



NOAA ARL Monthly Activity Report



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Highlights

1. Mercury in the Arctic. Monitoring of atmospheric Reactive Gaseous Mercury (RGM) was started in Barrow in January ahead of the polar sunrise, which occurred on January 23, 2000. January's RGM concentrations matched September's consistently low 1-2 pg-m⁻³ (30-80 pg-m⁻³ is typical of the Eastern US). By February 9, two weeks after polar sunrise however, RGM concentrations had developed strong diurnal cycles. With a sunlight duration of 5 hours and 48 minutes, daytime concentration reached as high as 100 pg-m⁻³, returning consistently to 1-2 pg-m⁻³ each night. Unexpectedly, the daytime RGM maxima appear to be strongly positively correlated with ambient air temperature. The hypothesis of direct temperature influence must be checked against possible transport from different air-mass source regions.

Barrow snowfall has been sampled monthly for an exciting new study in collaboration with the University of Manitoba. Researchers there (C. Kelly et al.) have developed bio-reporter bacteria which emit visible light when Hg crosses their membranes. This phenomenon will be used as indicator of the bioavailability of inorganic Hg deposited with the snow. UM researchers have agreed to analyze the mercury content and bioavailability in these snow samples. Data are expected by early summer.

Finally, we are collaborating with George Divoky at the University of Fairbanks on analysis of Hg in Barrow seabirds. brooks@atdd.noaa.gov (Meyers, Lindberg-ORNL)

2. Mercury in Florida. From January 15 to February 7, ARL scientists from three divisions were involved in the first phase of a field study taking airborne measurements of the concentration of elemental mercury gas (Hg⁰), reactive gaseous mercury (RGM), and fine particulate mercury. This field study is a collaborative effort involving the State of Florida, EPA, and ARL. The goal is to quantify the flux of various species of atmospheric mercury from outside the south Florida region. Mercury contamination in the Florida Everglades is known to occur from atmospheric deposition. However, there remains much debate as to the sources responsible for this contamination. Hg⁰ and RGM have very different atmospheric behaviors. Thus, they each must be sampled separately to help identify the importance of mercury flux from outside the region. The NOAA Twin Otter aircraft was used to obtain air samples at various altitudes from just above ground (or sea level) to as much as 12,000 feet above sea level. Trajectory analyses using ARL's HYSPLIT model were used to define flight paths to sample air coming onto the Florida peninsula from various locations. This winter season campaign will be followed by a summer campaign, now planned for May 23 to June 30, 2000, to obtain measurements in both cool and warm seasons. (Russ Bullock, 919-541-1349) winston.luke@noaa.gov, gunter@atdd.noaa.gov

3. Detection of Stratospheric Trends. A paper on "Detecting the Recovery in Total Column Ozone," has been accepted for publication in JGR. The paper shows that it is unlikely that ozone recovery, as defined by measuring an increase in total column ozone, will be detected in the next two decades. Strong regional

5. ARL Systems to be Used in European CO₂ Sequestering Studies. A cooperative agreement was reached to provide the Italian National Research Council (CNR) with an ARL Mobile Flux Platform system for measuring fluxes of heat, moisture, momentum, and CO₂. The system will be installed on a new Sky Arrow ERA (Environmental Research Aircraft) to be used in the European Union study, “Regional Estimates of Carbon Balance” (RECAB), to start this summer. brooks@atdd.noaa.gov (Dumas)

The same aircraft/MFP system was tested in a field study in Alaska last year. Data analysis was completed in February, and the results were presented at the NSF annual meeting. Daytime flights showed the tundra to be a source of carbon dioxide to the atmosphere. Vegetation productivity was low relative to respiration and decomposition rates. The highest source regions were around Barrow and within the foothills region at the far southern end of the Barrow-Atkasuk transect. Sensible heat fluxes were well correlated with carbon dioxide fluxes, while latent heat fluxes were nearly constant along the entire transect. brooks@atdd.noaa.gov (Dumas)

Silver Spring

6. 1999 Warmer Than 1998 After Adjustment for ENSO. Based on data from the 63-station radiosonde network, global tropospheric temperature in 1998 was the warmest of the 41-year record, 0.7K above the 1961-1990 average. However, after adjustment for the influence of the powerful El Nino of 1997-98 thereon, this temperature was slightly less than 0.2 K above the 1961-1990 average and only the 12th warmest year of record. Since the summer of 1998, the SST in eastern equatorial Pacific has been in the cool La Nina phase. Accordingly, even though the global tropospheric temperature in 1999 is indicated to be 0.6K less than in 1998, after adjustment for La Nina the global tropospheric temperature in 1999 is more than 0.2K above the 1961-1990 average and the 5th warmest year of record. Thus, after adjustment, 1999 is warmer than 1998! This shows quite vividly the different perspective one has on individual years with regard to global warming depending upon whether or not adjustment is made for the influence of the ENSO on global tropospheric temperature. (Jim Angell, (301) 713 0295, x127)

7. The Transport and Deposition of Toxic Substances to the Great Lakes. Work continues on modeling the atmospheric fate and transport of toxic pollutants, with emphasis on deposition to the Great Lakes. The preparation of a set of scientific papers on the modeling of dioxin and atrazine has begun. The primary interpolation procedures used in the modeling system – spatial and physical-chemical interpolation methodologies – have been carefully evaluated. It was found that the procedures are providing satisfactory results. In addition, the vapor/particle partitioning algorithm used was evaluated by comparison against several recently reported measurement data sets. It was found that the predictions compared fairly well with the measurements, giving confidence that the algorithm is providing reasonable results. A new emissions component – backyard trash burning – has been added to the Canadian dioxin emissions inventory being used in the modeling. The inventory, based initially on census divisions in Canada, is now being transformed to a 50 and 100 km grid for map-based display purposes. Initial modeling with the newly expanded inventory show encouraging results. For example, in the past, model predictions at Canadian locations have tended to be somewhat lower than ambient measurements. With the addition of the Canadian backyard burning element of the inventory, the agreement between the model predictions and the measurements in Canadian monitoring locations is better.

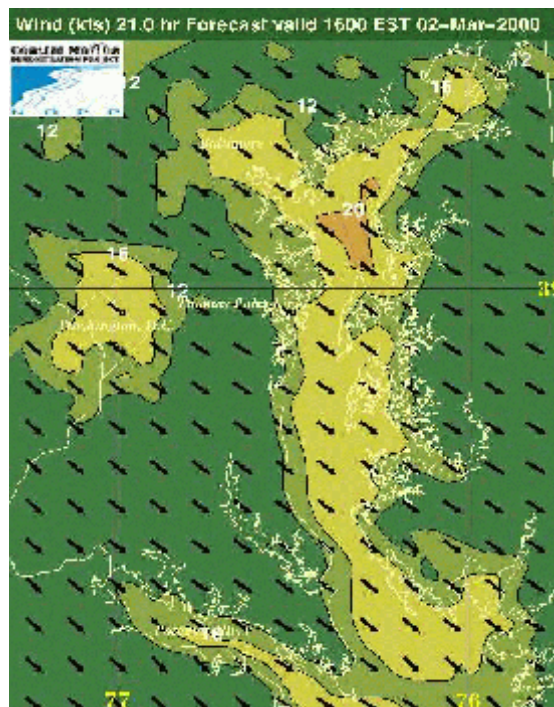
A dioxin-modeling collaboration with Nicolas Lewyckyj, of the Flemish Institute for Technological Research, was begun. Dr. Lewyckyj is attempting to model the atmospheric fate and transport of dioxin in his region, and has decided to try to use the HYSPLIT-based dioxin modeling system being developed here at NOAA ARL. mark.cohen@noaa.gov

8. Dust Storms and Dust Dispersion. Results from last month indicated that there was substantial sensitivity to the spatial structure of the emissions inventory file due to the small spatial extent of the region of strong winds that would induce PM10 emissions. One solution that produced acceptable results was to assume a minimum soil disturbance area, such that every grid cell would have at least 10 to 20% of the soil disturbed to permit PM10 emissions at a much lower threshold velocity. roland.draxler@noaa.gov (and Dale Gillette, Jeff McQueen)

9. PARTS Project. The HYSPLIT code was installed on Sun and Linux systems at the Meteorological Service of Singapore (MSS). In addition, software was installed to convert the meteorological fields from the Japanese Meteorological Agency's model (used by MSS) for input to HYSPLIT. roland.draxler@noaa.gov

10. Coastal Marine Demonstration Project Preparation for Winter Demonstration. RAMS version 4.2 was incorporated into the ARL operational script system and then installed on the NOS SGI. The 36-hour 4 and 16 km RAMS 4.2 forecasts are to be run twice a day through April 15, then once a day (12 UTC cycle only). The current forecast file and associated graphics are also available on the ARL-READY and WSI-Weather Channel web pages. RAMS 4.2 uses a more sophisticated cloud radiation scheme which accounts for diverse cloud species (snow, rain, ice crystals, cloud vapor, aggregates particles). Mellor-Yamada Turbulent Kinetic Energy parameterization (level 2.5) is used for boundary layer mixing. The new LEAF-II soil and vegetation parameterization account for subgrid land use variability. The parallel code requires 4-6 hours to complete a 36-hour forecast on an 8 processor SGI.

Outputs are now easily accessed via READY. The figure shows ARL-RAMS predictions displayed on the WSI-Weather Channel web page. Wind speedups are observed over the Northern bay and up the Potomac river. The advanced high-resolution system is now being tested for application in southern Nevada. jeff.mcqueen@noaa.gov (and Glenn Rolph; Jim Sanders)



11. CMC and ARL Collaboration. Glenn Rolph traveled to the Canadian Meteorological Center (CMC) in Montreal in February to participate in the Regional Specialized Meteorological Center (RSMC) radiological exercise and gain an insight into their operations during an emergency. A plan was also finalized to jointly develop redundant dynamic web pages at each of the three centers (Washington (USA), Montreal (CA), and

Melbourne (AU)) as another means of dissemination of transport model products. The web pages were implemented and tested at CMC and ARL in preparation for the March monthly RSMC exercise. In addition, CMC has offered to help ARL in its development of an improved interface for initiating the transport model and disseminating the results. glenn.rolph@noaa.gov

12. *READY Guides Solo Manned Balloon Flight* . READY was used by Lou Billones and his team of meteorologists in preparation for and during the flight of Kevin Uliassi, aboard the balloon J. Renee, who was competing to be the first soloist to navigate the globe in a hot air balloon. The HYSPLIT model forecast trajectories were “superb” according to Billones and he believed the flight would have been successful if not for a technical problem with the oxygen system Kevin Uliassi used to breathe. NOAA released a press statement (<http://www.arl.noaa.gov/pubs/press/Feb242000.html>) during the flight. glenn.rolph@noaa.gov

13. *Canning the Spam*. *Spam* is a term used on the internet for electronic junk mail. Unwanted solicitations are sent to mailing lists all over the internet by people who use not only their own machines, but take advantage of the way most computers have e-mail set up, to relay everyone else’s mail. Recently, it was discovered that spammers have been using arlrisc as such a relay point. Apart from the fact that we did not invest in our powerful machines so that spammers could use them, some of the spam targets are sophisticated enough to respond by blocking e-mail from arlrisc, which can impact legitimate e-mail contact from us. Current versions of the sendmail program at the heart of the mail system are set up to block such relays from unwanted systems. However, sendmail is interlinked with basic parts of the operating system, and IBM support would only suggest a complete upgrade of the entire operating system. Rather than that, we have downloaded the current version of sendmail, and installed it in place of the previous version, apparently without adverse effect on existing legitimate traffic. albion.taylor@noaa.gov

Boulder

14. *SURFRAD*. Software that interpolates rawinsonde-type profiles to SURFRAD station locations now runs in near real time. The key to getting this working automatically was to construct software that would automatically query the FSL web site to retrieve North American sounding network data for the previous day. A web page that allows users to plot these soundings on a skewT-logP diagram and to download the interpolated sounding files has also been developed and is now a link on the SURFRAD web page. Historical soundings have been processed for the duration of the network (Jan. 1995 to present) for all station locations, and the newest soundings are now processed in near real time. The sounding page can be accessed from the SURFRAD web page by choosing the link “Soundings.” To quality control the interpolated soundings, a feature has been added to the daily SURFRAD data processing where the interpolated soundings and the nearest real sounding for the day being processed are plotted on the same skewT-logP diagram. If an interpolated sounding is found to be in error it is deleted.

Another web page has been created to view monthly means of SURFRAD data in annual time series. The web plotting page for these data is analogous to the plotting page for daily time series of SURFRAD data, i.e., plot parameters are chosen from a form and variables may be plotted together as long as their units are the same. Select “Monthly Means” on the SURFRAD web page. (John Augustine, 303 497 6415)

15. *Spectroradiometer Intercomparison*. Planning and preparation for the upcoming Fifth North American Spectroradiometer Intercomparison have been progressing. The week of March 12, the CUCF staff will

decide by the end of the week whether there is sufficient financial support available to conduct the intercomparison. The WMO and the NASA GAW program have offered some support for foreign participation. An ADF request to help support the event has been submitted for consideration. The scheduled time of the intercomparison is mid-June to coincide with the summer solstice so that the measurements over the greatest range in solar zenith angle can be used to examine the cosine responses of the different irradiance collector devices of each instrument. The value of these intercomparisons goes well beyond just comparing instruments and revealing irregularities. It offers opportunities for instrumentation specialists to interact with others having similar interests, ideas are exchanged, advances in state-of-the-art are described, and recent scientific achievements are presented. There is a secondary benefit derived from these intercomparisons and that is the spectroradiometric data from several instruments offers a best estimate for calculation of the irradiance in the human erythema (sunburning) region of the solar spectrum. This calculation is then transferred to the SRRB's triad of Yankee and Solar Light standards. Three reports have been written summarizing the results of these intercomparisons and a fourth report is in the process of being finalized. They are available upon request from NIST and the ARL\SRRB in Boulder. (John DeLuisi, 303 497 6824 and Patrick Disterhoft, 303 497 6653)

Note – As at the time of this writing, no response has been received to the request for ADF support. The Intercomparison has been canceled (BBH).

16. Arctic Research. A new assessment of the impacts of climate change to the Arctic is being planned by NOAA's Arctic Research Office. Tom Murray and John Calder headed a group of roughly 40 internationally renowned scientists to establish the scope of the final assessment. Scientists from at least eight different countries were represented and spent three days working out the details for the plan. Betsy Weatherhead chaired the part of the meeting dealing with what we currently know. The final assessment will be headed by Bob Correll and Gunter Weller. (Betsy Weatherhead, 303 497 6653)

17. UV Newsletter. The first edition of a monthly UV newsletter, titled "UV Network News," was published in February. EPA is funding Betsy Weatherhead to establish an outreach program for their network of Brewer UV monitors. The newsletter went out to approximately 75 scientists and people associated with the network. Amy Stevermer has taken the lead with this newsletter and several other outreach projects. Amy has both an interest and skill at communicating complicated subjects to a wide variety of audiences. If you're interested in getting on the mailing list for these newsletters, contact Amy Stevermer. (Betsy Weatherhead, 303 497 6653 and Amy Stevermer, 303 497 6417)

Oak Ridge

18. Carbon Dioxide Program. Long term monitoring of fluxes above and below the canopy continues. A second short-term study of eddy covariance on the forest floor was begun. The purpose of this study was to examine the effect of mean vertical advection on nocturnal estimates of soil respiration. A paper was submitted to *Boundary-Layer Meteorology* describing the earlier short-term study at the forest floor. A new carbon dioxide profiling system is being tested. wilson@atdd.noaa.gov

19. Canaan Valley. Installation of a NOAA AIRMoN station in the Canaan Valley, WV will resume as soon as conditions permit. The cooperation of the U.S. Fish and Wildlife Service, managers of the Canaan Valley National Wildlife Refuge, has greatly expedited the process. The air-quality data this station will

provide will be important to the missions both of the Canaan Valley Institute and of the USFWS. Air quality in the Mid-Atlantic Highlands was the subject of a meeting at ATDD on Feb. 23, which included the executive director of the Canaan Valley Institute, a staff member from the National Park Service, and staff from NOAA/ATDD. The Discussion of science issues and research plans will help define the suite of measurements for the new AIRMoN station.

A climate article was written for the *Encyclopedia of Appalachia*, to be compiled by the Center for Appalachian Studies and Services, East Tennessee State University, and to be published by the University of Tennessee Press. vogel@atdd.noaa.gov

20. Dynamical/Photochemical Modeling. A substantive report is being prepared on the ARL large eddy simulation (LESchem) modeling research, with completion expected by the end of March. A program was created to compute the statistics of the turbulent midday convective boundary layer (CBL) generated in the benchmark large-eddy simulation of LESchem. Many LES quantities were calculated, such as the mixed layer depth, the convective velocity and temperature scales, and horizontally-averaged profiles for the velocity components, their standard deviations and normalized variances, velocity component covariances, resolvable turbulent kinetic energy and its flux, potential temperature and its normalized variance, kinematic sensible heat flux, passive tracer flux, and eddy diffusivities for momentum, heat, and tracer. The statistics and their profiles closely agree with the statistical characteristics reported in other LES studies and field program data. herwehe@atdd.noaa.gov

21. Urban Modeling. Final analysis of wind rose data for several sites of varying terrain and landscape continues (Cape Canaveral, FL; Jamestown, TN; and Spencer, TN). A comprehensive report is being written for inclusion with the Federal Highway Report. One major conclusion is that the NWS ASOS network is not adequate for urban dispersion problems. A first step in improving the problem would be to refit ASOS sites with wind speed and direction capabilities that measure to air quality standards (down to 0.5 m/s or less). Currently, ASOS sites only measure winds at or above 1.5 m/s. This largely fails to account for very important light wind data needed to properly model air quality. More details will be available next month. birdwell@atdd.noaa.gov

The evaluation and refinement of the ROADWAY-2 model using the 1976 GM tracer data continued. All program files have been reconfigured for the new computer. The concentration predictions for the four perpendicular wind runs were plotted together. The results look good. The input for the first run (Case # 58) with parallel wind was set up. This did not work well, however, and the output is being studied in order to improve the results. rao@atdd.noaa.gov

22. INSRP (Interagency Nuclear Safety Review Panel). Discussions related to the draft Safety Analysis Report prepared by DOE for the 2001 Mars Lander mission (MARS'01) continue. The rover requires small heating units (LWRHU's) powered by small amounts of Pu238. Additional reviews were conducted by INSRP to confirm the program's assessment of little risk associated with potential on-site or re-entry accidents for the MARS'01 spacecraft. pendergrass@atdd.noaa.gov

23. NSF Multi-User Environmental Research Aircraft. Work continues on upgrades of the mobile flux platform (MFP) system for incorporation into three Sky Arrow aircraft. Several changes to the current system are being made: repackaging the auxiliary components in a separate box from the main computer,

upgrading the main processor, and updating the interface cards to use the PCI bus. dumas@atdd.noaa.gov (Auble, Brooks)

In an interesting aside to the above work, Steve Brooks and Ed Dumas received an award from Oak Ridge Associated Universities for their outstanding work in transferring the technology developed at ATDD to a commercially available environmental research aircraft, the Sky Arrow ERA.

24. *Urban Dispersion.* ATDD's Remtech sodar was deployed to the National Arboretum in Washington, D.C. in support of Defense Threat Reduction Agency (DTRA) urban dispersion studies. Initial performance of the system has been quite poor. The installation is located next to (100 yds) New York Ave. (Hwy. 50), which provides for a continuously high background noise level. In addition, mulching operations at the National Arboretum have begun next to the sodar site. pendergrass@atdd.noaa.gov

An ATDD team visited the Navy Memorial on Pennsylvania Avenue in downtown Washington, D.C., to test the feasibility of using radio frequency modems instead of cables to acquire wind data from a sensor mounted on one of the masts at the Memorial. The system worked well, with no apparent interference. The staff at the Navy Memorial Visitor Center were extremely hospitable, and will allow ATDD to set up a laptop computer and RF modem in their lobby, to record the wind data. Installation of the sensor and computer will occur during early March. hosker@atdd.noaa.gov (Pendergrass)

25. *Refractive Turbulence Study.* Turbulent temperature variations modulate the air's index of refraction, affecting light propagation, a condition of interest to numerous military applications. We have made extensive *in-situ* measurements of clear-air turbulence near the wintertime subtropical jet. These document the jet's turbulent structure in unprecedented thoroughness. Observed turbulence intensity varied from near zero to levels comparable to the convective boundary layer. A full set of turbulent statistics, including third moments, for fluxes of momentum and heat is being computed from three wintertime expeditions, two in Australia, and one in Japan. The general survey will hopefully reveal some characteristic structure of turbulence relative to the jet core. Once this is complete, a more careful look at significant cases will examine the role of gravity waves and other complicating features. dobosy@atdd.noaa.gov

26. *Rocket Exhaust Dispersion.* Samples of the format and content of the Florida Model Validation Program (MVP) tracer summary files were refined. The programs for processing the MVP surface tracer data were updated, streamlined, and many comment cards were inserted.

The processing of MVP tracer data for HYPACT evaluation continued. The modeled plume appears narrower and its centerline is closer to the observed plume footprint (as indicated by the van sampling tracks) than for the other tests processed so far. rao@atdd.noaa.gov

Research Triangle Park

27. *Analysis of the Effects of ASOS Data on Air Dispersion Modeling.* The effects of calm winds in the pre- and post-ASOS periods in 1991 and 1995 for Baton Rouge, LA, Lincoln, NE, and Syracuse, NY, were investigated. The results of the study indicated a tendency toward higher ground-level pollutant concentrations with increased instances of calms at these specific locations. Although the ceiling heights for ASOS data are not measured above 12,000 feet, an analysis of the stability classes illustrated that the relative

ratios for each stability (A-F) remained the same both before and after the ASOS commissioning dates. A poster paper entitled “Analysis of the Effects of ASOS Data on Air Dispersion Modeling” was presented at the 11th Joint Conference on the Applications of Air Pollution Meteorology in Long Beach, CA. (Dennis Atkinson, 919 541 0518)

28. *Urban Dispersion – Flow Measurements Around Building Clusters.* To predict the dispersion of harmful materials released in or near an urban environment, it is important to understand the flow patterns which result when the wind interacts with buildings. Experiments have been conducted in the ASMD Fluid Modeling Facility’s wind tunnel to examine the flow field within and around clusters of buildings. The goal was to identify characteristic features of the flow field and to produce a high-quality set of flow measurements against which to evaluate predictions from various computational models. In the first set of measurements, the building cluster consisted of seven buildings aligned perpendicular to the flow with a streamwise separation of one building height and extending the full width of the tunnel (a “2-D array”). In the most recent set of measurements, a similar building arrangement was used, but formed from cubes with both streamwise and spanwise spacing of one building height (a “3-D array”). Pulsed-wire anemometer measurements of all three velocity components were made along a vertical centerplane for both arrays and at additional locations within the 3-D array. The centerplane flow structure around the 3-D building array was found to be very similar to that measured around the 2-D array in terms of the gross characteristics of the flow field. Flow approaching the 3-D building array decelerates more slowly than the flow approaching the 2-D array, although the depth over which the deceleration takes place is about the same in both cases. The upstream reverse flow region is smaller for the 3-D array. Flow over top of the first building of the 3-D array shows separation taking place, albeit rather shallow compared to the 2-D array. In the canyons downstream of the buildings, the reverse flow near the surface is considerably weaker for the 3-D array than for the 2-D array. Velocity profiles downstream of the 3-D array show reverse flow until approximately 1.2 heights(H) downstream of the last building, whereas reverse flow extended slightly more than 3.5H downstream of the 2-D array. For both arrays, the velocity profiles farther downstream relax toward their undisturbed values. These measurements are being compared to results from similar studies and to measurements made with laser anemometers in order to draw conclusions regarding the representativeness of the results for the proposed application. (Bob Lawson, 919 541 1199)

29. *Gordon Research Conference.* Approximately 75 plant physiologists, botanists, biochemists, atmospheric chemists, and meteorologists recently gathered in Ventura, CA, for a Gordon Research Conference on Biogenic Volatile Organic Compounds (VOCs) and the Atmosphere. Tom Pierce gave an invited talk entitled “Reacting to Isoprene: An Air Quality Modeling Perspective.” He reviewed the changes in emission algorithms that have produced massive increases in isoprene emission estimates during the past twenty years. The conference attendees showed much interest in the isoprene “volcano” that models like Models-3/CMAQ are predicting over the oak forests of the Ozarks. While surface isoprene concentrations of 140 ppbv have been measured in this region, model estimates are peaking at ~350 ppbv. Discussions on this issue focused on improved forest canopy modeling of solar radiation and temperature, evidence of nighttime hydroxyl radical production, and possible low model estimates of nitric oxides (NO_x). Other presentations included those by Dennis Baldocchi (formerly with ARL) and Paul Makar (Environment Canada) who discussed biogenic VOC flux experiments at ARL’s Walker Branch tower in Oak Ridge. (Tom Pierce, 919 541 1375)

Idaho Falls

30. Shoaling Waves Experiment (SHOWEX). Preliminary analysis has begun on data acquired by the LongEZ during the Shoaling Waves Experiment. On 20 November 1999, the LongEZ flew repeated flux legs over the western edge of the Gulf Stream at an altitude of 10 m to help understand surface forcing on the atmosphere. An example of data from a 30-km flux leg is illustrated. These data were obtained with the LongEZ headed east. Three distinct atmospheric flow regimes can be identified – stable, transitional, and unstable. The stable regime is marked with an absence of turbulent activity. The mean wind speed is 1.3 m s^{-1} from the west. On average, the atmosphere is 3.9E C warmer than the underlying sea surface. The variances of the alongwind (σ_u^2), crosswind (σ_v^2), and vertical wind velocity (σ_w^2), air temperature (σ_T^2), and humidity (σ_q^2) are all minimal (Table 1). The sensible (H_S) and latent heat (H_E) fluxes are essentially zero. Other turbulent statistics include wind stress ($\hat{\tau}$), friction velocity (u_τ), temperature scale (T_τ), humidity scale (q_τ), drag coefficient (C_D), Monin-Obukhov length (L), and surface layer stability ($\alpha = z / L$). All of these values are indicative of a stable marine atmospheric boundary layer (MABL).

The start of the transitional MABL is quite dramatic. The wind speed increases from 2 to 6 m s^{-1} over a distance of 10 km while the wind direction backs from westerly to southeasterly. As the LongEZ begins crossing the western edge of the Gulf Stream, the sea surface temperature increases about 4 EC over a distance of 10 km. The air-sea temperature difference also switches signs in this portion of the MABL. Large increases are observed in all of the variables. However, these statistics are somewhat inflated by the nonhomogeneous nature of the MABL. When applying eddy correlation techniques to a nonhomogeneous time series with step-like changes, artificial increases of the variance are injected. We note that while the sensible heat flux is extremely small, a significant increase in the latent heat flux to 73 W m^{-2} is observed. The wind stress increases by two orders of magnitude while the friction velocity is about ten times that found in the stable MABL. The drag coefficient also increases dramatically, while the Monin-Obukhov length switches signs and has increased by one order of magnitude.

Note the leveling off of sea surface temperature in the unstable MABL, with air temperature about 1E C cooler the water. Average wind speed is then 9.0 m s^{-1} from the southeast. While the air temperature has not changed dramatically over the length of the entire leg, the specific humidity has risen from 9.0 g kg^{-1} in the stable MABL to 11.3 g kg^{-1} in the unstable MABL. The sensible and latent

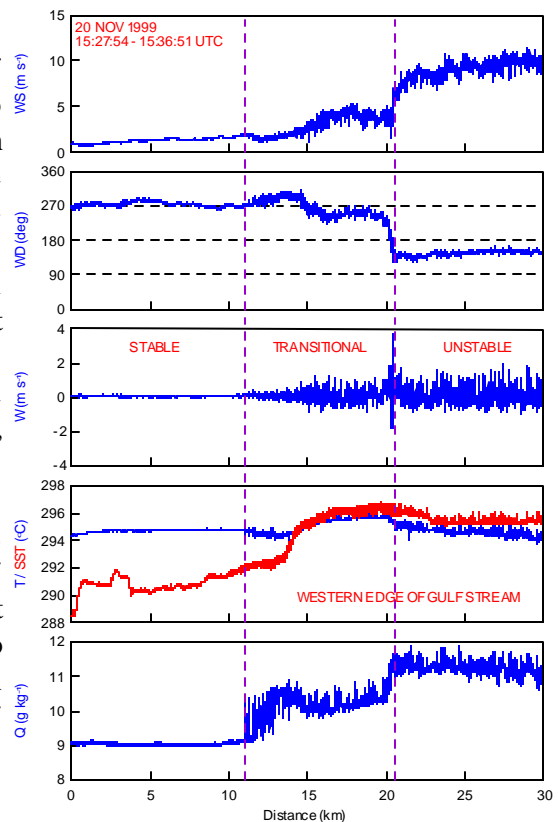


Figure 1. Time series acquired by the LongEZ during a 30-km flux leg at an altitude of 10 m near the western edge of the Gulf Stream. From the top: Wind speed, wind direction, vertical wind speed, air and sea surface temperature, and specific humidity.

heat fluxes have increased to 46 and 108 W m², respectively. Values of $\hat{\delta}$ and u_t remain nearly the same as are found in the transitional MABL; however, significant increases in T_t and q_t can be seen. Values for L and α are typical values for an unstable MABL. jerry.crescenti@noaa.gov (Jeff French, and Tim Crawford)

31. High Speed Temperature Probe. Several different probe materials have been tested for use in a high speed temperature probe for high altitude aircraft use, to yield a 50 Hz response and a near 1×10^{-3} E C resolution. We have been successful at getting the temperature resolution and frequency response with $\sim 10 \mu\text{m}$ diameter, 200 ohm tungsten wire. However, when placed inside the probe and subjected to turbulence and other vibrations, noise is induced in the temperature signal due to flexing of the tungsten wire. The mechanically induced noise ranges around 2 to 3×10^{-2} E C while it is being vibrated and returns to under 1×10^{-3} E C without vibration. We have isolated the vibration to the tungsten filament to be sure that it is not a loose connection or some other component causing the problem. By simulating very low vibration to the filament, we are able to watch the phase of the output temperature maintain phase with the vibration. There does not seem to be any practical resolution to this problem.

Current studies are focusing on use of $\sim 10 \mu\text{m}$ thermocouple wire feeding into an ultra low noise DC amplifier. We are continuing to experiment with this and are finding 3×10^{-3} EC random electrical noise and are working to reduce this. So far, we have not seen substantial mechanical noise using the thermocouple. We are now working on a design to chop the low level DC signal into a high frequency AC signal, amplify the AC signal and then run it through a high pass filter to remove low frequency amplifier noise. randy.johnson@noaa.gov (and Tim Crawford)

32. Tornadoes Strike Southeastern Idaho. The afternoon of Valentine's Day, 2000, proved to be one for the record books, at least in southeastern Idaho. What began as a warm, moist spring day, ended in darkness with major power outages and wind damage caused by severe storms. A strong cold front pushed through the area spawning five tornadoes: two F0 and three F1 Fujita Scale tornadoes. The INEEL mesonet provided valuable information on the position of the frontal passage to both NWS and FRD forecasters. During the followup, the mesonet provided clues for personnel in charge of providing damage assessment reports.

As a result of the storm, nine of the 33 mesonet stations recorded new wind gust maximums (see Table below). The storm registered a maximum gust of 43 m s^{-2} (96 mph) and Minidoka, and nearly one-half of the stations recorded gusts above 33 m s^{-2} (70 mph). For 12 other stations, the wind gusts were among the top ten strongest gusts ever recorded for the data period of record. During the afternoon and evening the entire INEEL computer network went down as a result of the power outages. However, the dedicated link from the FRD office to the EOC remained operational because of backup generators at the FRD office, the EOC, and some other key installations. kirk.clawson@noaa.gov roger.carter@noaa.gov (and Neil Hukari)

INEEL mesonet stations with new record peak wind gusts from the 14 February 2000 storm.

Station Name	Peak Speed (mph)	Time (MST)	Old Record	Data Period
Atomic City	74.1	1555	60.2 mph on 11/26/99	Sep 1999 - Feb 2000
Big Southern Butte	92.9	1520	90.0 mph on 07/09/95	Apr 1993 - Feb 2000
Blackfoot	85.7	1630	78.0 mph on 04/23/94	Apr 1993 - Feb 2000
Fort Hall	77.3	1600	69.6 mph on 06/17/97	Mar 1997 - Feb 2000
Idaho Falls	69.4	1620	62.8 mph on 09/25/99	Apr 1993 - Feb 2000
Lost River Rest Area	73.5	1530	63.6 mph on 09/18/99	Nov 1997 - Feb 2000
Minedoka	96.3	1500	72.7 mph on 07/09/95	Apr 1993 - Feb 2000
Naval Reactor Facility	77.4	1550	72.7 mph on 07/10/95	Apr 1993 - Feb 2000
Rover	87.7	1605	78.6 mph on 06/16/96	Apr 1993 - Feb 2000

33. Portable Meteorological Monitoring Stations. Work has commenced on building a portable meteorological monitoring station for an INEEL mobile incident command center. The station will be deployed to monitor local meteorological conditions. A digital readout will be displayed in the center and the data will be ingested into the INEEL Viz display (see <http://www.noaa.inel.gov/frd/Capabilities/inelviz.html>). kirk.clawson@noaa.gov (and staff)

A small, portable, all-in-one met station has been purchased, to allow us to set up a station quickly, during emergencies. The station includes wind speed, wind direction, temperature and relative humidity. A small electronic compass is built into the 2D sonic wind speed and direction transducer to allow automatic direction orientation of the unit regardless of its physical orientation. randy.johnson@noaa.gov

34. Sagebrush Steppe Year-round Flux Monitoring Station. The sagebrush steppe ecosystem flux station at the INEEL continues to collect data. That system, together with a Bowen-Ratio system installed by USDA Agriculture Research Service scientists continues to generate interest, particularly among range scientists. kirk.clawson@noaa.gov

35. New Web Site for the AMS Measurements Committee. The American Meteorological Society's (AMS) Committee on Measurements has recently developed a web page to describe its activities (<http://measure.noaa.inel.gov>). Included are the Committee's mission statement, a list of its current members, the awards that the Committee is responsible for, annual reports to the AMS, detailed information about the upcoming 11th Symposium for Meteorological Observations and Instrumentation (SMOI), and its upcoming

short course on the basics of meteorological instruments and observation techniques.
jerry.crescenti@noaa.gov

Las Vegas

36. *Climate Change in Nevada.* A study of temperature trends for Las Vegas and Southern Nevada has been completed. A report now nearing completion includes information for four locations in Southern Nevada--Las Vegas, Boulder City, Searchlight, and Caliente. The general conclusions from the report are that the night-time minimum temperatures have increased in Southern Nevada with Las Vegas experiencing greater increases due to urbanization. (Doug Soule', 702 295 1266)

37. *NTS Dispersion Model Development.* Improvements were made to software from lessons learned during the recent sub-critical test to allow faster generation of confidence limits for a trajectory path in ArcView table format. ArcView was used to generate additional scales for presenting trajectory prediction information during readiness briefings for DOE Nevada Operations Office (DOE/NV). These trajectory predictions are provided to the Desert Research Institute (DRI) for use in environmental assessments.

ArcView was used to begin development of a new product for use by the Emergency Manager and responders for chemical releases. Beta software was developed to read modeled concentration data and create ArcView-ready tables for plotting. SORD was classified as the Subject Matter Expert and the lead in NTS Dispersion Modeling from a meeting with DOE/NV management. SORD will coordinate model software status and updates, and improve on current capabilities. (Walt Schalk, 702 295 1262)

38. *Intermountain Precipitation Experiment (IPEX).* Special 1800 UTC upper-air soundings were taken on ten days in direct support of the University of Utah IPEX project. IPEX is a field and research program designed to improve the understanding, analysis, and prediction of precipitation and precipitation processes in the complex terrain environment of the western United States. The study is focused on the Wasatch Mountain Range between Brigham City and Provo, UT.

39. *Interagency Monitoring of PROtected Visual Environment (IMPROVE).* SORD staff participated in the IMPROVE steering committee meeting held at the DRI in Las Vegas, NV, on February 8^h and 9^h. Among the topics discussed was the status of the network expansion from 30 to 110 sites. The pace of the expansion is slower than originally anticipated. The full network deployment that was expected by January is now anticipated to require another three or four months to complete. Earlier production and availability problems for the updated version of the IMPROVE particle sampler that is being deployed as part of the network expansion is one of the reasons for the network expansion delay. A change in the monitoring schedule from the current twice weekly sampling schedule to EPA's standard one-day-in-three schedule will not be made until all of the older version IMPROVE samplers in the field have been replaced by new samplers. The next edition of the IMPROVE report is expected to be available for review by the end of March. (Marc Pitchford, 702 895 0432)

Western Region Air Partnership (WRAP) Meeting. SORD staff participated in a WRAP Fire Emissions Forum meeting held in Phoenix, AZ, on February 10^h. The principal topic of the meeting was how to estimate the natural (as opposed to man-made) contribution to fire emissions. The ability to make a distinction between natural and man-made contributions to regional haze is indicated in the regional haze regulations, which

requires reduction in man-made visibility impairment. There are both technical and policy related aspects to this issue, especially for fire emissions. There is technical evidence that pre-settlement historic fire emissions substantially exceeded current levels. However, substantial land-cover and land-use changes make the comparisons between current and historic smoke conditions difficult to interpret. The direction taken at this meeting was to develop an approach to assign all smoke emissions estimates to either man-made or natural categories so that smoke concentrations can similarly be subdivided into the two categories. While some fires are pretty clearly natural (lightning ignited fires on wilderness land) and some are pretty clearly man-made (agricultural burning between crops), prescribed fires are at least in part designed to function in place of natural fire cycles, but may also have benefits to man. Determining a fair approach to apportion prescribed fire emission will be a challenge. (Marc Pitchford, 702 895 0432)