrated target forecast accuracy. The testing conditions included several episodes of poor air quality arising from the build-up of ground-level ozone caused by this summer's hot sunny weather. The enhanced air quality forecast capacity will provide hour-by-hour graphical ozone forecasts for urban and rural communities, with geographic specificity greater than currently possible with metro area-wide alerts. This information will be on the NOAA and EPA data servers, and will be available to the public and state and local air quality forecasters. The air quality forecast capability is being built collaboratively by a team of NOAA and EPA scientists from OST, NCEP, CIO, ARL, EPA/ORD, and EPA/OAQPS. rohit.mathur@noaa.gov

13. Community Multiscale Air Quality (CMAQ) Model – Updating the Chemistry. An updated Carbon Bond (CB05) Mechanism has been developed for the Community Multiscale Air Quality (CMAQ) model. The updated mechanism will be appropriate for use as a general tropospheric chemistry mechanism so that it can simulate a wide variety of conditions found throughout the United States, including urban, rural and pristine areas, winter temperatures, and high altitudes than the previous CB4 mechanism. The base mechanism contains 156 reactions and 51 chemical species. Rate constants for all reactions have been updated using the latest kinetic data recommended by the National Aeronautics and Space Administration/Jet Propulsion Laboratory and the International Union of Physical and Analytical Chemists. This chemical mechanism has been evaluated by comparing simulation results with smog chamber data from the University of North Carolina at Chapel Hill and the University of California, Riverside. The CB05 mechanism is currently being incorporated into the CMAQ model. Two additional versions of the CB05, one including chlorine and another with explicit toxic pollutants, have also been developed for inclusion into CMAQ. A beta version of the CMAQ model with the updated base CB05 will be released in the fall of 2005. (Golam Sarwar, 919 541 2669; Deborah Luecken, 919 541 0244).

14. Upcoming Release of the Community Multiscale Air Quality (CMAQ) Model v4.5. In support of the CMAQ model v4.5 release, simulations have been underway to evaluate model performance. An annual simulation at 12-km×12-km horizontal grid resolution for the Eastern United States is being evaluated for speciated aerosol, ozone, and wet deposition predictions. The results from this evaluation will be included with the CMAQ v4.5 public release as a technical report in September 2005 and will be presented at the American Meteorological Society Golden Jubilee, September 21, 2005, and the 4th Annual Models-3 CMAQ Workshop on September 26, 2005. alice.gilliland@noaa.gov; wyat.appel@noaa.gov

15. Air Quality Forecast Model Development, Testing, and Evaluation. Air quality forecast applications with the Community Multiscale Air Quality (Eta-CMAQ) modeling system have continually been evaluated for the eastern and continental United States developmental runs. Relatively high O₃ over the complex terrain regions in the western United States were noted. Diagnostic evaluation with a variety of boundary tracers suggest that simulated elevated surface level O₃ in these regions arises from a combination of effects including high boundary layer heights (which were verified against available profiler data) coupled with high O₃ levels in the upper troposphere; the upper tropospheric O₃ levels are primarily dictated by lateral boundary conditions derived from the National Centers for Environmental Prediction's (NCEP) Global Forecast System (GFS) model. In the GFS, O₃ is initialized using the Solar Backscatter Ultra Violet (SBUV-2) satellite observations. The evolution of the 3-D O₃ fields in the GFS is then simulated by its transport schemes and a zonally averaged production and depletion scheme. Comparisons of 2004 forecast results with ozonesonde measurements from the INtercontinental chemical Transport Experiment (INTEX) Ozonesonde Network Study (IONS) deployed during the International Consortium for Atmospheric Research on Transport and

Transformation (ICARTT) study show high model bias above 6km. To limit such effects, the use of the GFS was discontinued in the developmental continental forecast runs. In the eastern United States of the domain, the use of the GFS was further limited to the top-most model layer. These changes helped reduce the model bias in O₃ predictions. rohit.mathur@noaa.gov

16. Climate Impact on Regional Air Quality (CIRAQ). The first draft report of the Climate Impact on Regional Air Quality (CIRAQ) project has been completed and distributed to team members for review. An analysis of the current climate simulation, which was generated to test the ability of a regional climate model to represent the climate of the past 10 years, was included as a section in the report. Below are some of the main results of the analysis.

- The regional climate model performed well relative to observed climate for some seasons and geographic regions of the United States. The dominant near-surface wind flow regimes and temperature and precipitation patterns over much of the central United States, Great Plains, and Midwest during the winter seasons are captured. The northeastern United States and New England are also well-represented by the climate model, both in winter and summer. There were mixed results for the western half of the United States, for all seasons.
- The general representation of the summer climate (June, July, August) over the southeast quadrant of the United States and for much of the midwest is poor. The main reason is the failure to simulate the Bermuda High well enough. The simulated climate consistently centered this ridge of high pressure anywhere from eastern Texas to the Great Lakes.
- The simulated climate over the eastern United States during the wintertime is also poor, excluding areas of the Northeast and New England. The evidence suggests that the simulated climate has a suppressed polar Jet Stream, which frequently allows unusually cold air masses to anchor over most of the eastern United States. robert.gilliam@noaa.gov

Idaho Falls

17. New York City Study. Preparations were concluded this month for the Urban Dispersion Program (UDP) scheduled to begin in August. The conditioning of the continuous analyzers was completed in the laboratory while supplies and equipment were packed for the cross-country trip to New York City. Roger Carter provided continuous analyzer, sampler, and safety training for those people involved in the release, operation and sampler servicing portions of the study. Training was greatly modified for this complex study and covered 3.5 days. Included in the training were classroom lectures and discussions, written tests, videos and hands-on operation of the continuous analyzers and samplers. roger.carter@noaa.gov, Debbie Lacroix

An SF₆ background study in New York City was conducted from July 9-14 to further determine any fugitive sources of SF₆ in the intended study area. Six sites were selected for this study: three sites along 7th Ave. at 45th, 49th, and 54th Streets (focusing on Times Square); one at Rockefeller Center on 5th Ave. and 49th St.; and two sites on Park Ave. on 46th and 54th Streets (focusing on Grand Central Terminal). One-hour bag samples were taken at all 6 sites continuously over the 5-day sample period. Analysis was completed in three days. SF₆ background levels were higher than anticipated and previously measured by a mobile real-time analyzer in January 2004. The results may lead to possible sampling modifications for the coming field program. kirk.clawson@noaa.gov, Debbie Lacroix, Roger Carter, and staff

18. Extreme Turbulence Probe. Although ARL is not deploying ET probes this year, we were able to provide some assistance to the other hurricane intercept teams we have been collaborating with. During Hurricane Ivan last year, ARL was able to use personal contacts to deploy at a Navy airfield called NOLF Wolf. In July of this year, Hurricane Dennis struck the Gulf Coast at nearly the same place as Ivan. NOLF Wolf appeared to again be an ideal deployment location. ARL staff was able to assist the Texas Tech

hurricane intercept team, lead by Dr. John Schroeder, in gaining access to Wolf for Dennis. In past years, ARL has coordinated with the Texas Tech team during hurricane deployments. richard.eckman@noaa.gov, Phil Hall and Ed Dumas, ATDD

Las Vegas

19. NOAA CIIASTA - Urban Air Quality Study. Meteorological support is being provided to the Clark County Air Quality Study. Radiosonde and pibal observations were taken at several locations in the Las Vegas Valley during July. Up to four radiosonde observations were taken at the different locations, and up a dozen pilot balloon runs per day. These data were set up as graphical plots, which were sent to SORD's Web Server for display. The prompt display of these products on the SORD website greatly facilitated their use. rick.lantrip@noaa.gov, Abbott, Sanders, Soule, Bullard

20. Ozone Data from Upwind of Las Vegas. ARL/SORD, in collaboration with ATDD (Oak Ridge) is operating ozone sensors at several locations upwind of the Las Vegas urban area, to provide data that might be indicative of the extent to which long range transport contributes to exceedances downtown. The first results are now coming in. The upwind data generally fail to show the strong diurnal cycle that is familiar to most researchers. The same behavior has been found in the ETOS program in East Tennessee, but perhaps because of different reasons. darryl.randerson@noaa.gov

21. IMPROVE Steering Committee. Marc Pitchford chaired the IMPROVE Steering Committee meeting at Acadia National Park, ME. The meeting followed a half day tour of the IMPROVE site and collocated equipment from other monitoring programs at Acadia NP. Much of the meeting entailed presentations and discussions concerning network operations including a review of the data recovery statistics for the 172 site monitoring network (overall annual recovery of 94%); plans for upgrading the aerosol monitoring data processing and quality assurance system at the UC-Davis; changes to the carbon analyzers and SOPs at Desert Research Institute; EPA's independent aerosol monitoring audit program; and planned revisions to the aerosol monitoring Quality Assurance Program Plans. There was a lively discussion of plans to revise the IMPROVE algorithm for estimating light extinction from aerosol species concentrations. The current algorithm is cited in EPA's guidance for tracking trends for the Regional Haze Regulation as part of the official approach for determining the haze metric. The current algorithm was developed about 20 years ago needs to be updated to reflect the latest technical literature. However because of its link to regulation, there is a great deal of interest in the timing and nature of changes by those affected by regional haze regulation. A subcommittee was named to make specific proposals by the end of September for consideration by the Steering Committee. The meeting also included progress reports on a number of special studies including results of the nitric acid denuder performance, intensive ion seasonal studies at several sites, PM₁₀ speciation monitoring for a year at 10 sites, development of a special studies mobile lab, and the Rural Aerosol Intensive (RAIN) Network currently consisting of three remote area sites (including Acadia) of high time resolutions aerosol speciation and precursor gas instrumentation sponsored by the MANE-VU, the northeastern regional planning organization. marc.pitchford@noaa.gov