



# FRD ACTIVITIES REPORT

## October – December 2011



### RESEARCH PROGRAMS

#### *NOAA/DOE Wind Forecast Improvement Project*

There were two WFIP site visits by FRD staff during the quarter. The first was from 6-12 October by Kirk Clawson. It was found that the Atmospheric Systems Corporation (ASC) Acoustic Signal Processing (ASP) unit at the Colorado City sodar had failed a few hours prior to his arrival. By extending his visit a few days, it was possible to replace the failed ASP during this trip with expedited shipping of a replacement. This limited the loss of data to just a few days rather than having to wait another 6-7 weeks until our next site visit. The second visit was from 17-19 November by Shane Beard. All other maintenance activities at all 3 sites were successfully completed including retrieval of the sonic data cards. There were minor maintenance or communications issues to resolve but, overall, high-quality radar, sodar, and sonic data sets from all 3 sites were reliably retrieved and forwarded to ESRL on the requisite hourly basis throughout the quarter.

Late in the fourth quarter, a possible problem with the ASC sodar at the Brady site was first identified and evidence for a problem mounted throughout the first quarter. The primary evidence was reduced data recovery, especially in comparison to the very similar unit operating at Colorado City, but it wasn't clear what the cause might be. Evaluation eventually determined that the problem was likely primarily in the antenna array circuitry with weak signal intensities (send and/or receive). Arrangements were made to obtain a loaner from ASC at the time of our next regularly scheduled visit the first week of January to provide continuity of service while the FRD unit could be shipped for repair. An adjustment in the signal processing parameters was made to somewhat improve data recovery in the interim.

Late in the quarter, initial steps were taken to collaborate with ATDD on their CRADA project in Texas with Duke Power for estimating hub height winds based upon surface fluxes. The FRD WFIP project area is a relatively short distance east of the ATDD Ocotillo project area and WFIP data could augment the database for that study. Sonic and sodar data sets for the Jayton site from project start in July through the time of the second site visit (18 November) were provided to Will Pendergrass for processing in mid-December. Results of this initial analysis were anticipated early in the next quarter and then additional data sets would follow. (Dennis.Finn@noaa.gov)

#### *Extreme Turbulence (ET) Probe*

A single ET probe was deployed in the Florida Keys from late August until mid November. No hurricanes hit the Keys this season, but there were periods with stronger winds. Based on experience in previous years, an additional solar panel was added to the system this year. As a result, there was only one period of extensive cloudiness in October when the system temporarily shut down due to low battery power. A few pressure sensors were affected by a static discharge that occurred during probe installation in August. There was concern that these sensors were no longer providing a useful signal for

computing winds. However, tests performed after the probe returned to FRD showed that these sensors still have a linear response even though the calibrations changed as a result of the static discharge.

A prototype for an improved ET Probe data acquisition board was developed and successfully bench tested. It uses low cost, low power microcontrollers with integrated analog to digital converters. The prototype draws only 6 milliamps at 3 volts. This board could provide significant cost and power savings for future ET Probes or possibly allow for redundant data acquisition subsystems.

([Richard.Eckman@noaa.gov](mailto:Richard.Eckman@noaa.gov), Tom Strong, Roger Carter, Shane Beard)

### ***HRRR Collaboration with ESRL***

The HRRR model still systematically underpredicts wind speeds in Southeastern Idaho. FRD performs WRF runs locally using a 4 km grid spacing, and these forecasts do not underpredict the wind speeds as much as HRRR. Given that HRRR is a version of the WRF model and is configured similarly to the local WRF runs at FRD, it is not entirely clear what is causing the underpredictions. Preliminary comparisons of the HRRR winds with Wind Forecast Improvement Project (WFIP) observations in Texas suggest the model may be overpredicting the winds in that region. This suggests the model wind forecast skill varies substantially in different parts of the country. ([Richard.Eckman@noaa.gov](mailto:Richard.Eckman@noaa.gov), Dennis Finn, Will Pendergrass [ATDD])

### ***U.S. Historical Climate Network–Modernization***

FRD continues to provide support for ATDD's QC responsibilities for the U.S. Historical Climate Network-Modernization despite the lack of current funding. A proposed budget for ongoing support and development work has been submitted to ATDD.

### ***Dust Transport/Tracer Dispersion Project***

The tracer datasets for the dust transport study generated during the 19-22 September set of field experiments were reviewed. A final quality checked database for that period was provided to the collaborators on the project at Desert Research Institute and Pacific Northwest National Laboratory. It wasn't clear if there would be a third set of field measurements to follow in 2012.

([Roger.Carter@noaa.gov](mailto:Roger.Carter@noaa.gov); [Dennis.Finn@noaa.gov](mailto:Dennis.Finn@noaa.gov))

### ***High Performance Computing***

Danny George, the graduate student at Boise State University working on the implementation of Graphics Processing Unit (GPU) computing for HYSPLIT, visited FRD in early November. FRD staff found him to be very bright and capable and he reported that the visit was very helpful to him in gaining insight into how all parts of the model work together. He was provided with a set of test cases that included matching packed meteorological files, namelist (setup) files, control files, and corresponding postscript output files for comparison with output generated by GPU versions of the code. Instructions were also provided in the use of the programs con2dose, doseplot, and conread to enable him to evaluate the output. At the end of the quarter he reported progress in identifying the sections of code where GPU computing would be of greatest benefit but it was a slow process since many of the computations are done by subprograms. He anticipated having a more in-depth interim report on progress by mid-January. ([Dennis.Finn@noaa.gov](mailto:Dennis.Finn@noaa.gov), Rick Eckman)

## **NOAA/IDAHO NATIONAL LABORATORY (INL) METEOROLOGICAL RESEARCH PARTNERSHIP**

### ***Emergency Operations Center (EOC)***

The Emergency Operations Center was activated 11 November (Veterans Day) in response to a sodium fire and small explosion in Building 766 of the Material and Fuels Complex. One site employee was evaluated for minor burn injuries. Weather forecasts were provided by the FRD meteorologist in the EOC, but plume maps were not required as there was no significant release from the building. The fire burned itself out in about one hour. (Dennis.Finn@noaa.gov)

The INL Annual Exercise was conducted on 5 October. The scenario involved a radiological release from the ATR complex. Attempts to run the HYSPLIT plume model using the provided canned weather files failed. The cause of the failures was later discovered to be in the canned weather files themselves. They had been subtly altered from the expected format, which resulted in a fatal computer error during meteorological preprocessing. The problem was identified and corrected but not before the drill had ended. Plume maps using the old MDIFF model were generated in place of the HYSPLIT plume plots. It is unfortunate that this problem occurred because the accident scenario was included in the existing library of preconfigured releases for HYSPLIT and this would have been one of the first times to have used this function in HYSPLIT. (Kirk.Clawson@noaa.gov)

### ***INL Hazardous Weather Alert System***

There were 8 INL Weather alert/statements issued by the NOAA INL Weather Center during this past quarter. All 8 of the statements were issued for high winds. These alerts/statements are important to the INL because the National Weather Service warning criteria for the general public is less stringent than for the INL.

### ***Transport and Dispersion Modeling***

Work continued on upgrades to the implementation of HYSPLIT for the EOC and a new version will be released in the near future. Improved labeling of time, scenario, and radionuclide has been tested and is ready for inclusion in the next release. The calculation and plotting of derived intervention levels (DIL) for specific combinations of isotopes was requested by EOC clients and is also ready for inclusion. Work on providing the user the ability to fully customize the configuration of multiple isotope radiological releases is nearing completion (currently only preconfigured releases are available). Preliminary testing of a version of Doseplot that includes the sequential, time-stepped animation of plumes has been successful. Another new feature will provide the ability to run Doseplot to generate all possible radiological plume maps for a specifically parameterized HYSPLIT run without having to repeat that run. It is presently necessary to run HYSPLIT for each set of plume maps desired (dose, deposition, etc.) for a specific parameterization even though the necessary radiological output files already exists. Work on changes to the User's Guide reflecting these revisions are in progress. Updates to the preconfigured scenarios were completed upon request by the EOC client. ([Dennis.Finn@noaa.gov](mailto:Dennis.Finn@noaa.gov); Brad.Reese@noaa.gov)

FRD currently has two main options for providing meteorology input to the HYSPLIT model: WRF model forecasts and interpolated NOAA/INL Mesonet observations. Each option has some drawbacks. Sometimes the WRF model blows a forecast and is obviously unusable. The interpolated observations contain no physical constraints or explicit terrain adjustments, and most of the observations are near the surface. FRD is investigating alternative sources of meteorology that include some physics but still give

weight to available observations. One option being investigated is a mass-consistent model that adjusts the winds to flow over or around topography. Another is a full-blown data assimilation system that starts with forecast model output as a background and then makes adjustments based on available observations. For the latter option FRD has looked at the Local Area Prediction System (LAPS) and is also considering the data assimilation capabilities in WRF. ([Roger.Carter@noaa.gov](mailto:Roger.Carter@noaa.gov), Rick Eckman)

Brad Reese worked with Glenn Rolph (ARL HQ) to develop a Google Maps interface displaying plume projections and animations for the implementation of the ALOHA/CAMEO model within HYSPLIT. ([Brad.Reese@noaa.gov](mailto:Brad.Reese@noaa.gov))

FRD is preparing to upgrade the WRF forecasts that are run locally every three hours. The current forecasts are based on version 2 of WRF and have been running for several years. A new computer is available that has two CPUs each with eight cores. WRF version 3.3.1 has been installed on this computer for testing. The current forecasts are based on a 4 km grid spacing in WRF, but the speed of the new computer is allowing serious consideration of using a 1 km grid in the future. The new forecasts will use the NOAA Rapid Refresh model, which will soon replace the Rapid Update Cycle, for initial and boundary conditions. Since the new computer also contains an Nvidia graphics processing unit (GPU), investigations are under way to determine whether the GPU can be used to further speed up the WRF runs. ([Richard.Eckman@noaa.gov](mailto:Richard.Eckman@noaa.gov))

Rick Eckman will be chairing the INL Monitoring and Surveillance Committee in 2012. This committee meets every other month and includes representatives from various groups in Southeast Idaho that perform monitoring activities related to the INL. FRD's main monitoring activity is, of course, the operation of the NOAA/INL Mesonet. The committee also has been interested in the adoption of HYSPLIT at FRD.

## **OTHER ACTIVITIES**

### ***Safety***

On October 20, the office participated in the 2011 Great Idaho Shake Out. The drill used simple steps to inform employees how to perform drop, cover, and hold on, which are quake-safe actions designed to protect people from falling furniture and flying objects during ground shaking.

During December's staff meeting employees viewed videos on Winter Safety by Coastal Video Communication Corp. and Proper Shoveling Technique by KIDK TV3.

### ***Training***

Kirk Clawson, Richard Eckman, Dennis Finn, and Jason Rich completed the INL Emergency Operations Center's yearly requalification training.

Rick Eckman was accepted into the Leadership Effectiveness and Advancement Program (LEAP) and participated in the first training session in Potomac, Maryland in October. The program requires participants to join year-long teams that focus on specific issues of concern to OAR. Rick is part of a corporate civility team. The teams meet on a weekly basis.

In November, Duane Nelson from the Idaho Falls Fire Department provided the staff with CPR, First Aid, and AED training.

By November 9, all employees had completed the required annual INL training, which includes ES&H, Counterintelligence, and Controlled Unclassified Information.

Several employees participated in the Webinar on Preventing Identity Theft on November 17.

In December all employee completed the required 2011 NOAA Employee Safety, Environmental and Sustainability Awareness Course.

### *Travel*

Kirk Clawson traveled to San Antonio, TX from October 7-11 to retrieve data cards from the sonic anemometers at all 3 sites, and perform general maintenance at the three Texas WFIP sites.

Rick Eckman traveled to Washington DC from October 24-28 to attend the initial Leadership Effectiveness and Advancement Program (LEAP) training meeting.

Shane Beard traveled to San Antonio, TX from November 16-21 to retrieve data cards from the sonic anemometers at all 3 sites, and perform general maintenance at the three Texas WFIP sites.

Rick Eckman and Tom Strong traveled to the Florida Keys from November 13-17 to retrieve the ET Probe.

### *Outreach*

In December Jason Rich answered an Ask a Scientist question for the Idaho Falls newspaper. The question was: "Is this an El Nino year or a La Nina year? What effect do these weather patterns have on southeastern Idaho?"