



FRD Activities Report November 2004



Research Program

Smart Balloon

A new cut-down mechanism has been designed for the smart balloon and is presently undergoing testing. The new cut-down mechanism is based on cutting a hole in a diaphragm that is mounted in the top plate of the balloon. The new design uses a total of four inexpensive aluminum camera filter adaptors as diaphragm holders and mounts. Two of the adaptors are mounted in the top plate of the balloon to make a flange for the easy-to-remove diaphragm, which is also made of two filter adaptors. Two adaptors of a slightly different size are used to hold a polyethylene film diaphragm with a high temperature resistance-wire heating element. When a cut-down command is sent to the balloon, a voltage is applied to the resistance-wire sufficient to melt the polyethylene film around the perimeter of the adaptor. A tension spring, as shown in the figure, is attached to the diaphragm and tensioned to pull the material out of the way if and when internal pressure in the balloon is insufficient to keep the flap clear of the hole created by the resistance-wire. This design will save significant weight, simplify deployment, and eliminate unintended cut-down during a balloon flight. (Randy Johnson, 208 526-2129)



Figure 1. Photograph shows the resistance wire around the perimeter of the diaphragm and the spring used to pull back the cut-away material.

ET Probe

Analysis continues on the ET probe data collected during the 2004 hurricane season. The data are passed through a series of checks to flag any problems and then finally stored in NetCDF format. NetCDF is a common data format for meteorological data developed by the University Corporation for Atmospheric Research (UCAR). Previously, this format was commonly used with the data collected by the Long-EZ research aircraft. All of the ET data collected at Sebastian, Florida during Hurricane Frances have now been processed, and about half the data collected at Vero Beach are complete. The Hurricane Ivan data are still awaiting processing. (Richard Eckman, 208 526-2740)

New Tracer Sampler Boxes

Twenty new plastic corrugated boxes of four different wall thicknesses are being tested as a replacement for the 14-year old wax coated corrugated tracer sampler boxes. The new boxes will be used along side the old waxed cardboard boxes over the next year or so to determine which of the four different plastic corrugated boxes works best and if there are any problems with contamination.

The new boxes should offer better operation during field experiments where rain has penetrated the wax coat and caused the boxes to deform and, at times, come apart. The plastic is totally water repellent and the seams are actually welded together rather than being held in place with glue. Weight of the box with sampler is about the same in the lightest plastic boxes and about 750 grams heavier with the thickest plastic corrugated boxes. If the new boxes work out, the cost for the new boxes will actually be less than that of the old cardboard boxes when the labor cost of construction is considered and for minimal fee we can get the NOAA logo and our address added to the outside of the boxes. (Randy Johnson, 208 526-2129)



Figure 2. Vance Hawley standing next to the new white plastic samplers on the left and the old cardboard samplers on the right.

Tracer Sampler Controller Program Upgrade

Initial work began on changing the FRD tracer bag samplers to accommodate different time periods for each of the 12 bags. The firmware in the hand-held TimeWand II's has been modified to support the upgrade to the so-called PIGS (Programmable Integrating Gas Samplers). Now the PIGS will sample for different times on different bags, pause for specified times between bags, and even begin filling a bag at a position other than position one. This upgrade should allow the PIGS to meet the special needs of some atmospheric tracer experiments. The TimeWand II's are used to load timing information into the PIGS during field experiments at the same time they collect information about the location and time of each sample. The TimeWand II firmware required extensive modifications to support the more complex timing information. The most difficult problem was optimizing the code so it would run in a reasonable time. The initial version of the code required about 18 seconds to load timing information into a PIGS. The code was rewritten and optimized and the download time reduced to about 7.5 seconds which should be practical for field use. A significant effort remains to integrate the modified PIGS data into the tracer analysis software. (Roger Carter, 208 526-2745)

Joint Urban 2003

Progress has resumed on the preparation of the final JU 2003 report. Sections on the tracer dissemination and tracer sampling with bag samplers and real-time analyzers has been written. The remaining sections, including the introduction and results and discussion sections are being

prepared by a FRD contractor who was part of the field deployment in 2003. It is envisioned that the report will be ready for ARL review in January 2004. (Jason Rich, 208 526-2328)

Cooperative Research with INEEL

INEEL Mesoscale Modeling

Some minor changes were made to the Perl scripts that drive the daily MM5 runs at FRD. A few cases arose in which the scripts mistakenly reported a successful MM5 run when in fact the run had failed due to problems with the download of initialization data from NCEP. The modified scripts perform some additional checks to ensure that the model completes a run without any error conditions.

As reported last month, staff from FRD attended a training course on the HYSPLIT dispersion model. This model contains pre-processors that allow it to run using MM5 output. Therefore, some tests have been performed at FRD in which the output from the FRD MM5 runs have been used to drive HYSPLIT dispersion simulations from INEEL. These runs showed some interesting phenomena, including pollutant being pulled up the tributary valleys to the west of the INEEL. Since the dispersion is three dimensional in HYSPLIT, the runs also showed some of the pollutant being transported vertically and then exiting the Snake River Plain. Such phenomena cannot be represented in the current modeling using MDIFF, since it is based on a two-dimensional wind field. (Richard Eckman, 208 526-2740)

Emergency Operations Center (EOC)

(No activity this month)

INEEL Mesonet Narrow Band Radio Transition

The FRD mesonet transition to the new narrow band radio system and new data collection software has been completed. During the month of November, the remaining 29 stations were switched to the new system, bringing the total to number of stations to 38. Although the transition is complete, we are continuing to work out the bugs in the system. When we added our 30th station we started observing problems in the collected data. Dates and times were showing up in the wrong place. We think we have isolated the problem to the storage buffer in the RF base station. When the data flow became too high, the RF prom began mangling the incoming data packets by allowing data to overflow into the storage buffer. We burned a new RF prom thereby doubling the storage buffer size. We think this should correct the problem. In the meantime we are continuing work on improving the RF communications and in collecting, storing, and distributing the incoming mesonet data. (Brad Reese, 208 526-5707)

Other Activities

ARL Core Competencies Review

At the invitation of the ARL Core Competencies Review team, Kirk Clawson presented the core competencies of FRD to the review team on November 3. His presentation included the synergistic work with DOE-Idaho centered on the FRD mesonet and FRD's atmospheric transport and dispersion modeling capability, the atmospheric tracer program, the smart balloon program, and the ET sphere program. An invitation to visit FRD was extended to the review team, and responses were encouraging. (Kirk Clawson, 208 526-2742)

Safety

The video "Shift Work Preventing Fatigue", by the National Safety Compliance (NSC) Company was shown at the monthly staff meeting. (Debbie Lacroix, 208 526-9997)

Travel

Kirk Clawson to Silver Spring, MD, November 1-4, to attend the OAR Core Competencies Review of the Air Resources Laboratory and its divisions.

Kirk Clawson to Washington, DC, November 17-22, to deliver two presentations at the 10 year anniversary meeting DOE Meteorological Coordinating Council.