



FRD ACTIVITIES REPORT

March 2006



Research Programs

Urban Dispersion Program

A NOAA Technical Memorandum documenting FRD's participation in the MID05 Urban Dispersion Program in New York City was completed for review. The results of this project should make a valuable contribution to our understanding of atmospheric dispersion processes in urban environments and deep street canyons. (Roger Carter 208-526-2745, Debbie Lacroix, Jason Rich)

This month was spent running PFT tracer samples from the MID05 study to gain experience in PFT analysis. The PFT tracer analysis was performed on samples that were placed close to the PFT release mechanisms and on samples placed close to TGA vans that could have seen some higher PFT concentrations. We wanted to see if there were any possible PFT contributions downwind from the PFT releases and indoor study building that might interfere with the SF₆ measurements that were done. Although there was no appearance of a definitive problem, there were some unexpected peaks that were measured farther downwind. (Debbie Lacroix, 208-526-9997).

ET Probe

After a final push, the manuscript entitled "A Pressure-Sphere Anemometer for Measuring Turbulence and Fluxes in Hurricanes" was submitted for publication in the *Journal of Atmospheric and Oceanic Technology*. This manuscript describes the design of the ET probe. Focus is now shifting to the data collected in the 2004 hurricane season. One conference paper on these data has already been completed for the upcoming 27th Conference on Hurricanes and Tropical Meteorology. An oral presentation for this same conference is now being developed. After that, the next step will be to lay out a framework for a journal publication on the 2004 data. (Richard Eckman, 208-526-2740)

The ET probe is also intertwined in an ongoing controversy related to ARL's general participation in hurricane-related research. In addition to the ET probe, this research includes work with the BAT probes on the NOAA P-3 aircraft and possible future work on similar instruments for Unmanned Aerial Vehicles (UAVs). The research was not questioned before the ARL Research Review, but is now being criticized for not clearly fitting into ARL's three core capabilities. However, all these hurricane activities have a large degree of overlap with ARL's primary research in turbulence and air-surface exchange. The hurricane-research community could, at considerable cost, recreate ARL's expertise in turbulence measurements, but it seems far more efficient to simply use ARL's expertise for the crossover hurricane work. A point paper is under development to address these issues. (Richard Eckman, 208-526-2740)

Smart Balloon

The redesign of the smart balloon shell has been completed. The balloon shell, which is made of high strength Spectra fabric, has been redesigned by replacing the steel cable reinforcement with an aluminum interface plate (Fig. 1). Six machine screws will now be used to hold the transponder enclosure inside the pressurized balloon, rather than six tied strings. This should make assembly, disassembly and bladder insertion an easier and faster operation. It will also

provide a complete physical seal to prevent bladder herniation around the transponder enclosure tube. The rigidity of the aluminum balloon ring also helps keep the shape of the fiberglass transponder tube because the brackets hold the tube centered and against the ring in six places. Because the ring provides a very precision non-flexible opening from balloon shell to balloon shell and the fact that the fiberglass enclosures are very precise in size and spherical shape, a precision soft flange made of fabric allows the area between the balloon shell flange and the fiberglass enclosure to be completely sealed. This will allow no possibility of bladder herniation in this area. Notice that there are three flexible hoses protruding to the outside from the fiberglass transponder enclosure (Fig. 1) which provide for helium fill, argon fill, and air ballast control. (Randy Johnson, 208-526-2129)



Figure 3. Aluminum interface plate attached to the balloon shell.

Joint Urban 2003

Due to staffing limitations, FRD has heretofore been unable to conduct a comprehensive analysis of the JU03 data set. This situation has now changed and steps toward a comprehensive analysis were initiated during the month of March. The initial steps have required the compilation and merger of the extensive SF₆ tracer, sonic anemometer, radio sonde profiles, and other data sets. The compilation and merger are ongoing but the initial, preliminary results of this effort will be generated in April. (Dennis Finn, 208-526-0566)

Tracer Sampler Upgrade

The FRD programmable air samplers have been used for many years to support numerous atmospheric transport and diffusion experiments. Over the past several months, the possibility of replacing the miniature pumps used in the samplers has been considered as a way to extend the life of the samplers and to decrease the diffusion of the samples while they are in the sampler. Several different types of pumps have been considered and tested. A number of tests were conducted this month on some prototype pumps. Unfortunately, they all failed to perform any better than the existing pumps so the search for a suitable replacement will continue. (Roger Carter, 208-526-2745, Randy Johnson, and Debbie Lacroix)

Cooperative Research with DOE NE-ID (Idaho National Laboratory)

Emergency Operations Center (EOC)

Many of the INL Mesonet towers have a Pressurized Ionization Chamber (PIC) for measuring radioactivity. They are owned by the State of Idaho, but their data are included in the Mesonet data stream as part of a collaborative agreement between the State and FRD. Recently, there have been problems with the PIC data being misused by outside organizations who have access to the Mesonet data. FRD therefore plans to restrict access to the PIC data, but this restriction will have no effect on INL access to the data. A meeting with DOE-ID and the State of Idaho to discuss PIC data access restrictions is pending. In the distant future, we plan to restrict PIC data access to all external organizations by sending only meteorological data to MADIS, which will

then become the data source for the external organizations. (Kirk Clawson, 208-526-2742, and Richard Eckman)

INL Climatology

Some progress was made in updating the atmospheric-dispersion chapter of the draft INL climatology report. The dispersion chapter in the 1989 edition of the climatology has now become somewhat outdated. In particular, the older climatology provided only a limited discussion of how pollutant dispersion is directly tied to the diurnal evolution of the planetary boundary layer (PBL). Much of the emphasis in the old edition was on Pasquill stability classes rather than PBL structure. The updated version includes a section that describes the current knowledge of PBL structure. (Richard Eckman, 208-526-2740)

INL Drills, Exercises, and Emergencies

Kirk Clawson and Randy Johnson (EOC Team B) participated in their first INL EOC requalification drill of 2006. The drill scenario centered around a fuel rod storage cask that was accidentally dropped by a handling crane at INTEC. As a result of the fall, the cask's lid was broken open and some radioactive material escaped. FRD personnel at the EOC operated FRD's MDIFF transport and diffusion model to provide real-time plume footprints calculated from meteorological data obtained from the INL Mesonet. They also provided short term weather forecasts during the drill. (Kirk Clawson, 208-526-2742, and Randy Johnson)

Kirk Clawson represented FRD at the Quarterly Assessment Specialist Drill at the EOC on March 23. He described FRD's installed GM tube and high volume air sampler instrumentation in the INL Mesonet. He also described the proposed station acronym and name changes required to bring the names into compliance with other site name changes brought about by the splitting of the INEEL into the INL and ICP programs. His presentation generated considerable discussion among the dozen or so participants. It was decided that FRD would operate the hi-vols when the order to do so was received by the FRD representative in the EOC from Planning Support Director (PSD). The start time and duration of the sampling would be determined after discussion with the PSD and the EOC Assessment Specialist. The samplers would operate for a total of 10 minutes or less to avoid clogging of the sampler and subsequent possible motor burn-out. The FRD representative in the EOC would then communicate this information to the duty meteorologist at the FRD offices where (s)he would then issue the appropriate collection instructions to the instruments through the INL Mesonet radio communications link. (Kirk Clawson, 208-526-2742)

Lightning

Mr. Mike Evans of Battelle Energy Alliance, the INL M&O contractor, visited with FRD staff on March 22, to discuss their lightning detection needs. This has generated much discussion among the FRD staff as to the best approach to use for INL lightning detection, warning, and protection. Electric field mills, lightning detectors, and a lightning detection service have been used in the past with limited success. The lightning detection service was expensive and somewhat unreliable, and was subsequently discontinued several years ago. Three electric field mills were installed for several years during the lightning season, but were not installed last year. The mills need repair before they can be reinstalled but the manufacturer has gone out of business. New electric field mills cost approximately \$5,000 per unit. The lightning detection system has never been fully integrated into the FRD meteorological data distribution system. It seems to be fairly accurate for direction calculations, but very unreliable for distance calculations. A possible solution is to purchase additional units (about \$500 each) to be deployed around the INL site. The data from these units could then be collected at a central location and

computer software developed to calculate strikes from triangulation methods. The direction forward needs to be discussed with the local DOE management. (Kirk Clawson, 208-526-2742)

Other Activities

Outreach

Jason Rich has worked with a local Boy Scout Troop on receiving the Weather Merit Badge. During the past month, the scouts toured the FRD facility and learned about the NOAA-INL Mesonet, MDIFF transport and diffusion model, continuous real-time tracer analyzers, and the programmable integrated gas samplers. Jason gave a one-hour presentation on the importance of weather to certain occupations, the safety rules for dangerous weather related conditions, fronts, clouds, water cycle, and the effects of pollution to the atmosphere. So far 7 scouts have completed the Weather Merit Badge.

Papers

Eckman, R. M., R. J. Dobosy, D. L. Auble, T. W. Strong, T. L. Crawford, 2006: A pressure-sphere anemometer for measuring turbulence and fluxes in hurricanes. *Journal of Atmospheric and Oceanic Technology* (submitted).

Safety

The videos "Egress/Exit Safety, Fire Escape-Getting out Alive, and Fire Prevention" were shown at the monthly staff meeting. (Debbie Lacroix, 208-526-9997)

Travel

On March 21-23, 2006, Paula Fee traveled to Seattle, WA for the WEB TA training at PMEL. While at PMEL she met with members of the Financial Data Management System (FDMS) team to discuss FDMS Financial Reports. She also met Heide Sickles, Chief, Western Region Acquisition Division (WRAD) and some of her staff as well as financial specialists in the Western Region Finance Office. FRD's acquisition and finance support was recently transferred from Mountain Region to Western Region, and this was a good opportunity to meet them.

Training

On March 22, 2006, Paula Fee attended the 4-hour WEB TA Training for Timekeepers and the 2-hr Training for Supervisors at PMEL, Seattle, WA. The WEB TA training was presented by Amy Townsend, T&A Manager in Boulder, CO, via Teleconference capability.

On March 29, 2006, Paula Fee gave a training session on the WEB TA to Kirk Clawson, Rick Eckman, and Brad Reese (Alternate Timekeeper).

Personnel

On March 6, 2006, Dennis D. Finn, Ph.D, entered on duty as a Research Meteorologist. Dennis has previous experience with atmospheric tracers and atmospheric dispersion modeling.

The interview process for the vacant Meteorologist, ZP-II position, was conducted and an offer letter was submitted by WMO, Boulder, to the successful candidate. Mr. Jason Rich accepted the offer and will EOD on April 3, 2006.