



NOAA ARL Monthly Activity Report



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Bruce B. Hicks, Director
Air Resources Laboratory

Contents

1. *HIGHLIGHT – Salt Lake City Dispersion Studies*
2. *University of Hawaii/NASA Volcanic Ash Forecasting*
3. *READY Updates*
4. *Emergency Response Toolbox*
5. *SURFRAD*
6. *Central UV Calibration Facility (CUCF)*
7. *International Radiation Symposium*
8. *EPA Brewer Network*
9. *Press Release on Recovery of the Ozone Layer*
10. *NOAA Science Festival*
11. *Terrestrial Carbon Program*
12. *Canaan Valley*
13. *Climate Reference Network*
14. *Mercury in the Arctic*
15. *NASA/Land Surface Hydrology*
16. *NSF Multi-User Environmental Research Aircraft*
17. *Southern Oxidants Study*
18. *Coastal Dispersion — Cape Canaveral*
19. *Remote Sensing of Spectral Albedo*
20. *Rain-Gauge Network for the Multimedia Integrated Modeling System (MIMS)*
21. *New Version of CMAQ Aerosol Model*
22. *National Coastal Data Development Center*
23. *Salt Lake City Dispersion Study*
24. *Refractive Turbulence Study*
25. *Extreme Turbulence (ET) Probe*
26. *Central California Ozone Study (CCOS)*
27. *Wave Profile Experiment (WAPLEX)*
28. *INEEL Emergency Operations Center (EOC) Support*
29. *FRD Wildfire Program*
30. *INEEL Mesoscale Meteorological Network*
31. *INEEL Citizen's Advisory Board*
32. *TANS-INS-LIDAR Platform Attitude Comparison*

33. NOAA Cooperative Institute for Atmospheric and Terrestrial Applications (CIASTA)
34. Climatic Change Project

Highlight

1. Salt Lake City Dispersion Studies. Three ARL groups are involved in studies related to the forthcoming Olympic Games. All of the ARL involvement relates to the need to understand and predict dispersion regimes, motivated by the fear of terrorist attack. Tracer aspects of the study involve many ARL staff from Idaho Falls. The schedule calls for six coordinated SF₆ and perfluorocarbon tracer releases. The photograph shows the ARL van crew ready for deployment. The van crew has a big job managing both mobile real-time SF₆ analyzers and whole-air bag samplers. Upon arrival, they will immediately deploy all of FRD's whole-air samplers on eight different servicing routes that extend to 6 km from the release site. In addition, closely spaced samplers placed in ½ block increments will also be deployed. Following the whole-air sampler deployment, a 6-hour release will begin under the supervision of Randy Johnson. The van crew will then mobilize, looking for the SF₆ plume and measuring its concentrations. At the end of the release, the crew will retrieve the whole-air samplers and return to Idaho Falls (see item 23 below).



Figure 1. Staff ready for Salt Lake deployment of continuous analyzers and whole-air samplers.

The Idaho Falls group will also deploy a 915-MHZ radar wind profiler, Doppler sodar, and 10-m tower with two 3-d sonic anemometers. (jerry.crescenti@noaa.gov, kirk.clawson@noaa.gov, roger.carter@noaa.gov, Debbie Lacroix and FRD staff).

The ARL/Oak Ridge contribution to the study involves measurements of the turbulent kinetic energy budget in the Salt Lake Valley, with both surface and airborne components. Three towers 3, 10, and 20 m high support sonic anemometers and sensors for CO₂ and water vapor, one set per tower. This configuration minimizes flow blockage. Procuring the site during September was a balancing act among regulatory, scientific, and political requirements. The site is near the second Municipal Airport for Salt Lake City, where the Long-EZ airplane will be based. Low-altitude flight, permissible over the airport, brings airborne

measurements close to the tower-based instruments, both horizontally and vertically. (dobosy@atdd.noaa.gov)

Silver Spring

2. University of Hawaii/NASA Volcanic Ash Forecasting. Initial work has started on a NASA funded “Volcanic Plume Dispersion Monitoring and Prediction Capability” research project. An ensemble dispersion forecast model will be developed at ARL, while researchers at the University of Hawaii (UH) will develop satellite detection and display algorithms. The combined system will be optimized for Hawaiian volcanoes and will be installed at the Pacific Disaster Center with all computations performed at the Maui High Performance Computing Center (MHPCC). Thirty two processors are available at the MHPCC. The HYSPLIT code is currently undergoing a substantial revision to introduce a variety of Fortran-90 features that will permit easier optimization of the ensemble code. (roland.draxler@noaa.gov)

3. READY Updates. Several changes were made to READY programs, to simplify external use of the products.

Vertical sounding - The way in which we display model sounding data has been changed. Instead of plotting all of the NCEP model sounding data, including that which is "under ground" (pressure surfaces that are below the terrain height), the vertical sounding (profile) will now only plot data that are at or above the model terrain height.

MSL starting heights in HYSPLIT - Another common request we have been getting is to have the starting height(s) for HYSPLIT trajectories on the web to be in height above mean sea-level (AMSL). HYSPLIT now will accept starting heights in AMSL and then convert them to above model ground level (AGL) before running. Results are still in meters AGL. This option is not available for concentration runs.

Meteogram and sounding - Many READY users take the text data and import it into other programs and therefore don't necessarily need to view the graphics. An option is now available to extract the data in text form in the meteogram and vertical sounding programs on READY. (glenn.rolph@noaa.gov)

4. Emergency Response Toolbox. Work continues on adapting the emergency response “Toolbox”, installed by Jean-Philippe Gauthier from the Canadian Meteorological Center (CMC) last month, to run the HYSPLIT model and produce NOAA graphics. The CMC Toolbox is a computer interface to launch a dispersion model and then manipulate the results into a final graphical format for distribution to users. CMC offered their interface to foster collaborative development between NOAA and CMC in regard to atmospheric emergency response. (glenn.rolph@noaa.gov)

Boulder

5. SURFRAD. A small building is to be installed at Fort Peck, MT, to house equipment associated with a Total Sky Imager (TSI). TSI systems are planned for all SURFRAD sites. They give records of total cloud cover, automatically.

Problems were found and addressed at two SURFRAD stations. The tower-mounted pyrgeometer was damaged by an electrical surge, probably from lightning, at Penn State. It was replaced on 9/19/2000. The problem was subtle and would not have been identified as quickly if not for new daily quality control diagnostics that were implemented after a similar problem voided about nine months of Desert Rock infrared data. The temperature and relative humidity probe at Desert Rock was replaced on 9/7/2000 after it was found to be defective. (John Augustine, 303 497 6824)

6. Central UV Calibration Facility (CUCF). The CUCF has been working on updating and automating several of the QA/QC procedures for calibrating UV instruments. The CUCF has currently calibrated, at least once, all the UVB Broadband radiometers and all the UV-Multi-Filter Rotating Shadowband Radiometers (UV-MFRSR) of the USDA UV Monitoring Network. This past year we have begun to see many second and third calibrations; details of the long-term stability of the instruments are now starting to become apparent. The UVB Broadband instruments have changes in the scale factor for calculating erythemal irradiance of less than 1.3% over the past three years and on average of 0.5%, except for one instrument which showed an 8% change but whose cause was easily identified. The changes in the absolute calibration of the UV-MFRSR filter channels are currently being investigated and are more difficult to assess at this time due to instrument improvements over the years. (Patrick Disterhoft, 303 497 6355, Kathleen Lantz 303 497 7280, Charles Wilson 303 497 7314)

7. International Radiation Symposium. Dr. Irina Petropavlovskikh participated in the International Radiation Symposium held in St. Petersburg, Russia, 24-19 July, 2000. Dr. Petropavlovskikh together with Dr. John DeLuisi (NOAA/SRRB) and Amy Stevermer (CIRES) presented a poster titled "Effects Of Aerosols On Zenith Sky UV Radiance: Application To The Umkehr Retrieved Ozone Profiles." The poster discussed errors in ozone profiles retrieved from the Dobson and Brewer Zenith-sky UV radiance (ZUV, traditionally known as Umkehr) measurements related to elevated stratospheric aerosols. The effects of various types of stratospheric and tropospheric aerosols on zenith-sky UV radiance were discussed. The poster received a good amount of attention from the Brewer community; an assessment of aerosol errors in ZUV measurements during Sahara dust episodes is especially needed. (Irina Petropavlovskikh, 303 497 6279)

8. EPA Brewer Network. ARL is heavily involved in evaluations of data from the EPA network of Brewer UV spectral radiometers. At some stations the instrumentation appears to have been relatively stable over the two to three years of data. However, at some stations there are clear calibration problems associated with step changes in the data, from 10% to 40% in magnitude. There also appear to be periods where instrument problems cause linear drifts that can be as large as 2%-3% per month. In addition preliminary work has been done identifying the magnitude and wavelength dependence of the effect of temperature on the Brewer. (David Theisen, 303 497 6620)

9. Press Release on Recovery of the Ozone Layer. A paper entitled "Detecting the Recovery of Total Column Ozone" was published in the September 16 issue of Journal of Geophysical Research - Atmospheres. The results were also reported in a press release, resulting in coverage by CNN. (Betsy Weatherhead, 303 497-6653)

10. NOAA Science Festival. On Friday, Sept. 15 and Saturday Sept. 16, NOAA Boulder hosted a Science Festival in celebration of NOAA's 30th anniversary. About 1600 middle school students attended

on Friday, and about 1000 people from the local community attended on Saturday. Amy Stevermer organized SRRB's contribution. We had a booth with several instruments running, including a UVB radiometer that was used to test the blocking value of varying grades of sunscreen and various types of clothing. Posters on atmospheric radiation and health effects of UV were also displayed, and several new and updated pamphlets were made and given. On each of the two days John Augustine gave a talk on electromagnetic radiation and Betsy Weatherhead spoke on UV radiation. (John Augustine, 303 497 6824)

Oak Ridge

11. Terrestrial Carbon Program. A network program is starting in Asia, paralleling the Ameriflux and Euroflux networks in the global FLUXNET program, monitoring carbon fluxes over the world's ecosystems. A paper describing five years of eddy covariance measurements was submitted to *Agricultural and Forest Meteorology*. A paper on flux evaluation in complex terrain was presented at the first Asiaflux conference in Sapporo, Japan (September 27-29). (wilson@atdd.noaa.gov)

12. Canaan Valley. Precipitation sampling, following the protocol of NOAA's AIRMoN program and the National Atmospheric Deposition Program, is continuing at the Canaan Valley Air Quality Research and Monitoring site in West Virginia. More than four months of data have now been collected. Analysis of measurements from both lab and field is in progress. A web site, nearing completion, will post updated meteorological observations and some atmospheric deposition information. (vogel@atdd.noaa.gov)

13. Climate Reference Network. Sensors for three CRN stations were calibrated during September using the ATDD wind tunnel, a new temperature calibration bath and reference standard thermometer, and reference solar sensors. The calibration bath process was automated to run unattended. The stations were then installed for a week at ATDD's site in Bondville, IL, for an intercomparison to establish station precision. The stations were then returned to Oak Ridge for final testing before installation at two sites near Asheville, NC, scheduled for early October. (hosker@atdd.noaa.gov, Matt, McMillen, Hall, Brewer, White, Auble, Ridenour, Mayhew)

14. Mercury in the Arctic. ATDD participated in the Experimental Lakes Area (ELA) study near Kenora, Ontario. Atmospheric elemental mercury was measured in the range of 1.5-1.7 ng/m³, near global background levels. Reactive Gaseous Mercury (RGM) ran 1-5 pg/m³ - very low background levels. (brooks@atdd.noaa.gov, Lindberg-ORNL)

To test the RGM instrument, a small (25ml) container of crystalline mercuric chloride was opened for ten seconds 5 meters away from the sensor in low wind conditions. This single spike resulted in a RGM reading of 280 pg/m³ (two hour average) and the function of the Tekran 1130 reactive gaseous mercury sensor was qualitatively confirmed. (brooks@atdd.noaa.gov, Lindberg-ORNL)

15. NASA/Land Surface Hydrology. A good agreement among the three disparate measures of atmospheric structure continues as further modeling and data processing are completed. Care is being taken in the modeling to control as much of this complex system as possible. The test run, using ESTAR-derived soil moisture, would ideally match the observations, while the control would not. While such a result is idealistic, we are looking for signs along these lines. We are considering three principal features.

(1) Entrainment at the mixed layer is a feature to which our types of measurements are unusually suited. (2) Secondary circulations appear to have produced a sharp feature both found by LASE and simulated by the model. (3) A mesoscale feature which the model should be able to simulate developed on 14 July 1997 and appeared in the measurements. (dobosy@atdd.noaa.gov, K. Davis and D. Stauffer-Penn State)

16. NSF Multi-User Environmental Research Aircraft. Several Sky Arrow aircraft calibration data files from the SDSU ATLAS field study in Alaska are being analyzed at ATDD. A paper was written describing the instrumentation and calibration of the wind system. The paper will be presented at the AMS's 11th Symposium on Meteorological Observations and Instruments in Albuquerque, New Mexico, in January 2001. (dumas@atdd.noaa.gov, Brooks)

The San Diego State University Sky Arrow completed the summertime measurement campaign in the Barrow region. The operation was in collaboration with ATDD.. On a sad note, Steve Hastings, a long time San Diego State researcher, was among the seriously injured when a Cape Smyth scheduled commuter airplane crashed outside of Barrow while he was in transit. (brooks@atdd.noaa.gov)

17. Southern Oxidants Study. September saw the end to the field phase of the Houston 2000 Air Quality Study. ATDD had four towers measuring air-surface exchange and standard meteorological parameters. The drought that had characterized the entire study period came to an abrupt end on 13 September, just as the sites were to be dismantled. Despite several mishaps caused by the heavy rain, the equipment was safely returned to Oak Ridge. Organization, quality checking, and preliminary analysis of the data are now in progress. (gunter@atdd.noaa.gov, Hall)

18. Coastal Dispersion — Cape Canaveral. Work continues comparing output from the DoD HYPACT model, using measured tracer concentrations, with the RAMS model run during experimental tracer study sessions 2 & 3 at Cape Canaveral. (dumas@atdd.noaa.gov, Rao)

The tracer data from Tests 216 and 117 were processed and plotted in an effort to include one ground-level release and one elevated release for each of the three MVP sessions at Cape Canaveral for HYPACT evaluation. Both of these tests had elevated releases and complement the tracer tests already processed. The HYPACT outputs for these 2 tests were downloaded from the MVP site and processed to store the 10-min concentration fields in the required format. Time periods during which the observed half-hour (or other) average concentrations can be compared to the corresponding predicted values were identified for each test. Test 216, which used NCAR/NCEP data for initialization, yielded only 3 pairs (in time) for comparison, while Test 117, which used NGM data for initialization, gave 19 pairs. (rao@atdd.noaa.gov)

Photographs from the Model Validation Program field campaigns have been added to the MVP Data Archive FTP Server. The image files illustrate work at Cape Canaveral Air Station and Vandenberg Air Force Base, with an emphasis on showing the range of activities by ATDD – flux stations, gas analysis laboratory, IR camera setup, instrumented towers, tracer sampling vans, and the blimp, Cessna, Chieftain, and Long-EZ aircraft. (herwehe@atdd.noaa.gov)

Research Triangle Park

19. Remote Sensing of Spectral Albedo. Large scale determination of land use and ecological health is feasible only with remote sensing methods. One of the physical variables characterizing a landscape is its spectral albedo, or reflectance. The Change Detection program is developing methodologies to extend remote sensing techniques to quantitative ecological assessments using NASA's Airborne Visible and Infrared Imaging Spectrometer (AVIRIS). The AVIRIS instrument is a nadir-looking spectral radiometer that measures upwelling radiance in 224 bands from 370 nm to 2510 nm, with a spatial resolution of 20 m. It is typically mounted aboard a converted Air Force U2 aircraft and flown at altitudes of up to 20 km ASL. Geo-coded images permit atmospheric correction by comparing an AVIRIS absolute radiance with co-located ground-truth reflectance spectra. The MODTRAN radiative transfer model was employed for this task, calculating upwelling radiance for atmospheric conditions and geodesic configuration prevailing at the time of overflight. The lower Neuse River Basin is the first of a series of regions that will be characterized with respect to its land use and ecological state by the spatially-resolved reflectance. (John Streicher, 919 541 3251)

20. Rain-Gauge Network for the Multimedia Integrated Modeling System (MIMS). A network of 10 rain gauges is being established within a small watershed near the Neuse River in eastern North Carolina. This region is being scrutinized by environmental scientists because of the region's explosive growth of animal husbandry and concerns about estuary eutrophication and nitrogen deposition. Precipitation data from this network will complement other surface hydrology, water quality, and ground water measurements that are being collected by scientists from USGS and other EPA Laboratories. This rural area consists of a mixture of farmlands, swine facilities, and densely-wooded, snake-infested bottomlands. Ultimately, a mesoscale meteorological model will be linked with surface water, ground water, and air quality models at a small spatial scale. Precipitation data from the gages will also be useful for evaluating daily NEXRAD data. (John Rudisill, 919 541 3350, Peter Finkelstein, 919 541 4553)

21. New Version of CMAQ Aerosol Model. An updated version of the modal aerosol dynamics model was incorporated into the Community Multi-scale Air Quality model (CMAQ). This version includes a variable standard deviation of the aerosol size distribution. The history variables of the new version are number, surface area, and constituent species mass in each submicron mode. Testing showed that in the new version, the visual range calculated by the new model was in close agreement with that calculated by the IMPROVE method. This close agreement indicated that the size distribution was acceptable. The new version was included in the latest release of Models-3/CMAQ. (Shawn Roselle, 919 541 7699, Frank Binkowski, 919 541 2460)

22. National Coastal Data Development Center. NOAA NESDIS has established the National Coastal Data Development Center (NCDDC) at the Stennis Space Center in Mississippi. The NCDDC will develop and maintain a catalog of available coastal data, ensure the quality of these data and associated metadata, populate and maintain databases, and provide on-line access to the coastal user community. Although the NCDDC will not be open to the public until January or February 2001, a dedication will be held in November or December, dependant upon the availability of Senator Trent Lott to participate. Because of EPA's interest in using data from the Center, the ASMD Director has been invited to take part in the briefing of the Senator at the dedication. (Frank Schiermeier, 919 541 4542)

Idaho Falls

23. Salt Lake City Dispersion Study. Upon return of the van crew to Idaho Falls, the gas lab will be activated. Debbie Lacroix, Roger Carter, and Bill Behymer will carry out the analysis of the bag samplers and the mobile analyzers. Still others are involved with support. Shane Beard will ensure the proper operation of the whole air-bag samplers. In addition, Jerry Crescenti will act as the FRD duty forecaster and assume all EOC responsibilities while most of the FRD staff are in Salt Lake City conducting the intensive sampling. Kirk Clawson will deploy and operate two sonic anemometers. The principal investigator is Kirk Clawson. All of the FRD staff are involved to ensure a successful project.

As part of set up for VTMX-CBNP, the accuracy of the TGA-4000s was tested by allowing them to sample air containing a known concentration of SF₆ and comparing the concentration reported by the TGA-4000 with the known concentration. Well over 50 measurements were made in a variety of environments. Preliminary examination of the results show an average error of about 8%. Since both the calibration gases and the input sample concentrations are reported to $\pm 5\%$, this result is as good as could be expected.

24. Refractive Turbulence Study. Data analysis is focusing on the time response and temperature resolution for the new FRD Fast, Ultra-Sensitive Temperature Probe (FUST) compared to the Warsaw University UFT and the BAT micro-bead. Additionally, we are investigating recovery factor sensitivity to variation in flow angle. This preliminary work has led to a paper to be presented at the AMS annual meeting in January (see: http://www.noaa.inel.gov/frd/Personnel/Jeff/fust_conf.pdf).

The FUST and the UFT probes appear to recover temperature independently of the flow angle. Also, the FUST has more noise (0.05 C) and a slower response (~ 0.1 s) than what we were attempting to achieve (0.01 C, 0.02 s). Therefore, we will continue with laboratory testing, looking to remove the housing for future flight as it seems an unnecessary complication of the problem at hand. Additional test will begin in November. For these, emphasis will be placed on collecting data in regions of high optical turbulence. (jeff.french@noaa.gov, Tim Crawford and Owen Cote)

25. Extreme Turbulence (ET) Probe. FRD is developing an extreme turbulence (ET) probe, co-funded by the ONR CBLAST and the U. S. Weather Research Program/Hurricane Landfall programs. Under this project, we will develop and deploy an innovative ET probe for acquiring surface-based turbulent heat and momentum flux in hurricane-force wind and rain conditions. Deployment during landfalling hurricanes will begin in FY 2002.

The ET probe design and development is now well underway with the prototype housing and electronics nearly complete. Thirty pressure sensors will be used to make the ET probe function in extreme wind and independently of wind direction. The sensor boards, A/D system and other components will be housed within a large 40-cm sphere. To learn more about the ET probe and our hurricane research, visit <http://www.noaa.inel.gov/frd/Capabilities/ETprobe>. (tim.crawford@noaa.gov with FRD and ATDD staff)

26. Central California Ozone Study (CCOS). The Central California Ozone Study (CCOS) ended on September 30, 2000 after a four-month observation period. Quality control screening efforts have shown

that these tower systems worked exceptionally well during the course of the experiment with a few minor problems. The four tower systems located in southern California (Kettleman City, Piedras Blancas Lighthouse, Carrizo Plain, and McKittrick) were decommissioned between September 30 and October 2. In addition, the radar wind profiler and Doppler sodar were taken offline and were prepared for transport to Salt Lake City for participation in VTMX. The five towers located in northern California (Point Reyes, Suisun City, Granite Bay, Bella Vista, and Shasta Lake) will be retrieved sometime in October or early November. A final quality-controlled data set will be generated and delivered to the California Air Resources Board (CARB). A data report will also be generated summarizing FRD's contribution to CCOS. (jerry.crescenti@noaa.gov, Randy Johnson, Neil Hukari, Shane Beard, and Tom Strong)

27. Wave Profile Experiment (WAPEX). Data acquired by the LongEZ during the Wave Profile Experiment (WAPEX) off the Outer Banks of North Carolina in November 1998 will be reprocessed to correct for a heading offset (bias). In addition, the new Flykin software implemented during the intensive observation period of the Shoaling Waves Experiment (SHOWEX) in November 1999 will also be used on the WAPEX data. These differentially-corrected GPS algorithms will reduce the variance in winds by a factor of two to three from that of the previously used software. (jerry.crescenti@noaa.gov, Jeff French, Tim Crawford)

28. INEEL Emergency Operations Center (EOC) Support. Yet another range fire burned 8000 acres on the INEEL from September 17 to 18. Lightning from thunderstorms passing over the INEEL on Saturday, September 16 ignited a small fire which smoldered for about a day. On Sunday afternoon, the small fire which had gone undetected for nearly a day, began to quickly spread when strong southwesterly winds became established.. The EOC was activated soon after the fire was discovered several miles north of the Idaho Nuclear and Technology Engineering Center (INTEC) and the Power Burst Facility (PBF). FRD provided timely short-range weather forecasts to EOC personnel during the evening. (jerry.crescenti@noaa.gov)

29. FRD Wildfire Program. A presentation on FRD's fire modeling efforts was provided to the INEEL Monitoring and Surveillance Committee on 28 September. The discussion included an overview of the fuel and meteorological variables that are important for fire development. FRD has several assets for advancing the state of forecasting in wildfire situations. FRD already has instruments capable of measuring particulate concentrations and visual range. These instruments could be mounted on FRD's airborne research platform and used to study fire plumes. (richard.eckman@noaa.gov)

30. INEEL Mesoscale Meteorological Network. A new station was added to the INEEL Mesoscale Meteorological Network at the end of September, at the top of Big Southern Butte which is located to the south of the INEEL site. It is at an elevation of over 2280 m (7500 ft) above sea level and approximately 760 m (2500 ft) above the INEEL site. The location will provide measurements of mountain top winds and also serve as a backup radio repeater for the network, which should increase the reliability of the entire network. Data collection from the new station will begin the first week of October. (randy.johnson@noaa.gov, Tom Strong, Shane Beard, Roger Carter, Kirk Clawson)

31. INEEL Citizen's Advisory Board. The INEEL Citizen's Advisory Board meets monthly to monitor DOE-Idaho activities and to make recommendations to the DOE regarding public safety. The September meeting of the board was held in Jackson, WY, which is the location of the most recent and most vocal

opposition to INEEL activities. The various monitoring groups at the INEEL, such as the State of Idaho Oversight Program and the USGS, were invited by the Board to present detailed information of their monitoring efforts. Kirk Clawson represented FRD at the meeting and gave a presentation of our meteorological monitoring efforts, including an account of our joint community monitoring activities with the Shoshone-Bannock Indian Tribes. (kirk.clawson@noaa.gov)

32. TANS-INS-LIDAR Platform Attitude Comparison. Work continues on a cooperative study involving NASA-Wallops Island, studying position and attitude data collected during November 1999 using the NOAA Twin Otter. Three systems were mounted on the Twin Otter to independently determine the platform attitude. Using the NASA Advanced Topographic Mapping Lidar as a ground truth, attitude solutions from an INS and TANS-GPS are being compared. Preliminary results from this work will be presented at the 81st Annual AMS Meeting in Albuquerque, NM (see <http://www.noaa.inel.gov/frd/Personnel/Jeff/attitudes.conf.pdf>) (jeff.french@noaa.gov, Tim Crawford, and Owen Cote)

Las Vegas

33. NOAA Cooperative Institute for Atmospheric and Terrestrial Applications (CIASTA). An advanced mesoscale modeling system is now in quasi-operational mode, as a joint program of SORD and CIASTA. NV-RAMS ran to completion 21 of 30 days in September for a 70.0% model run factor. Missing runs were due to the University of Nevada-Las Vegas computer disk space and HVAC problems, and a DOE network outage. Data are continuing to be saved daily, and backed up to CD weekly. (Walt Schalk, 702 295 1262)

34. Climatic Change Project. A report on long-term temperature trends in Las Vegas and Southern Nevada was modified, after review, to look at comparisons between Las Vegas and a nearby township – Searchlight, NV. Searchlight is considered to be representative of a location that has had essentially no population increase in the last 50 years. This information is being incorporated in the report. Additional information on land use and population trends has been requested from the City of Las Vegas. (Doug Soule, 702 295 1266, and Darryl Randerson, 702 295 1231)