



FRD ACTIVITIES REPORT

January - March 2008

RESEARCH PROGRAMS

Perfluorocarbon Tracer (PFT) Analysis Development

Final testing of the bag cleaning protocol developed for the 3-PFT method was completed in early January. These tests confirmed that the protocol was effective in cleaning bags with long term exposure to high concentrations down to below the detection limit for each species. This concluded all testing of the PFT method and the method is at a stage where it is ready for actual experimental work. A final report summarizing the method, procedures, protocols, and cautionary notes was prepared. Key points from this document were summarized in the last quarterly report. Dennis.Finn@noaa.gov

Fast Response Tracer Analyzer Data System Upgrade

A new data system for our existing fast response tracer analyzers is being developed. It will be based on an embedded microcontroller and will store data on a compact flash card. A prototype system is running and the debugging of the firmware and hardware interfaces is nearly complete. A printed circuit board layout for the system is being created and should be completed soon. Hopefully, an order for printed circuit boards can be placed in the next few weeks.

Low Cost Tracer Detector & Existing Equipment Upgrade

FRD staff have been studying the feasibility of creating a low-cost version of the fast response analyzers. The current systems are too expensive for deployments in larger numbers, and a lower cost version would offer a broader range of potential applications. There is no guarantee that a low-cost system can be developed, so this effort is more in the line of high-risk, high-payoff research. Part of this effort has been the development of a new low-cost SF₆ detector that can measure concentration fluctuations. When the current prototype detector is used with the oxygen removal system of the existing fast response analyzers, it measures SF₆ with a detection limit of about 200 ppt and a response time of about 10 seconds. Although this performance is significantly worse than the current fast response analyzers, it is nevertheless usable in many experiments and it will be far less costly to build and deploy.

New oxygen removal systems and improvements to the existing oxygen removal system are also being investigated. Experiments with a solid state oxygen removal system showed that it was impractical for use in an analyzer. An electrolyzer that generates hydrogen from distilled water has also been tested. This has the potential of replacing the compressed hydrogen tank used in the current system, making the system safer to operate. One of our current fast response tracer

analyzers was successfully run with hydrogen generated by the electrolyzer and with a low cost detector, demonstrating that it would be possible to build a tracer analyzer that does not require tanks of compressed hydrogen. However, interfacing the electrolyzer with the analyzers will be a challenge to develop, because the hydrogen must be supplied under controlled and constant pressure.

Transport and Dispersion Modeling

FRD was contacted by a person from the Hawaii Volcanoes National Park asking about plume modeling for the recent enhanced eruptions at the park. The eruptions are apparently producing high concentrations of toxic gases at locations where the public or park staff may be present. Since the volcanic vents are releasing the gases fairly steadily and they have reasonable estimates of the source term, it was suggested that the NOAA ALOHA model may be a good choice for providing quick, short-range estimates of areas where concentrations may exceed toxic Levels of Concern. Richard.Eckman@noaa.gov

ET Probe

The main focus of activities related to the ET probes was on investigating various avenues for renewed funding. Right now three avenues are being pursued. One is the NOAA Science, Technology and Infusion (ST&I) program. Fiscal Year 2008 was the first in which the probes were eligible for funding in the ST&I program, but it appears unlikely that any support will materialize. A second is a partnership with the University of Miami, which is interested in deploying a probe on a buoy during the hurricane season. This avenue depends on successful funding of a university research proposal. The third avenue is a possible partnership with investigators associated with the insurance industry, who are mainly interested in wind damage at landfall. In addition to these programmatic efforts, FRD also made some improvements to the temperature housing on the existing probes. This housing was a weak point in the original design. Richard.Eckman@noaa.gov

Las Vegas Roadway Toxics Tracer Study

FRD is continuing to work with ASMD and EPA on conducting a roadway tracer study later this year. However, questions have arisen regarding the suitability of the presumed study location on Interstate 15 in Las Vegas. The site was originally an open field but is now a fenced parking lot for trucks. Prevailing wind directions are also problematic. One option being pursued is to conduct a more effective study the Idaho Falls area. Part of the study's focus is on the effects of large sound barriers on near-road dispersion. Idaho Falls does have one road with such a sound barrier, but it has also been suggested that a temporary barrier could be constructed at INL or another location and allow much better control over the setup of the study. It appears that an effective barrier could be constructed Lego-block style using large 900 kg straw bales. Such bales are inexpensive and easy to obtain in the Idaho Falls area. Kirk.Clawson@noaa.gov

NOAA/IDAHO NATIONAL LABORATORY METEOROLOGICAL RESEARCH PARTNERSHIP

INL Weather Products

After two weeks of severe winter weather in February (and several work curtailments at the INL due to road closures from blowing and drifting snow), we began to strengthen our severe weather warning capabilities with the INL Emergency Management group. We are developing new watch and warning criteria that we call Statements and Alerts, respectively, to avoid confusing our work with that of the NWS. Once these criteria are fully established and approved by EM, Fleet Operations, and others, these severe weather notices will be distributed on our NOAA INL Weather Center web site and via email to over 200 INL managers and emergency responders. These notices will improve the service provided by the local NWS because the NWS has responsibility for a much larger area and focuses on populated areas of the CWA, mostly ignoring the INL. Kirk.Clawson@noaa.gov

Multiple improvements are being made to the meteorological products that FRD supplies to the INL. These include enhanced procedures to notify INL management when meteorological conditions that will affect INL activities are expected to occur. Also, more extensive use is being made of the continuous stand-alone 4 km WRF model runs that are performed in-house. This work is part of a broader effort to upgrade and modernize various aspects of the activities FRD performs in partnership with INL. Neil.Hukari@noaa.gov

A new 3-hour experimental tabular forecast product is now available on our NOAA INL Weather Center web page. The forecast is available for each of the three micro-climatic regimes (INL north, INL southwest, and INL southeast). The new forecast was created to give INL managers in each zone more information to make better judgments regarding the safety of personnel and day-to-day operations. Jason.Rich@noaa.gov

Climate

FRD Staff is continuing to its efforts to produce a new climatology publication for the Idaho National Laboratory (INL). The last climatology was published in 1989. In addition to providing new analyses based on the INL Mesonet data, the report also has updated descriptions of boundary layer processes and their effect on dispersion. The climatology gets extensive use by INL staff for various activities. Jason.Rich@noaa.gov

Emergency Operations Center (EOC)

The ALOHA model has been installed on the NOAA computer in the INL Emergency Operations Center. FRD meteorologists have been trained on the ALOHA model for use in the EOC. The ALOHA model is another NOAA model suited to short-range transport and diffusion of chemical releases of less than 10 km. The model's large chemical database and computational

speed will provide quick and more useful hazardous concentration plume plots for the hazard assessment specialists and emergency director. In the past, MDIFF was used during chemical releases mainly as a general indicator of concentrations, which had to be interpreted by a specialist familiar with Acute Exposure Guideline Levels (AGEL) or other exposure guidelines.

Jason.Rich@noaa.gov

Team A attended an EOC drill on February 21. The drill scenario involved a pipe bomb that was found near one of the in-town INL facilities. Since this was a security event, FRD did not have a big role. Nonetheless, FRD did provide short term forecasts during the drill.

Jason.Rich@noaa.gov

Team B attended two EOC drills during the quarter. The first of these was on February 6 and featured a scenario involving an earthquake that resulted in a diesel tank rupture, a hydrogen tank leak, and minor injuries to personnel at the SMC facility. The wind field was highly variable and complicated over the INL during the drill making wind direction extremely difficult to forecast. Weather forecasts and updates were provided during the drill, but it was determined that there was no need to do dispersion modeling due to the nature of the emergency. The second drill was on March 27 and featured a bomb threat at the IORC facility in Idaho Falls. This scenario was also a security based drill that did not call for running the dispersion model.

Dennis.Finn@noaa.gov

Team C attended an EOC drill on January 16. This drill scenario, similar to the one on February 21 attended by Team A, involved a pipe bomb at an in-town INL facility. The scenario did not require plume model runs, but FRD did provide short term forecasts during the drill.

Neil Hukari participated in a quarterly Hazard Assessment Specialist Drill at the EOC on March 13. The drill scenario involved a radiological release from the INTEC facility caused by a plane crash. Much of the work during the drill was making comparisons of output from the FRD MDIFF model and the NARAC model.

Transport and Dispersion Modeling

The continuous stand-alone MM5 modeling effort at FRD has fallen victim to the NOAA changeover from GRIB1 to GRIB2 file formats. The MM5 forecasts—based on NAM output—had been running with few problems for years. We could have kept the system operating by rewriting scripts and using file converters, but the focus is now on the WRF/ARW modeling. The WRF setup at FRD has always used files in the GRIB2 format and thus was not affected by the changeover. Richard.Eckman@noaa.gov

Work began late in the quarter on developing the procedures necessary for using the meteorological data acquired by the INL Mesonet data as input into the AERMOD modeling system. Presently, attempts to use AERMOD to model transport are limited by the fact that they are driven by meteorological measurements made far from the INL site. The goal of this effort is

to drive the model for the INL site using the local meteorological measurements as much as possible. Dennis.Finn@noaa.gov

OTHER ACTIVITIES

Outreach

Richard Eckman has agreed to serve on the Ph.D. committee for a graduate student in the Department of Atmospheric Science at the University of Wyoming. The student is proposing to develop a thesis based on the topographically induced convergence zone events that often produce enhanced snowfall in the area near Idaho Falls. An initial committee meeting (via video conference) is scheduled for April. Jeff French, former ARL employee, is also on the committee. Richard.Eckmann@noaa.gov

FRD Staff participated with the Pocatello NWS staff at the 5th Annual Local Emergency Managers Meeting at the Southeastern Idaho District Health Department in Pocatello. The meeting consisted of a tour of the Regional EOC, demonstrations of new NWS forecasting tools, and a presentation on the regional water year forecast.

Publications

A comment entitled “Comment on Dynamical Implications of Block Averaging” by G. Trevino and E.L. Andreas’ by Richard Eckman has been published electronically in *Boundary-Layer Meteorology*, along with author responses, etc. The comment will appear in the print version shortly.

The manuscript “Plume Dispersion Anomalies in a Nocturnal Urban Boundary Layer in Complex Terrain” has been accepted for publication in the *Journal of Applied Meteorology and Climatology*.

The revised manuscript “Empirical Observations of Daytime-Nighttime Contrasts in Urban Plume Dispersion” by Dennis Finn was sent back to *Boundary-Layer Meteorology* with responses to reviewer comments. This manuscript deals with results from the tracer data and related research from the Joint Urban 2003 field study in Oklahoma City.

The manuscript “Observations of Concentration Variability in Tracer Plumes in an Urban Boundary Layer with Considerations for Emergency Response” has completed all internal reviews. Journal submission is pending. This paper focused on measures of concentration variability such as probability density functions, peak-to-mean ratios, and concentration fluctuation intensities in the Joint Urban 2003 study and how these measures affected toxicological considerations during emergency response scenarios. Dennis.Finn@noaa.gov

Safety

FRD staff has incorporated the iBalance, iStrength, and iStretch program developed by INL professionals into our daily routine. Every day at 9:30 am and 2:30 pm the staff gathers for a brief time to stretch and strengthen our bodies.

February 25, Duane Nelson with the Idaho Falls Fire Department trained the FRD staff on basic CPR, First Aid and Automatic External Defibrillator (AED).

Travel

Donna Harris to Silver Spring, MD, January 29-31 to attend Management Analysis & Reporting Systems training which is NOAA's new financial system.