NOAA ARL Monthly Activity Report

May 2004

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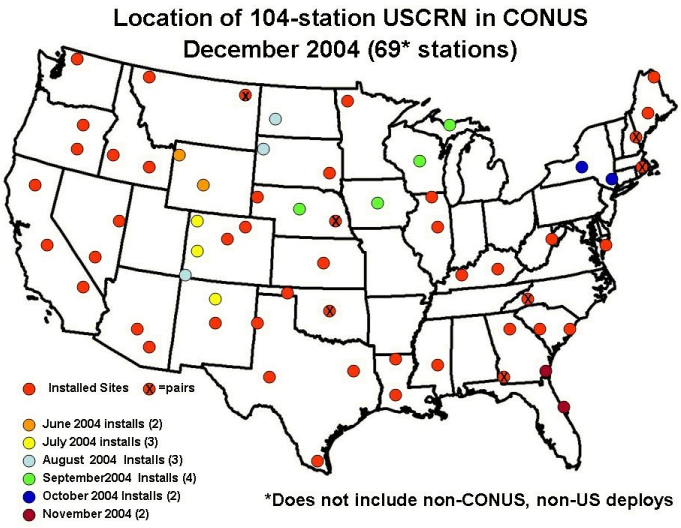
Contents

Highlights

1. Smart Balloon Involvement in the NorthEast Air Quality Program. Final preparations are being made to use the ARL-developed smart balloons in the NorthEast AIRMAP project. An ozone instrument from the University of New Hampshire has been integrated into the balloon payload and tested over the past month. Battery power and solar panels have been tested under full load and should yield a battery life of 3 to 4 days, possibly longer with clear weather for the solar panels. balloon launches are planned. from Orient Point on the northeast tip of Long Island during the month of July. (roger.carter@noaa.gov)

2. CRN Station Deployments Averaging Three Per Month. ARL is setting up and maintaining sites of the Climate Reference Network (CRN). The target is to have a 69-station network operational by the end of 2004. To meet this goal, sites are being installed at a rate of about three each month. The diagram (prepared by Mike Helfert of NCDC, Ashevile) shows the present plans. The CRN program is led by NCDC. ARL serves as the field agent for the program. (Ray Hosker, 865 576 1248)



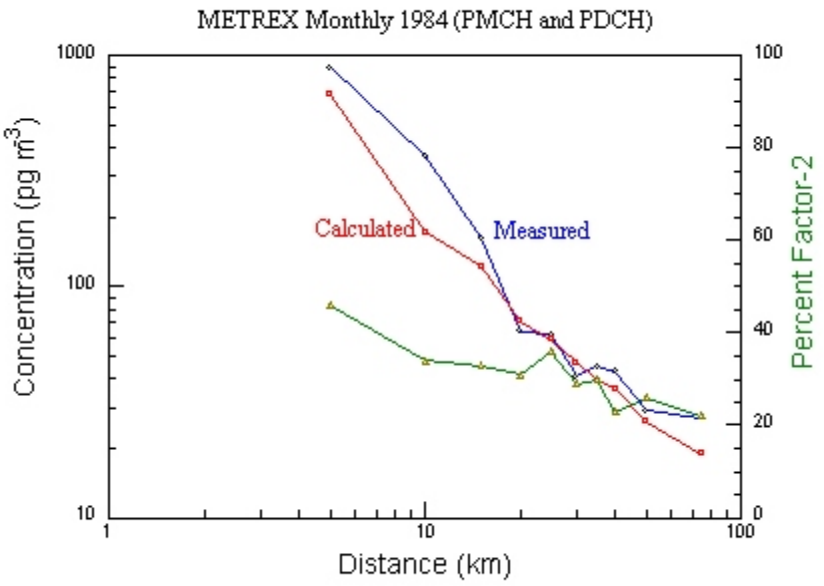
3. Training Completed for NCEP On-Demand HYSPLIT Runs. NCEP will soon be running HYSPLIT on demand. In preparation for the implementation of the integrated HYSPLIT system at NCEP, all senior duty meteorologists have been trained in running the model and interpreting its outputs. This is an example of how contributions from a number of agencies can be used to generate a NOAA operational product. HYSPLIT was developed on funding from the Department of Defense for national security applications. It is now widely in use, and is one of the few mainstream dispersion models endorsed by the World Meteorological Organization. barbara.stunder@noaa.gov

Silver Spring

4. Ozonesonde Data Updated Through 2002. Global ozonesonde data for 2-8, 8-16, 16-24, and 24-32 km layers have been updated through 2002. In the north temperate zone, where the data are best, there has been little change in ozone amount in the mid-stratospheric 24-32 km layer since the 5% decrease following the 1991 Pinatubo eruption. Basically the same is true of the low-stratospheric 16-24 km layer, though in this layer the year-to-year variation in ozone is much greater. In the 8-16 km tropopause layer there has been a significant increase in ozone since the minimum value in 1993, so that in 2002 the ozone amount equals the 1968-1990 average. There has been essentially no change in tropospheric 2-8 km ozone since a year before the Pinatubo eruption, despite repeated statements that tropospheric ozone is increasing. At least in the north temperate zone, only in the tropopause layer is there evidence from ozonesonde data that the ozone decrease since about 1970 has bottomed out, and is beginning to return to its pre-chlorofluorocarbon level. (Jim Angell, 301 713 0295, x127)

5. Dispersion Model Verification for Urban Scale Environments. Three months of simulations have already been completed on our LINUX cluster with the intent of creating one year's (1984) high resolution (4 km) meteorological data fields for use in dispersion calculations to compare with tracer data collected over Washington D.C. during METREX. Initial tests using HYSPLIT over distance scales of 5 km to 75 km downwind, using only the 2.5 degree ECMWF data (for MM5 initialization) are quite encouraging. Model bias is not significantly different (99% level) from zero at most distances (except the 5-10 km range) and 20% to 40% of the predictions are within a factor of two of

the measurements. The measure ments consisted of monthly averages at 93 sites and anywhere from 30 to 240 values are available within each distance range. roland.draxler@noaa.gov



6. Air Mass Dependent Initialization for Global Dispersion Model. A regression method has been developed to initialize a global dispersion model from measured concentration data. The dew point temperature is the independent variable, computed at the model start time for selected sampling locations. Northern and Southern hemisphere equations are computed independently. The regression equation is then applied to the entire hemisphere to compute the initial concentration distribution. This approach permits the initial spatial concentration distribution to follow air mass variations. roland.draxler@noaa.gov

7. GCOS Regional Workshop for Central Asia. The Global Climate Observing System (GCOS) program organized a regional workshop for the countries of Central Asia to address the need for improvements in climate and climate-related observing systems. Included in the meeting were Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan, the Russian Federation, China and Mongolia as well as the neighboring countries of Armenia, Azerbaijan and Georgia. Hosted by the Hydrometeorological Service of Kazakhstan, the workshop took place in Almaty, Kazakhstan (May 24-26, 2004).

The main focus of the workshop was to review the present status of climate observing systems in the region which include meteorological, hydrological and atmospheric chemistry measurements. Due to the lack of funding support and political upheaval, many of systems have deteriorated since the break up of the Soviet Union; though this varies from country to country. Specifically the Global Atmosphere Watch (atmospheric chemistry) activities in the region have been mainly focused on precipitation chemistry and total ozone. Both programs are barely functioning. One recommendation that came from the workshop is that aerosol optical depth measurements be considered at one or two locations. An outside sponsor would be needed. A separate report (below) addresses the development of a new ARL optical depth product. john.miller@noaa.gov

8. Rollout of Improved ARL Website. A new ARL website (http://www.arl.noaa.gov) was implemented in May that will be easier to navigate than the previous version. The website was developed using a template designed from the Macromedia Dreamweaver software package.

Dreamweaver has been found to be very good for designing, and especially for maintaining, corporate websites like the new ARL website. In addition, the new site utilizes the FirstGov.gov search engine capability so that all ARL websites (except SORD, due to the security banner at the entrance to their site) can be included in a user's search. All ARL Divisions are welcome to use the template for their site. Suggestions for further improvements or to fix problems are also welcome. glenn.rolph@noaa.gov

9. IPCC Special Report on Ozone and Climate. An "expert review" was provided of the IPCC Special Report on Safeguarding the Ozone Layer and the Global Climate. The report addresses the linkages between stratospheric ozone depletion (and ozone layer recovery) and climate variability and change. Previous assessments of these two issues have focused on one or the other issue, with relatively little attention to the feedbacks in the system. dian.seidel@noaa.gov

Boulder

10. SURFRAD/ISIS. The SURFRAD part of the NOSA (the NOAA Observing System Architecture) database was updated to include the new Sioux Falls, South Dakota, SURFRAD station, which was installed in June 2003. Besides observing system updates, the contact for the NOSA database also wanted fiscal information on documented observing systems, i.e., O&M costs and the Capital costs these programs have budgeted for FY 05 - FY 11.

11. New Aerosol Optical Thickness Product. In May we learned that Carlos Medina would be returning to SRRB this summer, as a SOARS student. He will continue his work on the development of an aerosol optical thickness product for SURFRAD. SOARS stands for Significant Opportunities in Atmospheric Research & Science. It is a program for minority students that is operated by the University Corporation for Atmospheric Research (UCAR) in Boulder, CO. John Augustine will act as Carlos' scientific mentor. john.a.augustine@noaa.gov.

12. Diffuse Radiation Standard. Progress in defining a working standard for diffuse horizontal shortwave irradiance was discussed at the Climate Monitoring and Diagnostics Laboratory annual meeting in Boulder. The instruments agree under cloudy skies, but disagree when it is clear. Attempts to explain the differences have included several obvious possibilities including the differences in angular responses as a function of spatial radiance distribution differences, differences in spectral responses caused by spectral absorption and dome transmission differences, and differences caused by receiver size differences when the same blocking geometry is used for each. Eight of eleven instruments agree within ± 1 W/m^2 for a 65 W/m^2 diffuse signal, but three are several W/m^2 higher. As yet, there is no explanation. joseph.michalsky@noaa.gov

13. Computing Resources. The recent meetings of the NOAA Technical Committee on Computing Resources (TCCR) and NOAA's IT Security community yielded considerable information if interest to ARL. Hot topics included spyware, anti-spam efforts, patch management, token-based authentication, and NOAA's email server consolidation. christopher.r.cornwall@noaa.gov

Research Triangle Park

14. Air Quality Pilot Project. A pilot project to test the ability to forecast atmospheric particle loadings has been started. The work involves collaboration between EPA, DOE's Sandia National Laboratory, and the New York State Department of Environmental Conservation (NYSDEC). The focus this month is to get NYSDEC set up to run its air quality modeling based on this summer's meteorology and air quality forecasts being conducted at the National Weather Service National Centers for Environmental Prediction. This work is aimed at transferring the tools and products developed by ASMD to state agencies for their use in air quality assessments. (Jeffrey Young, 919 541 3929)

15. New York City, Urban Dispersion Program (UDP). During early April there were several visitors collectively interested in collaborating with ASMD scientists on urban modeling in support of potential projects linked to the evolving interagency (DHS, DOE, NOAA, and EPA) New York City Urban Dispersion Program. Potential collaborators visited the Division during March 30-April 2 to discuss the status of potential FY 2004 plans for the UDP and to discuss how they might collaborate with ASMD's plans on computational fluid dynamics simulations and wind tunnel modeling within the UDP. The discussions lead to a general agreement that all would work together to develop future collaborative plans. Later in April, decisions were made principally by the DHS leadership that plans for potential FY 2004 field studies by the collective UDP groups will be moved to FY 2005. This will allow more time to develop the field monitoring program and necessary coordination with the several New York City governmental departments (fire, police, office of emergency management). This will also allow better planning and development for both computational and physical modeling support to the study. (Alan H. Huber, 919 541 1338)

Idaho Falls

16. Pentagon Shield. The field deployment for Pentagon Shield began in earnest on April 28 and continued through May 14. A total of six intensive observation periods (IOP) were conducted during the deployment. The project included both mobile and stationary releases of sulfur hexafluoride (SF_6) upwind of the Pentagon. Up to 8 real-time SF_6 analyzers and 100 concentration-integrating bag samplers were deployed during each IOP both inside and outside the building to measure the tracer concentration field. Figure 1 shows the installation of a real-time analyzer in the center courtyard of the Pentagon. This is the first time that FRD equipment has been utilized to study indoor tracer concentrations. New processing procedures will need to be developed to fully understand the data obtained by the real-time analyzers.

Following field deployment, the bags containing the tracer concentrations were shipped back to the FRD home office. There the air in the bags was subjected to analysis by gas chromatography techniques. The data are currently undergoing QC processing. kirk.clawson@noaa.gov & staff

The field deployment of the Pentagon Shield project has been completed and the focus has shifted to data analysis. Initial review of the continuous analyzer data is about 50 per cent complete. Several more processing steps will be required before data can be released. Several of the analyzers were placed inside the Pentagon and the tracer did not clear out of the building during the tests so the instruments did not record baseline readings after the release. This will require the development of

new data processing techniques since our current techniques assume that a baseline measurement is available before and after the tracer measurements. This will complicate the data processing and we are not sure how successful the new methods will be. roger.carter@noaa.gov

Analysis of the Pentagon Shield and Pentagon Indoor samples commenced on May 21st. Just prior to analysis, an instrument detection limit (IDL) study was performed on each automated tracer gas analysis system (ATGAS) to ensure the instruments were functioning adequately. Although the precision on the ATGAS #4 was excellent, the instrument exhibited a consistent low bias. It took several days of adjustments to rid the instrument of this bias, and analysis commenced on all four ATGASs with no other obvious problems. The average calculated instrument limit of detection (ILOD) was 0.5 ppt while the average calculated instrument limit of quantitation (ILOQ) was 1.7 ppt. However, all four instruments had trouble distinguishing between the 1.92 ppt standard and the 3.49 ppt standard, making these levels suspect. In fact, the lowest calibration standard that could be used on three of the ATGAS's was the 3.49 ppt standard, while the lowest on the fourth ATGAS was the 9.00 ppt standard. Due to this issue of measurement problems on the extreme low end, the ILOD and ILOQ will probably be increased by two times the original calculation and be reported as at least 1.0 ppt and 3.4 ppt, respectively. debbie.lacroix@noaa.gov

17. Joint Urban 2003. A meeting was held this month on Oklahoma City to discuss the status of the data analysis one year after completion of the field experiment. Several analyses are underway at FRD. Currently, the paired elevated and ground-level real-time SF_6 analyzer data are being compared. A ground-level analyzer and an analyzer on a 7-story parking garage were placed approximately 200 m downwind of the release site. Figure 2 shows a typical comparison for a daytime dissemination puff of the SF_6 tracer. A remarkably high level of tracer was observed on the top of the parking garage in comparison with the ground-level concentration due to lofting of the tracer plume. Nocturnal concentration levels did not exhibit such a large lofting of material. Figure 3 shows maximum tracer concentration on the top of the parking garage to be about one-third to one-half the maximum surface concentration. The arrival of the tracer material at the top of the parking garage was also slower in comparison with the arrival of the tracer at the surface. kirk.clawson@noaa.gov

18. Surface Fluxes in Hurricane Boundary Layers. FRD progress in making surface flux measurements in severe environments was highlighted at a recent Hurricane Conference. Two papers focused on measurements of latent and sensible heat and momentum flux from Hurricanes Fabian and Isabel last September. This work represents the first ever reported flux measurements in hurricanes. A third paper focused on the development/evolution of the BAT probe as an instrument suitable to obtain measurements in extreme environments.

19. NOAA P-3 Instrumentation Installation. The BAT system has been re-installed on a NOAA P3 at Tampa in late June, in preparation for the upcoming hurricane season. This was the third installation of the BAT on the NOAA P3 and it proceeded very smoothly. Test/calibration flights are scheduled for late June, after which the BAT will be removed while the P3 participates in a month-long experiment in Mexico. Upon the P3's return to AOC, the BAT will be re-installed and will remain on the P3 for the duration of the hurricane season. jeff.french@noaa.gov

20. Extreme Turbulence (ET) Probe. Further modifications were completed on the ET probe to reduce the effects of rain on the wind measurements. The modified probe was tested on the road in

dry conditions on 26 May. The ET probe wind components closely matched the measurements from a 3D sonic anemometer, so the latest modifications do not appear to have affected the probe's performance in dry conditions. Another test was performed on 28 May during a widespread rain event in Idaho Falls. The ET probe appeared to work well, but the gasoline generator used to supply power repeatedly failed in the rain. In spite of this, some useful data came out of the test.

In the recent Hurricane Isobel deployment, the ARL activity was coordinated with a test of sonic anemometry by Texas Tech University. The current plan is to repeat this approach during the upcoming hurricane season. The Texas Tech team has also deployed 3D sonic anemometers into hurricanes. Their experience with these sonic systems is that they provide little useful data in hurricanes. The ET probe will therefore be a significant advance if the water-fouling problem can be addressed. richard.eckman@noaa.gov

21. Proteus Aircraft. Work continues on the production of a BAT probe for the Proteus aircraft. Proteus is being used to obtain measurements near the top of the troposphere. These measurements are crucial to closing the radiation budget. The BAT will be used to measure turbulence and vertical velocity in and around cirrus clouds to gain an understanding of crystal formation, habit, and growth and how they relate to vertical air motion and supersaturation. jeff.french@noaa.gov

22. New Sampler Prototype. A prototype of a new sampler system has been designed and evaluated. The new plastic boxes should give us better water resistance and slightly less weight while maintaining the same size and operating characteristics.

23. The Search for New Tracers. On May 18, a meeting was held with representatives from the DuPont Corporation to discuss ideas for chemical compounds that could be used as tracers and provide an alternative to SF_6. A number of chemicals were identified, that meet the criteria of high electron capture cross section, implying good detection limits at low concentrations; low background levels; lack of fugitive sources; relatively short atmospheric lifetimes; and low cost. We also should be able to acquire permission to release them. Scientists at CMDL have developed the necessary analytical methods for these compounds and are currently measuring most of them at global background levels. A visit to CMDL is planned, in early fall, to learn about these methods and begin development of a new sampling and analysis system, based on our current bag sampler, for a number of these compounds. The objective is to develop a new capability to use multiple tracers in dispersion programs. tom.watson@noaa.gov

Las Vegas

24. Test-Readiness/Sub-Critical Test Conducted. ARL provided extensive meteorological (including dispersion forecasting) guidance to the controllers of the ARMANDO Sub-critical Experiment. ARL served as the Meteorological Advisor on the Test Controllers Scientific Advisory Panel. SORD personnel presented a comprehensive assessment of current and projected meteorological conditions in the vicinity of the ARMANDO experiment in Yucca Flat, making use of a wide variety of remote meteorological sensors, NOAA weather forecast models, and the RAMS model centered on the Nevada Test Site (NTS). ARL staff also provided test management assistance, specifically by providing the predicted transport and dispersion pattern for the unlikely occurrence of release of toxic material into the atmosphere. walter.schalk@noaa.gov

25. USGS Digital Elevation Model (DEM) 10- Meter Data. The USGS has available a DEM that has a resolution of 10 meters. These data were constructed from existing elevation contour maps for the coterminous U.S. SORD downloaded 1 degree quadrangles of these data for Central and Southern Nevada (5 degrees of longitude, 4 degrees of latitude). These files are in the new standard format for Geographic Information System data (SDTS). In order to easily view these data files, a viewing program (DLGV32) was purchased and downloaded. The program produces plots that depict the elevations in pseudo-3D with color schemes or gray scale. A specific portion from these data files was utilized to get a depiction of terrain on and near the NTS. This "background" was saved in a standard graphic format (JPG) and imported into ArcView. Once it was integrated into ArcView, the background can be used with other fields for depiction on the NTS. douglas.soule@noaa.gov and Jim Sanders