NOAA ARL Monthly Activity Report

August 2001

Bruce B. Hicks, Director
Air Resources Laboratory

Details of items identified in the Table of Contents and previous Monthly Activities Reports can be found at http://www.arl.noaa.gov/pubs/monthly/.

Contents

Highlights

1. WMO Emergency Response Activities (ERA) Meeting at NOAA. Preparations were made for a meeting (September 10 - 14, at Silver Spring) of the Emergency Response Activities Coordination Group of the World Meteorological Organization (WMO) Commission for Basic Systems (CBS), which is sponsored this year by NOAA ARL and NCEP. Participants from the United Kingdom, France, China, Japan, Canada, Australia, Russia, Germany, Kazakstan, Austria and Switzerland were invited. This group supports, and has members from, the Regional Specialized Meteorological Centers (RSMCs) for atmospheric transport model products, of which there are currently eight (US, UK, France, Australia, Japan, China, Russia, Canada). (glenn.rolph@noaa.gov)

2. Urban Dispersion. At Oak Ridge, reduction of aircraft data for the upcoming VTMX (Salt Lake City) workshop in September has begun. Initial comparisons between the Long-EZ data and the data collected from the towers and microbarographs have begun, to look for common events measured by all systems. (dobosy@atdd.noaa.gov, Dumas, Nappo, Meyers)

A briefing was provided to staff of Oak Ridge Associated Universities' Washington DC office on ATDD's recent work on urban dispersion, including measurements during the Inauguration, and the search for a suitable city to perform an intra-urban dispersion field study during the summer of 2003. (hosker@atdd.noaa.gov)

3. Global Warming on Hold. Temperatures from the 63-station global radiosonde network have been updated through the spring (MAM) of 2001. In this season there has been little change in surface or tropospheric temperature since the anomalous warmth associated with the record-breaking El Nino of 1997-1998, the surface temperature remaining about 0.3K above the 1961-1990 average, the tropospheric (850-300 mb) temperature near this average. This reflects the global tendency, significant since 1979, for the surface warming to exceed the tropospheric warming, the tendency more apparent in Northern Hemisphere than Southern Hemisphere. For the time being, however, global warming seems to be on hold, perhaps awaiting the next El Nino! (Jim Angell, 301 713 0295, x127)

Silver Spring

4. Atmospheric Transport and Deposition of Mercury. Initial examination of model physics and chemistry suggests that many aspects of mercury's behavior would be linear in mercury concentration. To the extent that this is true, source-receptor information could be obtained using the interpolation-based approach developed earlier (for dioxin and atrazine). Subsequent tests have indicated that there are some deviations from linearity, perhaps requiring some adjustment to assessments made using the Lagrangian HYSPLIT approach (which assumed linearity). The model is currently run in puff mode, and non-linearities may be arising in the puff-merging algorithm. Additional analyses will be conducted to determine if the simulation can made more linear without loss of accuracy.

The model has been used with mercury emissions inventory information to make initial estimates of the fate and transport of mercury emitted from sources in the United States and Canada, with particular attention to source-receptor relationships for deposition to the Great Lakes, Lake Champlain, and the Gulf of Maine. Maps of deposition contribution to each of the these receptors were prepared. While detailed model evaluations have yet to be conducted, initial estimates of mercury deposition to Lake Michigan for 1995-1996 are in very close agreement to the measurement-based estimates for deposition to the Lake made in conjunction with the 1995 Lake Michigan Mass Balance Study. (mark.cohen@noaa.gov)

5. Data Archive of Tracer Experiments and Meteorology (DATEM). The availability of meteorological reanalysis archives at several international centers provides an opportunity to link high quality modern meteorological data with the data from many older long-range tracer experiments. A set of CDs and a web site have been created, containing the experimental data, relevant reports, meteorological data, statistical analysis, and display software, all in a common non-proprietary format. This data base permits the atmospheric transport modeling community to conduct various verification and sensitivity studies and compare model results with each other on a common basis. Currently, only longer range (100's to 1000's of km downwind) experimental data are considered, consistent with the spatial and temporal resolution of the meteorological re-analysis data. The DATEM archive (software and data files) can be accessed through the ARL web page http://www.arl.noaa.gov/datem. DATEM includes data from five long-range dispersion experiments, representing a collection of more than 19,000 air concentration samples, meteorological fields from the NCEP/NCAR reanalysis project, and statistical analysis programs based upon the ATMES-II evaluation of ETEX. All the data fit on three CDs, with the first CD containing all the experimental data, software, and meteorological data from three experiments. The other two CDs contain meteorological data from the two other experiments. The CDs can be ordered on-line, or the individual data files can be downloaded directly from the DATEM web site. (roland.draxler@noaa.gov, Nick Heffter, and Glenn Rolph).

6. Climate Research Committee Workshop. A workshop on "Climate Change Feedbacks: Characterizing and Reducing Uncertainty" was held in Boulder, CO, Aug. 13-17 to complete the preparation of a report suggesting research activities to reduce uncertainties in climate projections for the next century. Dian Seidel chaired a session on water vapor, lapse rate, and cloud feedbacks. (dian.seidel@noaa.gov)

7. Parallelized Trajectory Cluster-Program. A parallel-processing version of the ARL trajectory cluster program was developed to permit clustering more trajectories. The goal was to cluster tens of thousands of trajectories, compared to the original program which can, in a timely manner, cluster ~400 trajectories. (barbara.stunder@noaa.gov)

8. Volcanic Ash Forecasts. After a quiet period, the volcano Tungurahua, in Ecuador, was in a near-continuous state of eruption for about two weeks in August. NCEP issued VAFTAD products 34 times during this period. NESDIS satellite analysis reported ash sometimes extending a few hundred kilometers downwind, but more typically less than 100 km. (barbara.stunder@noaa.gov)

Boulder

9. SURFRAD. Difficulties are being experienced with data transfer from Table Mountain, which is one of two radio quiet zones in the U.S. Present recommendations are that we use the existing internet capabilities at Table Mt. to download the CRN station data.

On August 16, John Augustine met with Chuck Long (DOE, PNNL), to discuss the operational settings of Total Sky Imagers (TSIs) at SURFRAD stations. The impetus for the meeting was an analysis of the objective cloud fractions output by the automated TSI processing at SRRB. It was concluded that adjustments are necessary for nearly all TSIs, and all data should be reprocessed. (John Augustine 303 497 6415)

10. Atmospheric Modeling of Radiation Experiment (AMORE). An archive of the AMORE project data is being prepared. The archive is a joint project with the USDA UV-B Monitoring Program. We have begun collecting modeling and measurement data from the participants. Some of the measurements will require processing to convert to erythema; SRRB/ARL/NOAA will be working on this processing in the upcoming two months. (John DeLuisi, 303 496 6824, Patrick Disterhoft, Janice Enagonio, Kathleen Lantz; and Jim Slusser from USDA/CSU/NREL)

11. BSRN. 1999 and 2000 SURFRAD data were transmitted to the BSRN archive using the automated Perl-based software and data bases developed at SRRB last summer. Besides the radiometer data, the nearest sounding to Table Mountain and Bondville were also submitted with the data. Although radiosonde-type soundings for 0000 and 1200 UTC are interpolated from the national network data to the SURFRAD station locations, the BSRN managers refuse to accept these as valid. The BSRN archive will only accept actual soundings that are within 100 km of the station. (John Augustine, 303 497 6415)

12. International Conference on Global Warming and the Next Ice Age. SRRB participated in organizing the First International Conference on Global Warming and the Next Ice Age, was held at Dalhousie University in Halifax, Nova Scotia on Aug. 19-24, 2001. Betsy Weatherhead presented a paper on trend detection, and John Augustine presented a poster on SURFRAD. Both John Augustine and John DeLuisi chaired sessions. The conference was well attended by the international climate community. It was a forum among modelers, observationalists, skeptics and proponents of global warming, meteorologists, solar scientists, social scientists, and others. Among the prominent scientists attending were Fred Singer (U. VA), Bill Gray (CSU), Pat Michaels (U. VA), Paul Brekke (ESA), John Christy (U. of AL) Hartmuth Grassl (Max Planck Inst.) Anthony Broccoli (GFDL), Peter Wetzel (NASA), George Kukla (Columbia), and many others. This conference represents the first time such a diverse group assembled to debate global warming on a truly scientific basis. The local Canadian news channel and newspaper covered the conference. The conference ended with a session where the general public was invited to question a panel of five who represented the diverse views of the conferees. (John Augustine, 303 497 6415)

Oak Ridge

13. Spallation Neutron Source. ATDD staff met with SNS staff on August 2 to review costs for the planned replicate of the Walker Branch Watershed air-surface exchange facility, which is being impacted by the SNS construction nearby. There was general agreement that we need to press on with transferring of funding to ATDD. Final estimates will be provided to SNS staff during September. (hosker@atdd.noaa.gov, Meyers, Wilson, Shifflett)

14. Terrestrial Carbon Program. The experimental setup to more rigorously examine nocturnal drainage flow and the effects on the measurement of CO2 fluxes began. This work involves collaboration with scientists from the University of Virginia. A paper on the net ecosystem exchange of carbon at Walker Branch was accepted in *Journal of Geophysical Research*: 'Comparing independent estimates of carbon dioxide exchange over five years at a deciduous forest in the southeastern United States' by K. Wilson and D. Baldocchi. Canopy model simulations were performed for an upcoming workshop on modeling and measuring ecosystem carbon, water, and energy fluxes at Walker Branch Watershed. (wilson@atdd.noaa.gov)

15. Coastal Dispersion. Hourly wind data during obtained in the U. S. Air Force Model Validation Program (MVP) coastal tracer tests were transcribed, for eight selected meteorological towers (out of a subset of 39 towers within the common dispersion grid at Cape Canaveral). The towers were selected because the winds recorded there influenced the surface dispersion patterns. These data will be used to prepare polar plots of wind direction versus height for each tracer test. Some plots are already completed. (rao@atdd.noaa.gov)

Surface-based and airborne measurements for the Chesapeake Bay study concluded at the end of July, and equipment was removed form the field. Analysis of surface-based data was begun, in preparation for a DTRA data analysis conference to be held in September. (meyers@atdd.noaa.gov, Brooks, McMillen, Gunter)

16. Canaan Valley. The NOAA Twin Otter research aircraft conducted flights in the Canaan Valley for an initial assessment of the spatial variability of ozone concentrations and fluxes. Also, an additional measurement

site is currently being found for the Climate Reference Network (CRN) and SURFRAD instrument suites. (vogel@atdd.noaa.gov, McMillen)

17. Climate Reference Network. During September we will install ten complete CRN systems (except for the precipitation gauges, which may not be delivered in time) at Bondville, IL for comparison (precision) testing. So ten anemometers were calibrated in the ATDD wind tunnel, using the new automated procedure; ten Apogee IR surface temperature sensors were tested; ten GOES transmitters were tested; and ten bases were constructed for mounting the towers. Temperature sensors were previously calibrated. MetOne technicians came to Oak Ridge to fix factory errors in aspirator shield fans and cable connectors. Numerous parts and sensors were received from different vendors; enclosures were painted and wired. Rough drafts of site layouts were readied, to assist the installation process. Field calibration procedures were developed for the precipitation gauge, and an initial recalibration schedule for the house "standards" was prepared. The layout for a permanent test site in the ATDD side yard was prepared, and "dig permits" were requested. Additional hardware (mainly precipitation gauges) was ordered. (hosker@atdd.noaa.gov, Hall, Meyers, Black, French, Brewer, Mayhew, Shifflett, Conger)

18. Dynamical/Photochemical Modeling. Sensitivity studies on the summertime sunrise-to-sunset large-eddy simulation (LES) continued to focus on the soil moisture content within the model domain and its effect on the convective boundary layer (CBL) dynamics. Soil moisture content in the four layers closest to the surface were decreased from the previous run, from 0.6 to 0.5. As a result, the CBL had stronger convective eddies when compared against the moister soil simulation, and grew to a depth representative of observed summertime CBL's in the southeastern US, approximately 2500 m. In addition, the time of initial lift-off of the convective eddies from the surface was earlier in this simulation; around 10 am LDT versus about 11:30 am LDT with the moister soil profile. Statistical analysis of the CBL dynamics from the dryer soil moisture simulation showed the results were more representative of observed conditions. These studies showed that the model dynamics are sensitive to changes in soil moisture content, as anticipated. (decker@atdd.noaa.gov, Herwehe)

The Tropospheric Ultraviolet and Visible radiation model (TUV v4.1) from the Atmospheric Chemistry Division at NCAR was recently downloaded. Its importance to the LESchem model is TUV's ability to calculate varying photolysis reaction rates with height for the 15 photodissociating trace gases used in LESchem. Previously, model simulations with the condensed isoprene photochemical mechanism (45 trace gases with 77 kinetic and 15 photolysis reactions) were initialized with photolysis rates that were constant with height. New height-dependent photolysis rates (*J* values) were incorporated into a two-hour midday simulation utilizing the condensed isoprene photochemical mechanism to examine the sensitivity of the varying photolysis reaction rates on the concentrations of the trace species. Initial results were encouraging and properly showed the effects of slightly larger *J* values. However, more analysis needs to be completed before making a final decision on its use in LESchem. (decker@atdd.noaa.gov, Herwehe)

19. GEWEX/GCIP. Conversion of GEWEX data acquisition software from the MS-DOS platform to Linux continues. Several modules have been finished this month. Those include modules to acquire, store, and graph data from the sonic anemometers, modules to acquire and store data from the Campbell data loggers, a module to acquire and store digital camera data, and communication modules to allow download and real-time viewing of the data. Initial field deployment of the new Linux-based data acquisition system is expected at Fort Peck, MT in mid-September. (dumas@atdd.noaa.gov, Jain, Meyers, Eckstein)

20. SURFRAD and ISIS. The standard operations of the ISIS Network continued. The regular processing of August ISIS level 1 and level 2 data is underway. Fifteen minute and hourly averaged data, flagged by QA/QC procedure will be transmitted to NCDC and placed on the WWW. Yearly instrument swaps are underway at only a limited number of sites (MSN, ABQ, and ORT) because a lack of instruments.

The long-running Albuquerque station is now again operational after replacing the data logger and radiation sensors after a lightning strike. Arrangements have been completed for the Solar Energy Laboratory, Univ. of Wisconsin, Madison to maintain the ISIS level 1 site (MSN) located on the Engineering Research Building. The MSN instrument swap was completed and an Eppley radiometer Model 848 (black/white) added to measure diffuse radiation.

Regular processing of the SURFRAD data to match the GEWEX time records of energy balance systems installed in Ft. Peck, Montana and Bondville, Illinois continued. These data are also provided on the WWW. (matt@atdd.noaa.gov)

21. Refractive Turbulence Program (with USAF). The EGRETT airplane of Airborne Research Australia was flown again to measure turbulence *in situ* around the wintertime (August) subtropical and polar-front jets near Adelaide, on the South Coast of Australia. In this phase our primary interest was to determine how readily we could predict the location of the strongest areas of turbulence using routine synoptic-scale meteorological observations. Most severe weather around South Australia occurs over the ocean to the south, where observations are sparse. We were, however, able to find significant turbulence on several days and have brought back a large data set to increase our supply of cases for examination. (dobosy@atdd.noaa.gov)

22. Forest Fire Plumes – with USDA. A summertime sunrise-to-sunset LES simulation with a surface-emitted passive tracer was run for the USDA Forest Service to simulate a purely convective model domain (i.e., no mean wind). An earlier simulation used the same run conditions except for the presence of a specified 5 m s^{-1} mean wind. Animations of the evolution of the 3-D volume-rendered tracer mixing ratios from these two simulations were created for use in a presentation on the potential use of fine-resolution modeling. (herwehe@atdd.noaa.gov, Decker)

Research Triangle Park

23. Owens Lake Dust Emissions. Dale Gillette has been working with the Great Basin Unified Air Pollution Control District to estimate the dust emissions from Owens Lake. Owens Lake has a very large (approximately 130 km^2) area that is a potential source for airborne dust. Because of the large variability of the emissions from a given area within the 130 km^2, they used a combination measurement-and-modeling method to estimate PM10 dust emissions. The measured quantity was q_{15} (sand flux at 15 cm height) and the modeled quantity was a "K-factor", equivalent to the ratio of the vertical flux of PM10 to the horizontal flux of sand. The product of the measured and modeled quantities is the vertical flux of PM10 mass.

The quantity q_{15} was shown to be a spatially smooth function but highly sporadic in time. By measuring q_{15} on the gridded area, they were able to quantify without undue difficulty a variable which was difficult to model, owing to dependencies on soil crusting, and changes in soil aggregation that are not well modeled at this time. On the other hand, K-factors are difficult to measure in the field but do not vary greatly seasonally or spatially. They were, however, modeled conveniently at Owens Lake. Therefore, the difficult-to-measure vertical flux of PM10 for Owens Lake was estimated by the conveniently measured q_{15} values times the modeled K-factors.

In preliminary work, the grid of measuring devices showed sporadic sand fluxes from easily identified source areas. K-factors which were defined for four subregions of the lake were shown to change seasonally and with the subregion of the lake. The K-factors developed for Owens Lake agreed passably with K-factors for which both horizontal mass flux and vertical PM10 flux were measured in the southern part of Owens Lake in 1993. In addition, wind tunnel measurements of K-factors obtained at locations found to be the most prolific producers of dust on the lake were also found to be in agreement with the K-factors developed for the four subregions of the Lake for the same year and season. (Dale Gillette, 919 541 1883)

24. Full-scale CMAQ Mercury Model Developed and Evaluated. Earlier this year, the cloud chemistry subroutine in the Community Multiscale Air Quality (CMAQ) model was expanded to include reactions involving elemental mercury (Hg^0) and various mercury compounds. The neutral mercury compounds $HgCl_2$, $Hg(OH)_2$, HgOHCl, and $HgSO_3$ were added to the simulated cloud chemistry, and an aqueous dissociation equilibrium was also added which includes all of these neutral compounds plus the ionic species $Hg(SO_3)_2^{2-}$, $HgOH^-$ and Hg^{2+}. Since there currently exists no source inventory with this level of chemical detail, the gas-phase chemistry and transport model in CMAQ has now been expanded to resolve mercury in the following species: elemental gaseous mercury, reactive (oxidized) gaseous mercury, and particulate mercury. Reactive gaseous mercury is a general form of gaseous mercury that has been shown to readily react with and deposit to vegetation and other moist surfaces. It is assumed to be comprised of volatile and water-soluble mercury compounds, of which, $HgCl_2$ is thought to be one of the primary constituents. Reactive gaseous mercury emissions are simulated to be incorporated into cloud water as $HgCl_2$ based on published Henry's Law constants for that compound. Gaseous oxidation of elemental mercury has also been added to the CMAQ model as four separate reactions involving ozone, molecular chlorine gas, hydrogen peroxide, and hydroxyl radical.

Evaluation of this new full-scale CMAQ mercury model against Mercury Deposition Network (MDN) data has been performed for two four-week periods in 1995, one in early spring and the other in early summer. The MDN provided weekly measurements of the wet deposition of mercury at eleven locations within the CMAQ-Hg test domain. This domain covers all of the central and eastern U.S. and most of southern Canada. Statistical correlation of modeled and observed wet deposition of mercury has shown the mercury simulations to be comparable in accuracy to those previously performed for acidic sulfur deposition. During the rather cool early spring period, when precipitation was generally from synoptic-scale systems, the model correlation to observations was quite good, with a r-squared correlation coefficient of about 0.43. However, the statistics for the summer period were not as good, with r-squared values of around 0.1. During this period when most of the precipitation was from convective systems, the MM5-derived precipitation definition accuracy was low, and r-squared correlations for precipitation were nearly zero. Evaluation of the CMAQ mercury model will continue for addition periods in later years as the necessary meteorological input data becomes available. (Russ Bullock, 919 541 1349)

Idaho Falls

25. Hurricane Balloon. Work on the Smart Hurricane Balloon has focused on three areas. The first was designed to address concerns about the reliability of the balloon's self cut down mechanism under differing failures modes. To test this, we constructed a simulator for the balloon payload that could repeatedly simulate various failure modes and monitor the response of the balloon. Tests using the simulator are currently underway and initial results show 100 percent reliability of all the systems.

The second area of work related to communications. The system was set up with the base computer and the balloon payload communicating via the satellite telephone for the first time. Software bugs had to be worked out for correct modem interface. The system works well now and will be undergoing complete testing over the next few weeks.

The third area focused on compliance with NOAA's Aircraft Operations Center and Air Force requirements for simultaneous smart balloon flights with research aircraft in a hurricane. The new August 22 mandated changes are based on the concern that the balloon has no horizontal position control and that altitude control has not been proven in severe storm conditions. Therefore, separation between the balloon and research aircraft cannot be guaranteed at all times. Additional testing to verify performance of our balloon in a storm environment will be carried out. The additional testing will:

- Insure the cut down valve brings the balloon down in the event of a power failure or loss of communications.

- Provide test data verifying all modes of failure including loss of communications, operator commanded, processor failure, power failure, and end of test timeout failure.

- Reduce the communication failure cut down time from its present fifteen minutes to possibly as little as two.

- Add and test a feature to cut down the balloon if it reaches or exceeds a predetermined maximum altitude.

- Gather actual flight test data to verify altitude control and positive communications in a storm environment.

- Gather information on failure data on critical components in the balloon cut down system.

Progress on these new requirements includes:

- The original normally closed cut valve was replaced with a normally open valve. The valve solid state switch inside the transponder has been modified to operate with the new release valve. The change causes the balloon to be brought down if power fails, the valve connector comes loose, the valve fails, a wire in the valve wiring harness breaks, or the battery voltage gets too low.

- A test simulator has been designed and built to allow testing of all failure modes. The simulator also tests GPS failure and maximum altitude cut down.

- Tests show reducing the communications failure cut down time to 2 minutes will frequently destroy the balloon. This is because, every 1 to 2 hours, communication must disconnect to switch between gateways. Such gateway changes often require more than two minutes. A 5 minutes communications failure cut down time would help eliminate unnecessary termination of a balloon experiment. We will suggest that only when a aircraft is near should a 2 minute cut down be used.

- The software has been modified to have the balloon cut down at a predetermined maximum altitude.

When all of the testing is complete and everyone is satisfied with the results the balloon will be tested under actual flight conditions and the resulting data will be forwarded for acceptance. (randy.johnson@noaa.gov, Roger Carter, Shane Beard)

26. Air-Sea Exchange: CBLAST-Low. The Coupled Boundary Layer Air-Sea Transfer light wind (CBLAST-Low) pilot study was conducted over a three-week period off the south coast of Martha's Vineyard, Massachusetts. The LongEZ research aircraft flew 20 missions for a total of about 52 hours. The objective of CBLAST-Low is to examine air-sea transfer processes under very light wind (< 3 m s^{-1}) regimes. These processes are not well understood and are inadequately modeled. The data acquisition system, and all of the instruments performed exceptionally well during CBLAST-Low.

In a typical experiment, the aircraft flew 10-m high flux legs about 20 km in length with the center of the pattern over the air-sea interaction meteorology (ASIMET) buoy deployed by the Woods Hole Oceanographic Institution. The ASIMET buoy is located along the edge of a SST front with warmer water to the southwest and west of the buoy. SST temperature differences of 2° to 3° C were observed over the course of just a few kilometers. As expected, air temperature at 10 m reflects the forcing by the SST front with warmer air to the

southwest and west and colder air to the northeast of this sample region. Differences of up to 2° C in air temperature were observed in this case study.

Many of the research flights were centered over the ASIMET buoy. However, the LongEZ flew over several other surface-based "assets" over the course of the three-week study. For several days during the first week, a three-dimensional sea surface temperature net was deployed by WHOI about 15 km off shore. This 100-m x 100-m array was moored at the corners. Horizontal separation of the SST sensors was approximately 10 m. This remarkable array was used to acquire SST in a volume and its changes over time. The LongEZ flew several missions over the array for intercomparisons. Another asset was the R/V *Asterias* which sailed several times over the course of the study. A full suite of surface-based turbulence sensors was deployed on the R/V *Asterias* as well as a catamaran being towed by the ship. When the ship was sailing, the LongEZ conducted numerous flux legs over the ship in order to document spatial variability of turbulence in the MABL. (jerry.crescenti@noaa.gov, Jeff French, and Tim Crawford)

27. CASES-99. Significant progress was made in processing the Long-EZ CASES-99 data during August. Improved differential corrections were obtained for the GPS positions and velocities. Work is now under way to correct several timing errors that have been observed in the CASES-99 data..

Improvements were also made to the method used to process the IRGA water-vapor measurements. The IRGA has a nonlinear response to water vapor. This is not a serious problem by itself, but the instrument also suffers from baseline drift. The combination of the nonlinear response and the baseline drift makes treatment of the IRGA data more difficult than many of the other instruments. The improved treatment of the IRGA data is based on the dew-point measurements from a chilled mirror, which is part of the Long-EZ's standard instrument package. This chilled mirror has a relatively slow response, but it does not suffer from baseline drift. Humidity measurements from the chilled mirror can therefore be used to quantify the baseline drift in the IRGA measurements. In the current software, the chilled mirror measurements are low-pass filtered using a cutoff corresponding to 60 Hz. Corrections for the IRGA measurements are then based on these filtered data. (richard.eckman@noaa.gov)

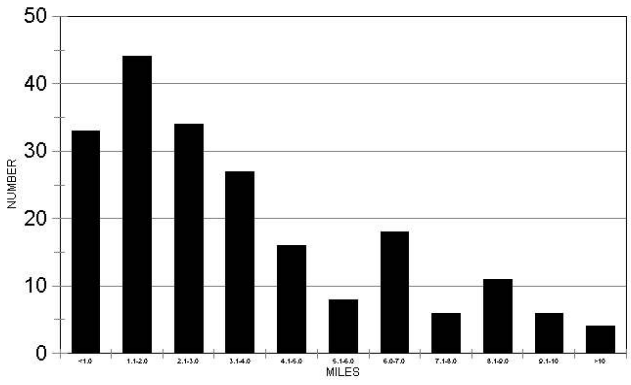
28. Dispersion tests – GAUNTLET 2001. A final report on FRD's contribution to the AFTAC GAUNTLET Program at Dugway, Utah, in April of this year has been completed. The project consisted of constructing a mobile SF_6 release mechanism capable of releasing gaseous SF_6 at a rate of 70 kg hr^{-1} for four hours. The release mechanism and three mobile real-time SF_6 analyzers in SUV's were deployed to Dugway where seven tracer tests were conducted in both daytime and nocturnal conditions. These tests involved eight FRD personnel on TDY to Dugway, and one additional person using the Internet for the first time for data processing at the FRD office instead of in the field. Careful quality control checks in the field and during data processing the day following each test at the FRD office, together with new more stringent in-field calibration checks, prevented the collection of any unusable data. A total of 246 plume traverses were completed by the real-time SF_6 analyzers. The report summarizes the results of these traverses and is currently undergoing internal FRD review. (kirk.clawson@noaa.gov and staff)

29. INEEL Mesonet. At the request of DOE, we are adding two community monitoring stations, located at the middle schools in Rexburg and Blackfoot, to the INEEL Mesoscale Meteorological Network (mesonet). These stations will eventually replace current stations located near these cities, but there will be an overlap for one year to help document differences between the old and new sites. We have replaced the data acquisition and communication equipment at these two sites so they are compatible with the mesonet and have made the necessary software modifications so that data may be collected from the new sites. The process of moving

instrumentation from the old sites to the community monitoring sites is also underway. (roger.carter@noaa.gov, Randy Johnson, Tom Strong, Kirk Clawson)

Las Vegas

30. Cloud-to-Ground (CG) Lightning Study. To develop a basis for site-specific CG lightning warnings for the Nevada Test Site (NTS), an analysis of the separation distances between successive CG lightning flashes was initiated. In April 2001, the ARL/SORD lightning detection system was upgraded with new IMPACT Sensors and a new position analyzer, LP2000, both manufactured by Global Atmospherics, Inc. This new system contained software (LTraX) that could be used to measure distances between CG flashes when displayed on the GAI LP2000.



A preliminary analysis was completed of the distances between successive CG flashes on the NTS using the CG flash data for July and August 2001. This process was laborious and complicated because the goal was to identify and locate the CG lightning footprint accompanying a single thunderstorm, when several storms may be in the general area. Moreover, the terrain within the boundaries of the NTS is complex and CG lightning can occur during any hour of the day. Consequently, every effort was made to identify isolated thunderstorms over different terrain environments, to collect CG lightning data at different times of the day, and to include weak, moderate, and heavy thunderstorm activity. A total of 12 individual thunderstorms were analyzed. These storms generated 207 CG flashes and they occurred on the NTS between 0900 LDT and 2300 LDT. Some were located over the high terrain in the northern part of the NTS and others were located over the dry lake beds and over the lower elevations in the southwest quarter of the NTS. This sample, although small, was representative of the NTS environment. (Darryl Randerson, 702 295 1231)

Results of the analysis are summarized in the accompanying figure. The diagram indicates that 27% of successive CG flashes occur within 2.0 miles (3.2 km) of each other. However, the average spacing between successive CG flashes is 3.5 miles, and 75% of these flashes are $\leq$5.0 miles (8 km) apart. Maximum separation detected is 11.9 miles (19.2 km). (Darryl Randerson, 702 295 1231, and Jim Sanders, 702 295 2348)

31. NOAA Cooperative Institute for Atmospheric and Terrestrial Applications (CIASTA). On August 24, the Director, SORD, met with staff of the Desert Research Institute and the National Nuclear Security Administration/Nevada Operations Office (NNSA/NV). Dr. D. Shafer and G. McCurdy represented DRI and E. Forness represented NNSA/NV. This meeting was convened to follow-up on our initial planning meeting of June 7. The purpose of the meeting was to explore opportunities for collaborative exchanges and paths to improving support to NNSA/NV programs. Issues of common interest were defined as well as potential collaborative research activities. Immediate focus was on developing common map backgrounds for use in NNSA operational programs related to national defense projects. (Darryl Randerson, 702 295 1231)

32. General Motors Collaboration. A new project for the southern part of the NTS has been initiated that may eventually utilize unused roads for testing motor vehicles. The negotiations are with General Motors, out

of their Phoenix Office. They requested meteorological data for locations in the south parts of the NTS. SORD sent them data for 1983 through 2000. They are specifically looking for temperatures of 90^0F or higher with winds speeds under 11 mph. The temperature conditions are easily met for the south end of the NTS, but the light wind speeds may be more difficult to achieve with the warm temperatures. (Doug Soule', 702 295 1266)

33. Test Readiness/Sub-Critical Training. Full support was provided for the Tabletop-3 Training Exercise, Number 1. SORD personnel presented "D-1 Day" briefings to the NNSA/NV Test Controller and Scientific Advisory Panel. These briefings included test-specific weather forecasts and radiological fallout assessments for the unlikely occurrence of a prompt massive release of radioactive material into the atmosphere. In addition, SORD personnel collected real-time "D-Day" meteorological data. These data and operations-specific weather forecasts and fallout projections were presented to the NNSA/NV Test Controller and Scientific Advisory Panel. Real-time weather data were collected and used for this exercise. The use of actual weather conditions created a real-world scenario that test management had to evaluate in a timely manner to ensure that the simulated test was conducted in accordance with NNSA/NV safety guidelines. The Director, SORD, served as the NOAA Meteorological Advisor on the NNSA/NV Test Controllers Scientific Advisory Panel.

Similar support was also given to Test 2 in this series.