



NOAA ARL Monthly Activity Report



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Highlights

1. *Bronze Medals Awarded to the Community Multiscale Air Quality Modeling Team.* The ARL Community Multiscale Air Quality (CMAQ) Modeling Team was awarded an EPA Bronze Medal for their contributions to the development and application of the Nation's premier numerical air quality simulation model at EPA/ORD award ceremonies in Cincinnati, Ohio, on August 10, 2005. The CMAQ model underpins the air quality forecasting program now evolving in NOAA. ASMD members honored by this award include Dennis Atkinson, Prakash Bhave, William Benjey, Russell Bullock, Jason Ching, Ellen Cooter, Robin Dennis, Patrick Dolwick, Brian Eder, Mark Evangelista, Robert Gilliam, Alice Gilliland, Jerry Gipson, James Godowitch, William Hutzell, Deborah Luecken, David Mobley, Tanya Otte, Thomas Pierce, Jonathan Pleim, George Pouliot, Shawn Roselle, Kenneth Schere, Donna Schwede, Gary Walter, and Jeffrey Young. kenneth.schere@noaa.gov

2. Air Quality Forecast Model Development, Testing, and Evaluation. Air quality forecast applications with the Eta-CMAQ modeling system have been continually evaluated for the eastern United States and continental United States developmental runs. Comparisons of model predictions over the eastern United States and continental United States domains over the region of overlap show lower bias in predicted surface-level O₃ forecasts and suggest improvements in model performance arising from enhancements in the model's treatment of cloud mixing and photolysis attenuation effects.

On August 31, 2005, NOAA and the Environmental Protection Agency (EPA) expanded the operational air quality forecast guidance to include the majority of the eastern United States domain. 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. rohit.mathur@noaa.gov

3. The NOAA Center for Weather and Climate Prediction (NCWCP). In the Spring of 2008, ARL Headquarters will be joining NCEP and several other research groups in a new facility located near the University of Maryland. The ground and building leases were executed and will be signed in early September. Several key contracts should be awarded by the end of September 2005. A Kick-Off meeting and presentation to NOAA executives will take place on September 15. A Ground Breaking Ceremony is expected to take place around November 15, 2005. donna.gray@noaa.gov

4. Mercury and the Great Lakes. The FY 2005 Congressional Appropriations Bill contains language from the House Appropriations Committee that directs NOAA "...to report to the Committee on mercury contamination in the Great Lakes, with trend and source analysis, by July 31, 2005." A report been reviewed by OAR, NOAA, and DOC. It is now being sent to EPA for review. After EPA review, it will be re-reviewed at DOC and then sent to OMB for additional review.

In parallel work, a multi-media mercury (Hg) modeling system is being developed in a collaborative project with EPA and the Environmental and Occupational Health Sciences Institute at Rutgers University. The overall modeling system will encompass atmospheric fate and transport, aquatic fate and cycling, aquatic bioaccumulation, human exposure, and risk assessment. The model is currently being developed for Lake Ontario, but it is anticipated that it could be adapted to other water bodies. Recent activities include: (a) a Quality Assurance Project Plan (QAPP) has been prepared for the atmospheric modeling component of the project and submitted to the EPA Quality Assurance team; (b) the Principal Investigators have worked with the International Joint Commission (IJC) to produce an extensive scientific description of the project, to be included in the forthcoming 2003-2005 IJC Priorities Report; (c) a proposal for a special session related to the project has been proposed for the 2006 Conference on Mercury as a Global Pollutant. mark.cohen@noaa.gov

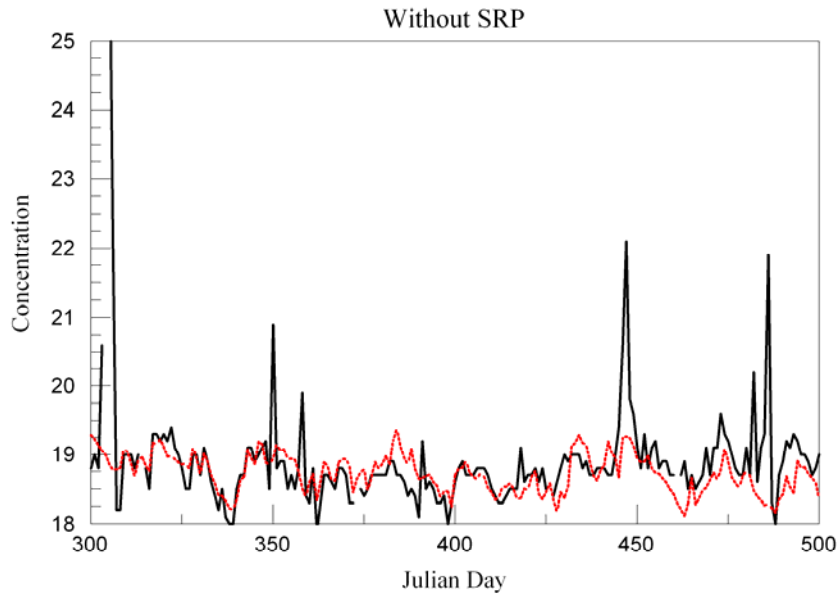
Silver Spring

5. Atmospheric Mercury Modeling with HYSPLIT. The HYSPLIT-Hg modeling system is being refined. This system augments the fully Eulerian system developed as an adjunct to the CMAW modeling system by ARL at Research Triangle Park. The HYSPLIT-Hg approach allows the effects of specific sources to be examined in considerable detail. The new refinements will result in several advantages over the previous version, including the ability to perform global simulations. The new system will also attempt to include natural mercury sources and re-emissions of previously deposited mercury. The first exercise of the new model will be to evaluate its predictions against the atmospheric mercury measurements made during Summer 2004 at two sites on the Eastern Shore of the Chesapeake Bay (Oxford and Wye). To this end, work has proceeded (with Paul Kelley, Winston Luke, Steve Brooks and others) to assemble an integrated data set for that field experiment. mark.cohen@noaa.gov

6. Preparations for a Gulf States Mercury Study. A preliminary screening study regarding potential mercury air sampling sites in the Gulf of Mexico region was conducted. Several potential sampling sites and regions were identified and investigated. One of the most promising locations was in the Pascagoula, MS area, due to its location relative to large mercury sources, an extensive NOAA presence in the area, and two nearby National Estuarine Research Reserves. However, the area suffered extensive damage during Hurricane Katrina, and its suitability for near-term sampling must be re-considered. mark.cohen@noaa.gov, Richard Artz

Work on a project analyzing Mercury Deposition Network (MDN) data is continuing. This project is being carried out through an Interagency Agreement with EPA's Clean Air Markets Division, and involves a collaboration between ARL, the Institute for Ecosystem Studies at Cornell Univ. (Tom Butler), and EPA. The MDN consists of ~80 sites at which weekly mercury wet deposition measurements are made. The data are being analyzed to attempt to determine the extent to which local and regional sources impact the measurements at the sites. Maps have been made of mercury emissions from different EPA inventories in the regions surrounding each of the MDN sites. The problem is being approached from many directions. In one approach, temporal trends in measurements at each site are being considered in relation to emissions trends in the surrounding region. In another approach, back-trajectories are being used to evaluate whether local and regional sources have a significant impact on measured deposition. In a third approach, forward dispersion modeling from the sources is being conducted to estimate the impact of local and regional sources – as well as sources more distant – on each of the MDN sites. It is anticipated that the different approaches will be synthesized to develop the best possible understanding of the phenomena involved. mark.cohen@noaa.gov, Tom Butler, tjb2@cornell.edu

7. Estimating the Background Concentration of Global Pollutants. Measurements of Krypton-85 made from 1982 through 1983 have been re-examined to determine if it is possible to develop a more quantitative method to correct for effects of changing background concentrations. The data were originally collected to test models of long-range transport and dispersion of Krypton-85 emitted from the Savannah River Plant (SRP - a nuclear fuel reprocessing facility in South Carolina). Five sampling sites were established along the northeast coast of the US from 300 to 1000 km from the plant (Fayetteville, NC to Murray Hill, NJ) for the 18 month-long experiment. In previous examinations of these data, a constant background concentration was assumed. However, because virtually all of the Krypton-85 sources are in the northern hemisphere (most of the major sources are in Europe and Asia), many of the smaller fluctuations in the measurements can be due to long-range sources. This was not an issue for the samplers near SRP, but the most distant sampler (located at Murray Hill, New Jersey) was frequently affected by a fluctuating background concentration and very low contributions from the SRP. A numerical solution to the problem was tested by solving the advection-diffusion equation on 3-dimensional grid identical to the 2.5 degree pressure-level NCEP/NCAR reanalysis data. The model was initialized with a latitudinal Krypton-85 gradient appropriate for January, 1982, and then run for two years with continuous emissions from the eight known major sources of Krypton-85. All the emission and sampling data are available in various journal publications. The illustration below shows the time series of daily Krypton-85 measurements at Murray Hill and the corresponding model predictions (excluding the SRP source) 300 to 500 days after the start of the simulation. Not only are there obvious spikes attributable to the SRP output, but also the agreement in background behavior seems encouraging. roland.draxler@noaa.gov



8. Climate Short Course. On August 1, 2005, the AMS Committee on Climate Variability and Change sponsored a one-day *Short Course on Climate and the Media: Understanding and Communicating Climate Variability and Change*, in conjunction with the 34th Conference on Broadcast Meteorology, the 21st Conference on Weather Analysis and Forecasting and the 17th Conference on Numerical Weather Prediction. The course was held at the Omni Shoreham Hotel in Washington DC and featured a panel discussion by broadcast meteorologists and science writers on the challenges and opportunities of communicating the nature and consequences of a changing climate. The discussion was followed by presentations by climate scientists on the following topics: overview of the Earth's climate system; recent developments in climate forecasting and new products; and understanding and explaining climate change. The course format very successfully allowed for plenty of interaction among participants and open discussion. About 65 individuals, mainly broadcast meteorologists, attended the course. Follow-up activities to provide better and more regular information regarding climate science to broadcasters are planned. dian.seidel@noaa.gov

9. Tropical Tropospheric Temperature Publication. An article by Ben Santer and colleagues (including Dian Seidel and Melissa Free) appeared in the August 11 issue of *Science Express* (the online version of *Science*) and will later appear in print. The paper demonstrates that both climate model simulations and most, but not all, observations, support the notion of enhanced variability of tropical tropospheric temperature as compared with surface temperature, consistent with theoretical expectations. This is true both for short and long time scales. The outlier observations, which show long-term cooling aloft relative to the surface, include one version of satellite Microwave Sounding Unit data as well as radiosonde data. The implication is that those two datasets have uncorrected errors that lead to the appearance of excessive cooling in the tropical troposphere. For radiosonde data, another study by Sherwood et al. published simultaneously in *Science Express* suggests the problem may be an undercorrection of daytime radiation error. For the MSU data, a third simultaneous publication by Mears and Wentz suggest a problem in the approach to diurnal cycle correction taken by investigators at the University of Alabama at Huntsville. dian.seidel@noaa.gov

10. Trajectory Cluster Analysis. It is now planned to add a trajectory cluster analysis program to the HYSPLIT PC package. This will serve as an analysis tool for sets of trajectories, up to many hundreds, produced by the PC package. The cluster program, currently used in-house in a UNIX platform, has been transferred to the PC platform, and scripts for running it through the HYSPLIT PC GUI have been developed.

Once the GUI-accessible “Help” information is finalized, it will be ready for beta-testing. barbara.stunder@noaa.gov

Boulder

11. SURFRAD/ISIS. On August 26, the NOAA Climate Board was briefed on the Surface Energy Budget Network (SEBN). This briefing followed an earlier presentation to the Climate Board on the future of NOAA’s Surface Radiation Budget Network. The intent is to add surface heat fluxes to the network to complete the measurement of the total surface energy budget, to show plans for integration of these measurements and network expansion, and to rationalize the closure of the ISIS network. Comments from the attendees were generally favorable. The primary action item from the board was for us to develop performance measures for the integrated network.

A meeting was held at NOAA in Boulder concerning pyrgeometer calibration issues, on August 31. In attendance were Ibrahim Reda and Tom Stoffel of DOE’s National Renewable Energy Laboratory, Ellsworth Dutton, Joe Michalsky, John Augustine, and Chris Cornwall. Ibrahim Reda gave a presentation entitled “A comparison between CMDL and NREL blackbodies including the four equations.” The discussion centered on considerations leading to the development of a pyrgeometer calibration standard. john.a.augustine@noaa.gov

12. Rotating Shadow Band – Interaction with Korea. Jeong Eon Kim, a graduate student of Young J. Kim, who worked in Boulder NOAA with John DeLuisi for many years, spent the three summer months in Boulder. She is from the Gwangju Institute of Science and Technology in Gwangju, South Korea. She worked with Joe Michalsky and Irina Petropavlovskikh on comparing three ultraviolet (UV) moderate spectral resolution models with UV and visible rotating shadowband spectroradiometer data taken during the DOE/ARM Aerosol Intensive Observation Period in May 2003. Comparisons of diffuse and direct solar spectral irradiance show clear differences in the models and measurements, which we are still trying to understand. This work will continue and is expected to become part of her dissertation. joseph.michalsky@noaa.gov

Oak Ridge

13. CASTNet interactions. An intensive operation period (IOP) was conducted at the Clean Air Status and Trends Network (CASTNet) site in Beltsville, MD during the month of August. The purpose of the IOP was to evaluate the operational capability of the MARGA (Monitoring instrument for AeRosols and GAses), which measures ambient concentrations of inorganic aerosols (NO_3^- , SO_4^{2-} , Cl^- , NH_4^+ , Na^+ , Ca^{2+} , Mg^{2+} , and K^+) and gases (HNO_2 , HNO_3 , SO_2 , HCl , and NH_3). Several continuous instruments and passive samplers were deployed for comparison with the two onsite MARGAs. ATDD operated annular denuder systems (ADS) for 6-hour sampling periods over 4 weeks to measure the time series of NH_3 , SO_2 , HNO_3 , NO_3^- , and SO_4^{2-} concentrations. Species concentrations from the ADS will be compared to data from the other systems that were deployed during the IOP and archived to a CASTNet database. latoya.myles@noaa.gov, Meyers, Klemenz, Heuer

14. University of Alabama Airborne Measurements Collaboration. Spatial heterogeneity in air-surface fluxes was sampled in a recent intensive experiment involving airborne and surface measurements near Champaign IL. Airborne flux measurements followed a polygonal path of about 35 km total length using Alabama’s Sky Arrow environmental research airplane. The polygonal path increases flexibility in covering tower sites and other areas of interest as well as in avoiding fixed obstacles on the ground, but it puts gaps in the timeseries. These must be handled properly to account for all turbulence scales. A method to treat such nonconnected time series is in development. Facilitating software was written in August. ron.dobosy@noaa.gov

15. *Urban Dispersion Study.* A multi-agency multi-organization study of transport and dispersion in New York City began in early August and ended on August 24. There were six daytime experimental periods, with three multi-tracer releases conducted on each day. The tracers included SF₆ (releases handled by ARL's Field Research Division, with sampling by FRD and LLNL) and several perfluorocarbon tracers (PFTs), released and sampled by Brookhaven National Laboratory staff. ATDD staff worked with BNL personnel to install meteorological equipment on the roofs of several mid-town Manhattan buildings to supplement available met data, and to set up and remove street-level wind measurement systems (3-D sonics) at about 10 locations near the various tracer release points. We also assisted Argonne National Laboratory in setting up a mini-sodar near the USCG station at Battery Park in lower Manhattan, and we set up and operated a ceilometer (borrowed from LLNL) on the roof of the U.S. Post Office near Madison Square Garden, to measure aerosol-induced backscatter as an indicator of mixing layer depth. ATDD also participated in the planning and oversight of the field study. ray.hosker@noaa.gov, Gunter, and Meyer

Research Triangle Park

16. *International Consortium for Atmospheric Research on Transport and Transformation (ICARTT).* Three division scientists attended the International Consortium for Atmospheric Research on Transport and Transformation (ICARTT) Data Analysis Workshop at the University of New Hampshire, Durham, New Hampshire in August. There were 67 oral presentations and 103 posters presented. The topics covered chemistry of power plant plumes, daytime chemical processing, nighttime chemistry, chemistry of halogen species, regional model evaluation and analysis, air mass characterization and sources, reactive nitrogen, upper tropospheric ozone enhancements and photochemistry, transatlantic and transpacific transport, aerosol sources and distributions, and aerosol optical properties. A wealth of data is coming available from the ICARTT study. Of special interest are the results of the nighttime chemistry studies, which may shed light on the Community Multiscale Air Quality (CMAQ) modeling parameterization of the hydrolysis reactions of N₂O₅ to HNO₃ (Steve Browne of the Aeronomy Laboratory). There is interest and potential for further collaboration in measurement design to support an evaluation of CMAQ's nighttime chemistry and an improvement of the parameterization of the hydrolysis reactions. Several talks used species ratios and analyses to further probe the accuracy of emissions inventories. Interesting chemical signatures of biomass burning plumes were noted from aircraft studies. There were many observations within and above the marine boundary layer. In the marine boundary layer sea salt was found to be rapidly scavenged and >90% of the particles were internal mixtures. Further collaboration was discussed with Delhousie University regarding satellite measurements of the NO₂ column. In a model intercomparison talk, CMAQ came out pretty well. There may be five successful Lagrangian air mass interceptions across the Atlantic, two of which are being actively studied. These may turn into evaluation cases regarding intercontinental transport from North America to Europe. robin.dennis@noaa.gov

Idaho Falls

17. *Urban Dispersion Program (UDP) -- Tracers.* FRD began the field deployment phase of UDP 2005 on August 1, with the arrival of eight FRD staff in New York City. During the first week, 5 real-time SF₆ tracer analyzers were installed in vans for mobile deployment, 40 sampler sites in Midtown Manhattan were outfitted for later sampler deployment, and the SF₆ tracer release mechanism was fully prepared for field use. Beginning on August 8 and continuing through August 24, six intensive observation periods (IOP's) consisting of two or three ½-hour releases of SF₆ tracer were conducted under various meteorological conditions. The experiment called for the first three IOP's to be focused on infiltration of the tracer into a major skyscraper with two 30- minute releases of SF₆ tracer in a six-hour period. The last three IOP's were focused on outdoor tracer dispersion with three 30-minute releases of SF₆ tracer in a six hour period. The study generated much interest from the media. More than a dozen interviews were given to both major and minor media outlets, including ABC, CBS, NBC, and CNN. The sampler boxes generated much public attention, especially with the public awareness advertising blitz in NYC "If you see something, say something." The combined effect elicited many calls to 911 to report suspicious packages being left on light

poles in the Midtown area. In all, the deployment was a complete success, with the collection of a very unique urban dispersion dataset. For other FRD staff that remained in Idaho, the month was dedicated to preparing the tracer analysis facility for the arrival of the samples from New York City. kirk.clawson@noaa.gov & staff

18. Perfluorocarbon Analysis Capability. Ten new perfluorocarbon calibration standards were received this month. Each standard contains three analytes including perfluorodimethylcyclobutane (PDCB), perfluorodimethylcyclohexane (PDCH), and meta-perfluoromethylcyclohexane (m-PMCH). Initial studies have proven that the existing sample handling systems in the laboratory are too contaminated for perfluorocarbon analysis. It has become apparent that the method setup for these analytes may become an arduous task. debbie.lacroix@noaa.gov

19. Smart Balloon. A total of three balloons and some spare parts for a fourth smart balloon were completed and tested for shipment to participate in the RAINEX experiment. Shane Beard and Randy Johnson were deployed to Coast Guard Air Station Borinquen near the town of Aguadilla in northwestern Puerto Rico. The Coast Guard allowed their large hanger to be used for inflation and testing of the smart balloons and use of their internet at the community center library. randy.johnson@noaa.gov and Shane Beard

20. Mesoscale Modeling. Since April, the MM5 point forecasts for several INL facilities have been archived for possible use in verification efforts. An effort is now under way to evaluate MM5's performance by comparing the model point forecasts with data from the INL Mesonet. The focus will initially be on the wind speed and direction, temperature, and the dew point. Eventually, it is hoped that the model's past performance statistics can be combined with the current forecast to provide a more probabilistic forecast of weather conditions at INL, including an estimate of the uncertainty in the forecast variables. richard.eckman@noaa.gov

Las Vegas

21. New Graphics for Displaying Meteorological Data. As the focus slowly shifts towards extending mesonet coverage into urban areas, there is increased attention being given to the presentation of data in a user-friendly way. Three new graphics products are being produced hourly that display temperatures, dew points, winds, and some weather phenomena (rain, snow, thunderstorms). These new graphics utilize SORD's new mesonet data, hourly surface observations from other sources within the area, and data from Meso-West. These new plots get updated at approximately 20-25 minutes after the hour. The data from the Meso-West tend to not be complete until more than ½ hour after the hour. This product is run again at about 10 minutes before the hour to get more stations. These graphics are available on SORD's Web Page under meteorological data/graphics. douglas.soule@noaa.gov, James Sanders, Walt Schalk

22. SCORPION Project. The ARL/SORD provided on-site dispersion forecasts for the Scorpion Test Series. The primary purpose of the test was to provide a controlled environment for chemical dispersion testing. Testing occurred at both the NPTEC (Formally the Hazmat Spill Center (HSC)) and the Site C region of Area 25. The support provided included short and long term (5 to 10 days) weather forecasts, lightning and severe weather warnings, and wind trend advice to the NPTEC control center. The product most desired was the dispersion forecast generated from these inputs. james.sanders@noaa.gov

23. NOAA CIIASTA - Urban Air Quality Study/RAMS Model. Much work during August included developing and initiating an urban air quality study for the Las Vegas valley in conjunction with ozone sensors and technical advice supplied by ATDD and ARL HQ. Two sites for the 2B ozone sensors were selected and instruments installed. Preliminary data from pristine areas appear to be reasonable and display strong diurnal cycles.