



# NOAA ARL Monthly Activity Report



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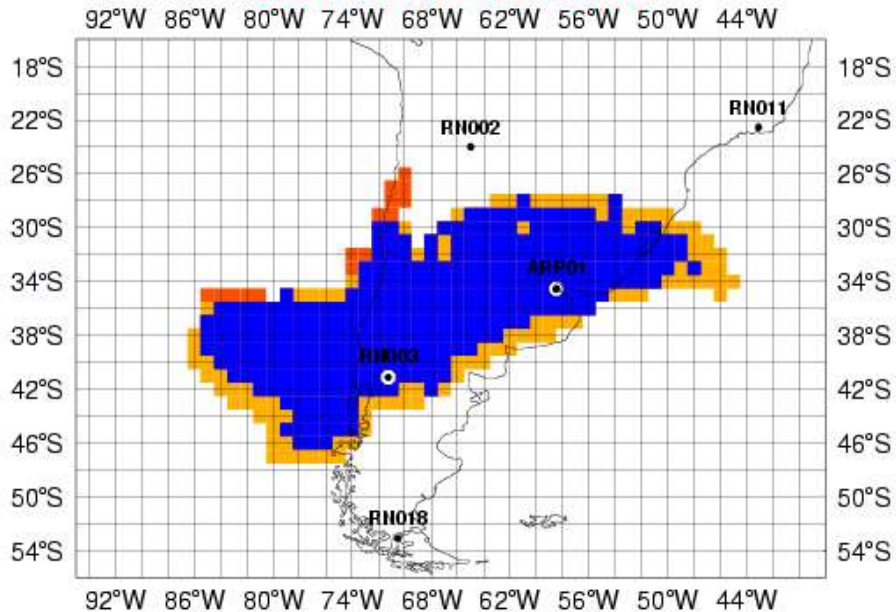
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## Highlights

**1. *HYSPLIT Installation and Training at the CTBTO, Vienna, Austria.*** HYSPLIT\_4.5 has been installed on computers at the Comprehensive Test Ban Treaty Organization, in Vienna. Software was installed to decode NOAA AVN and ECMWF data to HYSPLIT format. A three hour seminar (“Possible alternative ATM models and methods supporting CTBTO verification”) was given to CBTTO staff. Special training was provided.

The figure below shows time dependent (48h-72h) Field of Regard’s derived for the same collection period as that of the measurement location, derived with two models – HYSPLIT\_4.5 (unique area red/grey) and FLEXPART (unique area yellow/light gray). The results show a striking overlap (blue/black area) between both model approaches. The overlap achieved is much higher than that using the currently operative IDC Release 3 ATM software. ([roland.draxler@noaa.gov](mailto:roland.draxler@noaa.gov))

**20011111 1800 MOD#1**  
**20011111 1800 MOD#2**



**2. Dynamical/Photochemical Modeling.** The LESchem model is now being used to study the near-source ozone production potential of petrochemical flare stack emissions in the Houston area. Tabular data for proposed “upset” emission scenarios were acquired to help set up the proposed coupled simulations. Background research on the Houston problem was conducted and pertinent USGS quadrangles were downloaded. To support the project, development work began on implementing a new photochemical mechanism in LESchem built from Mark Jacobson’s tropospheric chemistry mechanism (similar to Carbon Bond Mechanism EX) used with his SMVGEAR chemistry solver. This mechanism utilizes 178 kinetic reactions and 23 photolysis reactions for 97 chemical species, which is significantly more complex than the current condensed isoprene mechanism used in LESchem (45 species, 77 kinetic reactions, 15 photolysis reactions). Applications of the complex mechanism will be applied to “urban-type” simulations where anthropogenic emissions (primarily NO<sub>x</sub> and hydrocarbon emissions) dominate over biogenic emissions (primarily isoprene). Initial tests of Jacobson’s tropospheric mechanism were successfully performed on the stand-alone version of chemistry model SMVGEAR II before integrating the mechanism into LESchem. With an increase in the number of chemical species came an increase in run time and computer memory usage for the simulation. For the test simulation we used the same domain, grid size and time step as previous simulations. Performance statistics from the simulation were encouraging, but a problem with the current file size limit must be overcome to prevent premature termination of the simulation when large output files are produced. ([decker@atdd.noaa.gov](mailto:decker@atdd.noaa.gov), Herwehe)

## Silver Spring

**3. READY/HYSPLIT Registrations.** Since 24 September 2001, ARL has been requiring all users, except those with **.noaa.gov** computer domains, to register before being permitted to run the HYSPLIT transport and dispersion model on the ARL READY (<http://www.arl.noaa.gov/ready.html>) website. At the end of December, over 500 requests for registration have been processed from more than 40 countries, which has caused an increase in workload that is substantially more than was anticipated. ([glenn.rolph@noaa.gov](mailto:glenn.rolph@noaa.gov))

**4. HYSPLIT Linkage With NCEP.** ARL and NCEP successfully linked the operational HYSPLIT model at NCEP with the recently released Eta 12 km output. This new capability provides the Senior Duty Meteorologist at NCEP with higher resolution meteorological forecast data as input to the operational HYSPLIT model run at NCEP. Focus now turns toward linking HYSPLIT at NCEP with the experimental 4 km non-hydrostatic Eta model.

An option to save the HYSPLIT concentration/deposition contours as ArcView GENERATE format ASCII files has been implemented on the operational HYSPLIT model run by NCEP. These files can be imported into the ArcView GIS software using a script to produce shapefiles. The shapefiles can then be overlaid on any GIS map or feature. This option will benefit the local emergency responder who may need to manipulate the model output on site specific maps. An alternative was to provide the model results in a binary gridded format, however by saving the contours created by HYSPLIT, everyone will have the same information no matter how the contours are displayed, thereby avoiding confusion over different contour levels.

Work and testing continues on a new HYSPLIT/READY website interface that will incorporate many new features of the HYSPLIT model recently completed by Roland Draxler. The graphics created from the model will now be the same as those produced by the PC version of HYSPLIT, thereby creating a unified product across many platforms and the web. One new web option will be to save the graphics as vector-oriented PostScript files, which will improve the clarity of the printed graphic on the user's end. The update should be ready for implementation during the first few weeks of February. ([glenn.rolph@noaa.gov](mailto:glenn.rolph@noaa.gov))

As part of the planned NCEP switch from VAFTAD to HYSPLIT for volcanic ash modeling, an earlier version of a program to display HYSPLIT output in the "VAFTAD-format" was modified to use the HYSPLIT library routines and to include many of the options as in the standard HYSPLIT plotting program, *conplot*. The similarity between the two programs, *conplot* and *volcplot*, will simplify operational use and upkeep. ([barbara.stunder@noaa.gov](mailto:barbara.stunder@noaa.gov))

**5. WMO Survey on Women.** In 2001, the World Meteorological Organization (WMO) conducted a second survey of its members on the participation of women in meteorology and in the activities of the WMO. The first such survey was made in 1996 (and covered the period 1992-1995), and individuals at NOAA led the analysis of the global survey results. This month, Dian Seidel and Kay Weston (NWS, International Affairs) analyzed the new survey data (covering 1996-2000) in a manner consistent with the previous analysis. Graphs and text were provided to WMO for incorporation in a report to be presented to the WMO Executive Council this spring. ([dian.seidel@noaa.gov](mailto:dian.seidel@noaa.gov))

**6. Update of Ozonesonde and Umkehr Data Through 2000.** Based on up to 19 Umkehr stations, most in the north temperate zone, the amount of ozone in the high-stratospheric 32-48 km layer has decreased by slightly more than 5% since the beginning of the record in 1968, but with no evidence of a decrease during the last decade. Based on the same Umkehr stations, as well as up to 15 ozonesonde stations (again mostly in the north temperate zone), there is no indication of an ozone decrease in the mid-stratospheric 24-32 km layer between 1968 and the Pinatubo eruption in 1991, and although immediately following this eruption the ozone

decreased by about 5% in both data sets, there is not any sign since of ozone depletion. Indeed, if anything, there has been an ozone increase in the 24-32 km layer during the last few years. In the low-stratospheric 16-24 km layer, both ozonesonde and Umkehr data indicate an ozone decrease of about 10% between 1968 and 1991, an ozone decrease of another 10% immediately following the Pinatubo eruption, and again little change in ozone amount thereafter. This leveling-off, or even slight increase, in layer-ozone since about 1994 suggests that the Montreal and other protocols are indeed having an effect and, barring further volcanic eruptions, that future years will see ozone enhancement rather than ozone depletion. (Jim Angell, 301 713 0295, x125)

**7. Mountain Temperature Variations.** Work has been completed on a study of diurnal, seasonal, interannual and multi-decadal differences in temperature variations at mountain radiosonde sites compared with low elevation locations. These differences may help reconcile the observations that, during the past two decades, global and tropical lower-tropospheric temperatures have shown little trend, while mountain glaciers have been retreating, suggesting warming at those high elevation surface locations. More generally, we conclude that local temperature changes at mountain sites are not necessarily comparable to those at low elevations sites, either at the surface or in the free troposphere at the altitude of the mountain sites. ([dian.seidel@noaa.gov](mailto:dian.seidel@noaa.gov))

## **Boulder**

**8. SURFRAD.** The diffuse correction scheme developed by Ellsworth Dutton was coded for SURFRAD data and applied to all data prior to the 2001 installation of the Eppley 8-48 pyranometer as the solar diffuse instrument. Dutton's method relates the nighttime thermopile signal of a collocated pyrgeometer to the nighttime signal of the diffuse pyranometer. The latter should be zero, but owing to infrared loss from the pyranometer sensor to the inner dome, the nighttime pyranometer signal is usually erroneously negative. At night these signals typically range between 0 and -20 Watts per meter sq. This error is also present during the daytime, and especially affects the diffuse measurement because its sensor is then shaded. Dutton et al. found that the thermopile measurement of a pyrgeometer is linearly related to this offset for Eppley pyranometers. Their correction was tested in daytime by comparing corrected data to collocated Eppley 8-48 readings. Eppley pyranometers are generally not used in the SURFRAD network. Instead, SpectroLab pyranometers are used. The two instruments look similar, i.e., both are double domed, but their thermopile and internal construction are different. The basic difference is that the case of the Eppley PSP is hollow, and that of the SpectroLab model is mostly a solid thermal sink. The Eppley thermopile "floats," and the SpectroLab model's thermopile is directly tied to a large thermal sink. This makes the SpectroLab model slower to respond to changes in insolation, but less affected by a thermal offset. Our results showed little if any relationship between the SpectroLab pyranometer's nighttime offset and collocated pyrgeometer thermopile signals. Typically the SpectroLab instrument showed a constant offset which varied among the different instruments. These constant offsets typically ranged from -2 to -6 Watts per meter sq. The conclusion is that we can not correct the historical SURFRAD diffuse data. (John Augustine, 303 497 6415)

**9. Central UV Calibration Facility (CUCF).** The Central UV Calibration Facility (CUCF) performs calibration audits for the EPA UV Monitoring Program managed by the University of Georgia, National UV Monitoring Center (NUVMC). The EPA UV Monitoring program has 21 sites located across the United States. Fourteen are located in National Parks and 7 sites are near population centers. The EPA UV Monitoring Network uses Brewer Mark IV spectroradiometers. The CUCF audits 7-8 sites per year during the Fall. This year the CUCF visited Denali National Park, Alaska, Chicago, IL, Roosevelt National Park, North Dakota, Atlanta, GA, RTP, North Carolina, Big Bend National Park, TX, Everglades, National Park, FL, and Riverside, CA.

Calibration audits are typically performed with 3 CUCF calibrated horizontal 1000W lamps. This provides redundancy in the measurement and provides quality assurance on the CUCF's lamps. Responsivity from different lamps typically agree within 1-2% and the variation is usually explained by the changing ambient

temperature during the different scans. The responsivities are then compared to previous audits by the CUCF. Changes in the responsivity occur in two separate spectral regions, 290-325 and 325 nm-363 nm. Approximate changes in the responsivity between the two audits (calibration dates are given in parentheses, Julian date and year) are given for the two spectral regions.

Denali -2% and -3% (243 1999 and 242 2001)  
Chicago -23% and -23% (319 1999 and 262 2001)  
Roosevelt -5% and -7% (306 1998 and 267 2001)  
Atlanta -11% and +3% (309 1998 and 290 2001)  
RTP -41% and -39% (267 1998 and 289 2001)  
Big Bend -38% and -22% (281 1998 and 318 2001)  
Everglades -25% and -60% (341 1998 and 331 2001)  
Riverside -60% and -2% (322 1998 and 345 2001)

Changes in the responsivity are due to several factors including but not limited to mechanical changes and upgrades to the instrument during the period, temperature effects on the responsivity, and degradation of instrument components. (Patrick Disterhoft, 303 497 6355 and Kathleen Lantz 303 497 7280)

**10. New Zealand UV Intercomparison.** From 25 November to 14 December of this year, an international intercomparison of ozone measuring instruments was conducted at the NIWA laboratory at Lauder in Central Otago, New Zealand. The primary intercomparisons were done between Dobson spectrophotometers from American Samoa, two Dobson spectrophotometers from Australia, the Dobson spectrophotometer at Lauder, and the international standard Dobson spectrophotometer from Boulder, Colorado. In addition, a Brewer spectrophotometer and a prototype Umkehr type instrument were brought to Lauder from NASA/GSFC to participate in campaign. To provide detailed information on the vertical structure of the ozone distribution during the period of the intercomparison, ozonesondes were flown almost daily, as well as ozone lidars from NASA/GSFC and RIVM (permanently installed at Lauder), and ozone microwave radiometer were operated.

Dr. Irina Petropavlovskikh presented preliminary results of intercomparisons done in zenith sky mode between participating Dobsons as well as informational content of Dobson measurements. All instrument agreed to better than 2 N-values, which usually accounts to about 5 percent layer ozone difference between retrieved ozone profiles. The final analyses are yet to be completed. (Irina Petropavlovskikh, 303 497 6279)

**11. Technical Committee on Computing Resources (TCCR).** Chris Cornwall represented ARL at the Technical Committee on Computing Resources (TCCR) meeting in Boulder December 4-5, 2001. He also attended the Senior IT Council meeting on December 6. It was mentioned that the 2003 budget includes money for IT security, which may (eventually) lead to NCIRT people at field offices. Document standards for PCs will be MS Word or WP, Excel or QPro, PowerPoint or Corel Presentation; document standards for Mac will be Word, Excel and PPT; doc standards for Unix will be Star Office; there's a plan to mirror Netscape email servers to protect data from physical disasters; users have been dissatisfied with Netscape Calendar, so OAR will look into other products, but the server will stay up indefinitely for those already using it; Security Alert #3 (not to be confused with Mambo #5) instructs all NOAA networks on correct router configuration for security, all NOAA networks -- even those on other agencies' systems -- will need to comply with this Alert (but it's pretty standard router configuration, so it's nothing to worry about); OAR encouraged us to send more people through the SANS GIAC online security training, a bargain at \$250/person. (Chris Cornwall, 303 497 7316)

**12. SANS.** Chris Cornwall, Gary Hodges and Charles Wilson sat in on the inaugural SANS Internet Security Threat Update webcast on December 19, 2001. The webcast was an attempt to summarize the threats facing IT today. Much of the information presented was pretty basic, lacking in technical detail. They had speakers

on the latest MicroSoft Internet Explorer security holes, and other topics. For a look at the slides or a listen to the audio of the webcast, visit [http://sans.digisle.tv/audiocast\\_121901/brief.htm](http://sans.digisle.tv/audiocast_121901/brief.htm) (Chris Cornwall, 303 497 7316)

The new NOAA Security Awareness Training is now online. Please make sure all of your computer users complete it by May 5, 2002. It takes about an hour, and is actually educational. For more information, see <http://www.csp.noaa.gov/noaa/ITSAC2001/index.htm> (Chris Cornwall, 303 497 7316)

## **Oak Ridge**

**13. Terrestrial Carbon Program.** Walker Branch Watershed measurements began returning to the levels that existed prior to recent tower damage. Some intercomparison measurements were made to compare differences between temporary locations (used during tower repair) and the more permanent locations at different elevations on the tower. The old, somewhat damaged electrical service was removed, and some new electrical conduit was installed. Several tower maintenance issues were addressed at the same time. Totally new ground fault electrical service will be installed in early January. ([wilson@atdd.noaa.gov](mailto:wilson@atdd.noaa.gov), White, Bellis, Randolph)

**14. Canaan Valley.** Instrument suites are planned for installation on the Canaan Valley National Wildlife Refuge. These will join the SURFRAD and Climate Reference Networks and will also monitor the surface energy balance. A proposal to the U. S. Fish and Wildlife Service is being completed, describing both the scientific value and the physical impact on the wildlife refuge. The Energy Balance suite is to be installed in late spring, while the SURFRAD and Climate Reference Network suites are planned for late summer. The existing instrumentation was recently hardened to provide more reliable winter service. Finally, flux data obtained in flights over Canaan Valley last summer, have had preliminary analysis. Moderate-to-high ozone concentrations were found in the Canaan Valley region. Spatial variability of these data is being assessed. ([vogel@atdd.noaa.gov](mailto:vogel@atdd.noaa.gov), Meyers, McMillen, Hall, Dumas).

**15. Climate Reference Network.** During December the 10 CRN systems continued to run at Bondville for system intercomparison. The two suites of instrumentation intended to go to Oklahoma were setup at ATDD for system checkout and testing of the data transmission components. Initial discussions were made with the site contacts at Oklahoma and it was decided that installation before the holidays was impractical and plans were made to begin this process after the first of the year. ([hosker@atdd.noaa.gov](mailto:hosker@atdd.noaa.gov), Meyers, Hall, Black, French, Brewer, Randolph)

**16. GEWEX.** Four sonic anemometers were tested simultaneously in December to determine their suitability for use in GEWEX. They were the RM Young model 81000 sonic (\$2000), the Metek USA-1 (\$5000), the Gill R2 (\$12000), and the Gill R3 (\$18000). Raw data were collected at 10 Hz from each sonic over 11 days. In the first look, the averages reported from all instruments agreed well. A complete evaluation will be performed early next year. ([dumas@atdd.noaa.gov](mailto:dumas@atdd.noaa.gov), Meyers)

## **Research Triangle Park**

**17. Remote Sensing/Atmospheric Correction.** Processing and analysis of hyperspectral images of the lower Neuse River Basin continues. Large scale determination of land use and ecological health is feasible only with remote sensing methods. EPA's Change Detection program is developing methodologies to extend remote sensing techniques to quantitative ecological assessment. One of the physical variables characterizing a landscape is its spectral albedo, or reflectance. Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) images taken in July 1999 provide spacial resolution of 20m, in a spectral range from 370nm to 2510nm in 10nm bands. Atmospheric correction of the upwelling radiance compensates for the absorption of surface radiance by water vapor and aerosols, as well as removing the

solar backscatter contribution. Obtaining surface reflectance is the final objective of atmospheric correction. Determination of relative water content is achieved by comparing a water-absorbing band to a water-insensitive band. Determination of relative aerosol content is accomplished using the 470nm band (an atmospheric window with respect to gases, but a strong aerosol scattering wavelength) for pixels having negligible surface reflectance at 470nm. (John Streicher, 919 541 3521)

## **Idaho Falls**

**18. Hurricane Balloon.** Data from the September 20, 2001, balloon flight is being used to determine if the hurricane balloon can meet one of the Aircraft Operations Center (AOC) and the 53<sup>rd</sup> Weather Reconnaissance Squadron (53<sup>rd</sup> WRS) requirements to be capable of descending in 20 meters per second updraft conditions. Some consideration has been given to designing a destructive (destroy the balloon shell and bladders) type of cut down. However, accidental activation of this type of destruct could be dangerous to those involved in its inflation and operation. We are also not expert or even experienced with this type of balloon cut down. Just the accidental instantaneous release of the balloon super pressure (balloon shell destruct) could be dangerous for the balloon operations people. Even if a balloon destruct command were executed, there is no reassurance that the balloon will become aerodynamic rather than catching the air like a boat sail. Further work on the balloon cut down or a relaxation of requirements will be required before one of these balloons will be launched into a hurricane. ([randy.johnson@noaa.gov](mailto:randy.johnson@noaa.gov))

**19. Urban Dispersion.** A NOAA Technical Memorandum is in preparation that describes the meteorological instrumentation set up and operated by FRD during URBAN 2000 and VTMX in October of 2000. Two different sites were utilized. The first was a continuously operating sodar and radar profiler site at the Raging Waters water park, which also was a site for a meteorological tower to measure standard surface parameters. The second site was a 3-D sonic anemometer site in the downtown area near the tracer release site that operated only during tracer releases. The Tech Memo will be finished and in review in early January. ([kirk.clawson@noaa.gov](mailto:kirk.clawson@noaa.gov) and Jerry Crescenti)

**20. Tracer Technology.** A commercial instrument manufacturer recently announced a micro-machined Field Asymmetric Ion Mobility Spectrometer (FAIMS). The instrument weighs just 2 pounds and is designed to measure very small concentrations of gases. At our request, the manufacturer is testing the instruments sensitivity to Sulfur Hexafluoride (SF<sub>6</sub>). They hope to have some results by mid-January. Our current continuous SF<sub>6</sub> analyzers weigh about 25 pounds and require a supply of compressed nitrogen and hydrogen while operating. If the FAIMS work, they offer significant size advantages which would allow a wider variety of sampling deployments. ([roger.carter@noaa.gov](mailto:roger.carter@noaa.gov))

**21. INEEL Mesoscale Modeling.** The Alpha workstation used for MM5 modeling at FRD malfunctioned yet again in December. Nevertheless, several improvements were made to the MM5 forecasts at FRD. A program was written to print out hourly time series of meteorological conditions at specific points within the model domain. The output includes forecast winds, temperature, humidity, and precipitation. Time series for specific INEEL facilities will eventually be put out on the network so that FRD staff can use them in developing forecasts for INEEL. Work was also under way to improve the MM5 initialization. Currently, data from the INEEL Mesonet are used only for the initial conditions. An alternative being investigated is a dynamic initialization, in which Mesonet data are used to nudge MM5 variables over a spin-up period lasting up to 3 hours. The main disadvantage of this approach is that the overall length of the model simulations will be increased. ([richard.eckman@noaa.gov](mailto:richard.eckman@noaa.gov))

## Las Vegas

**22. *Test-Readiness/Sub-Critical Tests.*** In support of a test readiness exercise, SORD personnel presented a comprehensive assessment of current and projected meteorological conditions in the vicinity of the U1a Complex in Yucca Flat, making use of a wide variety of remote meteorological sensors, NOAA weather forecast models, and the RAMS model centered on the NTS. They also provided test management with the predicted transport and dispersion pattern for the unlikely occurrence of release of toxic material into the atmosphere. Moreover, training was provided to the Alternate SORD HAZMAT Briefer to help maintain readiness skills. (Darryl Randerson, 702 295 1231)