



NOAA ARL Monthly Activity Report



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1. *Highlight – NOAA MSI PhD Student Success.* LaToya Myles was awarded a Ph.D. in Environmental Science during fall commencement exercises at Florida A&M University in Tallahassee. She was recognized as one of the first two doctoral graduates from the university's Environmental Sciences Institute. She successfully defended her dissertation, "A Study of Atmospheric Ammonia in Coastal Ecosystems Utilizing Ion Mobility Spectrometry and Relaxed Eddy Accumulation Techniques," in early December. Bruce Hicks from ARL served on her committee. Congratulations to Dr. Myles!

Silver Spring

2. *International Mercury Modeling Intercomparison.* The European environmental modeling community is conducting an examination of models used for studies of mercury in the environment. In the current phase of the project, each of the seven participating models estimated ambient Hg concentrations and dry and wet deposition at ~10 monitoring sites throughout Europe. Each model also estimated the total deposition to Spain, Italy, and the United Kingdom. For each of these three countries, the models estimated the proportion of the total deposition arising from anthropogenic sources within the country. Monthly total deposition and average concentrations estimated by each model for 1999 are being compared against estimates of the other models, and, where measurement data exist (e.g., wet deposition at monitoring sites) against field data as well.

The HYSPLIT model estimates of deposition to the UK, Italy and Poland appear to be reasonably consistent with those of other models, as were the model-estimated relative contributions from in-country and trans-boundary sources. If a “background” concentration of 1.2 ng/m³ is added to the HYSPLIT total gaseous mercury concentrations, then the results are reasonably consistent with the observed concentrations. In effect, the HYSPLIT simulations captured only a portion of the “background” and the addition of the 1.2 ng/m³ (approximately 2/3 of the normal background) can be interpreted as the amount of background that would have to be added to make up for the above limitations. mark.cohen@noaa.gov

3. *Near-field Mercury Deposition.* Detailed estimates of the deposition pattern or “footprint” of mercury emissions in the “near-field” – within 250 km of the source – have been carried out. One-year simulations have been completed for emissions of Hg⁰, Hg(II) and Hg(p) for effective stack heights of 0, 250, and 500 meters. In all, nine such simulations were carried out. For each simulation, deposition results were tabulated on a 0.1° x 0.1° (approximate 10km x 10km) grid surrounding the source. Results are being compared with analogous simulations for the same nine cases conducted by the EPA using the ISC model for the same time period and source location. mark.cohen@noaa.gov

4. *WMO and Emergency Response.* Dispersion modelers from several nations have constructed a program to expand the international emergency response program to address environmental emergencies in non-nuclear areas, such as in volcanic eruptions, chemical accidents, wild-land fires, etc. The main purpose of WMO’s Emergency Response Activities (ERA) program is to assist member countries (in cooperation with relevant international organizations) to respond effectively to environmental emergencies. Currently the program is mainly focused on emergencies caused by nuclear accidents and radiological incidents. WMO’s 14th Congress in 2003 decided to expand the activities of the ERA program. The workshop decided to focus the expanded program on chemical accidents. Meteorological services willing to support relevant capacity building will be invited to provide an interim contact point to the WMO Secretariat, that can be forwarded to the those countries that have expressed an immediate need for such support. A workshop was conducted in December. The workshop final report is available through the WMO web site. roland.draxler@noaa.gov

5. *Measurement Requirements for Upper-Air Climate Monitoring.* A study of measurement requirements for climate monitoring of upper-air temperature profiles has been completed. The study uses reanalysis data to test various measurement protocols for their ability to accurately reproduce

estimates of monthly climate statistics and multi-decadal trends. Effects of measurement precision, subsampling the diurnal cycle, subsampling the days of the month, and long-term data stability are assessed. Recommendations for upper-air temperature measurements for future climate monitoring will be presented in a manuscript now in final stages of preparation. dian.seidel@noaa.gov

6. *Global Temperature Updates for 2004.* Radiosonde-derived global surface, tropospheric (850-300 mb), tropopause layer (300-100 mb), and low stratospheric (100-50 mb) temperatures have been updated for 2004. Globally, 2004 surface temperatures are the second warmest of the 47-year record, about 0.6K above the 1961-1990 average, whereas tropospheric temperatures are the fourth warmest, about 0.5K above this average. The 2004 warmth is even more impressive in the Northern Hemisphere, where the 2004 surface temperature is the warmest of record, and the tropospheric temperature the second warmest of record. In the latter case, the warmest year is 1998, reflecting the effect of the powerful 1997-98 El Niño. This record and near-record warmth in 2004 is due mainly to a north temperate surface and troposphere (except for 1998) more than 0.2K warmer than any previous year. The global tropopause layer and low stratosphere have warmed about 0.5K since 2000, the latter representing an unusual break in the long-term tendency for low-stratospheric cooling. (Jim Angell, 301 713 0295, x127)

Boulder

7. SURFRAD/ISIS. The ISIS instrument exchanges for 2004 have been completed. All standards used for SURFRAD and ISIS have been calibrated to world standards and are now ready for the new instrument exchange season. john.a.augustine@noaa.gov

8. *DOE/ARM Collaboration.* A method for deriving a continuous surface albedo estimate for the ARM program at the central facility in northern Oklahoma has been developed and was presented to the ARM community at the recent meeting of the DOE/ARM Instantaneous Radiative Flux working group, in Santa Barbara, held on November 30 through December 2, 2004. Joe Michalsky chaired the meeting, and gave a talk on the results of the second diffuse intensive observation period conducted in the Fall of 2003.

Closure of radiative transfer models was a principal focus of discussions at the ARM aerosol working group meeting in Boulder, during December 8-10, 2004, which was co-hosted by Joe Michalsky and John Ogren from CMDL. Data taken during the clear-skies of the May 2003 ARM aerosol intensive observation period were compared with three clear-sky models using independent measurements of the model inputs acquired during the IOP. For the first time closure appears achievable without exaggerated aerosol absorption. joseph.michalsky@noaa.gov

9. *Diffuse Radiation Standards.* Analysis of data obtained in the second diffuse horizontal shortwave irradiance intensive observation period conducted in the Fall of 2003 has led to recognition that agreement among existing pyranometers can be achieved to about 3 Watts/m² at 95% confidence, but only if a different calibration technique is accepted. A paper aiming to lead to establishing a working standard for the measurement of this quantity was presented at the AGU meeting in San Francisco on December 15, 2004. joseph.michalsky@noaa.gov

10. Comparisons of Ground-Based and Satellite Ozone Observations. Analysis has been completed of data from two independent systems measuring stratospheric ozone -- the Solar Backscatter UltraViolet (SBUV and SBUV2) instruments on board several NASA and NOAA satellites, and the ground-based Dobson spectrophotometer (three Northern latitude stations). Trend analyses of the ozone time series from the SBUV/SBUV2 data sets are complex because of the multiple instruments involved, changes in the instruments' geo-location, and short time overlaps for inter-calibrations among different instruments. The long-term Umkehr Dobson time series are therefore used to validate the combined SBUV/SBUV2 data sets at several atmospheric levels. Generally, the data sets agree well, particularly in layers 6-8 (28km-43km), and differences between the satellite and ground-based data do not suggest any significant time-dependent shifts or trends. The shared features confirm the value of these data sets for studies of ozone variability. irina.petro@noaa.gov

Oak Ridge

11. University of Alabama Airborne Carbon and Energy Flux Collaboration. ARL and the University of Alabama began their first collaborative SkyArrow field study at the Ameriflux Slash Pine site outside Gainesville, FL. From east to west, the main transect crosses Lake Santa Fe, the Albert Cary Memorial Forest, swamplands, and grazing meadows. It passes near the Ameriflux towers after crossing the lake. The December phase gathered approximately 30 hours of data in flight. A spring phase in April and May will compare the wet and dry seasons. steve.brooks@noaa.gov

Research Triangle Park

12. Multimedia Integrated Modeling System. Updated user documentation has been completed for the most recent version of the Multimedia Integrated Modeling System (MIMS) and two MIMS components that are often used independently, the Analysis Engine for Evaluation and Uncertainty and the Spatial Allocator. MIMS is a software framework designed to tie together environmental models of differing spatial and temporal scales. The Analysis Engine was developed to assist modelers with evaluation procedures, with particular attention to air quality modeling. The Spatial Allocator allows modelers to spatially re-allocate data in Geographic Information System (GIS) formatted shape files, or previously gridded data. The Spatial Allocator is undergoing additional development to be completed during the summer of 2005. The updated documentation will be available on the Internet from <http://sourceforge.net/products/mimsw> (for MIMS), <http://www.cep.unc.edu/empd/projects/mims/analysisengine/> for the Analysis Engine, or <http://www.cep.unc.edu/empd/projects/mims/spatial> (for the Spatial Allocator).
(Bill Benjey, 919 541 0821)

13. Emissions Processing for Air Quality Forecasting. For the 2005 ozone season, updates to the existing air quality forecast system are continuing. The first change to the emission processing component will include the replacement of the SMOKE code from version 1.4 to version 2.1. This has been completed partially for the point-source emission processing. Retrospective SMOKE/Mobile6 runs have been completed for a week of July 2004 to compare with the real-time mobile source emission estimates generated using the regression method derived for the air quality forecast system. The agreement between the regression estimate and the actual SMOKE/Mobile 6 estimate is extremely

good and will be presented at the 7th Annual Conference on Atmospheric Chemistry in January 2005. (George Pouliot, 919 541 5475)

14. Model Evaluation: Incorporation of Satellite Products. Community Multiscale Air Quality (CMAQ) model simulations have been performed where a satellite product was used to temporally and spatially reallocate fire-related emissions. A comparison between the modeled values (both for base and reallocated emission cases) against the ground-based Interagency Monitoring of PROtected Visual Environments (IMPROVE) data has been completed. The comparison was mainly focused on 13 Northwestern wild-land fires (Oregon and Washington fires) occurring during the month of August 2001. The CMAQ aerosol optical depth (AOD) is also being computed (both for base and reallocated emission cases). When the emissions are reallocated, improvements are evident at some nearby IMPROVE monitors. Comparisons of results will be made next to determine if there is an impact on model performance over the larger domain.. A preliminary comparison has also been made between the NOAA/EPA Air Quality Forecast CMAQ calculated AOD against an AOD satellite product. (Biswadev Roy, 919 541 5338; Alice Gilliland, 919 541 0347; Rohit Mathur, 919 541 1483)

Idaho Falls

15. Extreme Turbulence Probe. All of the data collected during the Hurricane Frances deployment have now been passed through a set of quality assurance procedures. Overall, the wind data appear to be of high quality, with only a few brief time periods when rain spikes were a significant issue. The temperature data have more problems, mainly because the “mushroom” housing for the temperature sensors was not sufficiently waterproof. The probe deployed at Vero Beach, FL suffered a few half-hour time periods when the data files became garbled and data were lost. Fortunately, the data holes occurred early in the deployment when the hurricane was well offshore and the winds were still light. (Richard Eckman, 208 526 2740)

16. Smart Balloon. Significant changes have been made to the cut-down mechanism to increase its reliability and to simplify its fabrication. As part of the testing the mechanism is pressurized in a small test chamber up to 5 psi for days at a time to check for failure under pressure and to check operation of the central hot wire diaphragm destruct mechanism. All aspects of the new system seem to work very well. (Randy Johnson, 208 526 2129, Shane Beard, Vance Hawley)

17. Tracer Analysis Facility (TAF). This month has been spent gathering information and ordering parts and consumables to begin work on analyzing perfluorocarbon tracers (PFTs). This new analysis calls for a change from packed column to capillary column gas chromatography. The oven temperatures will need to be increased significantly, the carrier gas will be changed from nitrogen to helium, and argon/5% methane will be added as a make-up gas. Significant software changes will need to be made if more than one PFT will be analyzed at the same time. The effects of the potential new tracers on the samplers and the effects of sample holding times will need to be studied. Some gas chromatograph valving changes may need to be made also. (Debbie Lacroix, 208 526 9997)

A control charting program has been added to the automated tracer gas analysis systems (ATGAS) to track laboratory and field control results. This important program will provide a graphical means to demonstrate statistical control, document measurement uncertainty, and diagnose measurement

problems. The control limits as well as the mean will be established prior to commencement of a project by the analysis of at least 20 data points. Measurements made during the project will be graphed using these established limits. (Debbie Lacroix, 208 526 9997, Roger Carter, 208 526 2745)

18. Tracer Sampler Upgrade. The software upgrades for the Programmable Integrating Gas Samplers (PIGS) and the hand-held downloaders used to program them have been completed. This software upgrade allows the PIGS to sample for different times on different bags and pause for specified times between bags. Bench testing of the software has been completed and all features have been verified to work correctly. Work is now proceeding on modifying the analysis system software to support these changes. More testing will be conducted when these changes are complete. (Roger Carter 208 526 2745)

19. Idaho Mesonet. Plans are in place to switch data communications for the ARL Idaho Mesonet to narrow-band radios. Repercussions of the switch were recently discussed with a DOE management committee, focusing on the upgrade of the data acquisition software. In addition, the committee was shown some examples of the enhanced dispersion forecasting capabilities that are possible by combining local mesoscale modeling with the HYSPLIT dispersion model. (Richard Eckman, 208 526 2740)

Las Vegas

20. Daily Maximum Temperature Predictions. The maximum temperature predictions for selected Nevada mesonet stations during December showed similar results to previous months with the average bias being -0.1 C and the average absolute error of about 2 C. December was slightly above normal for both temperature and precipitation - most locations showed larger upward departures of the minimums than the maximums. douglas.soule@noaa.gov

21. Nevada Mesonet. Work continued on developing alternate communications methods. A technical panel was convened to examine options. A few environmental issues need to be resolved (for long term needs). walter.schalk@noaa.gov

Two new graphics are being produced, that have maximum and minimum temperatures plotted for selected locations in the western half of the U.S. These products are available via SORD's Web Page under "Weather Data", "meteorological Data - Graphics". douglas.soule@noaa.gov

22. New Surface Data Sources. A search is under way for data sources to substitute for the SORD AWIPS system, which is scheduled to be terminated in April, 2005. A potential source of surface observations from the National Weather Service (NWS), through the Internet, has proved unreliable due to erratic updates of the hourly files. Initial tests of data sources from ARL Headquarters and "Meso-West" have shown that the data from ARL Headquarters is much more reliable than from "Meso-West" when trying to get the "normal" surface observations. The initial alternative will be to use ARL Headquarters data. douglas.soule@noaa.gov

23. Plotting World-wide Surface Observations. A new program, "plot_world", has been set up to plot current surface weather observations for any location worldwide. The input surface observations are

from the hourly files available at ARL-Headquarters. Also the background map(s) are produced from data files provided by ARL-Headquarters. The program is going through testing and should be available for use in the future on “elnino”. douglas.soule@noaa.gov

24. SORD Web Site Activity. During December 2004 there were 356,256 hits serving up over 15 Gigabytes of data. This included 3273 unique visits with 132,407 web pages viewed. December 28th was the busiest day with 22,168 hits, over 1.2 Gigabytes of data transferred, the most unique visits (292) and the most number of web pages viewed (8600). james.sanders@noaa.gov