Air Resources Laboratory

Field Research Division

Idaho Falls, Idaho

Improving the understanding of atmospheric transport, dispersion, and air-surface exchange processes

The Field Research Division (FRD), part of NOAA's Air Resources Laboratory, is located in Idaho Falls, ID. FRD was created in 1948 as part of the U.S. Weather Bureau with the purpose of describing the meteorology and climatology surrounding the area of the National Reactor Testing Station, now known as the Department of Energy's (DOE) Idaho National Laboratory (INL). In a long-standing cooperative agreement between NOAA and DOE, FRD's highly skilled scientists and technicians support the INL with meteorological measurements, mesoscale modeling and forecasts, and atmospheric dispersion modeling in the event of an accidental chemical or radiological emergency at the INL. FRD also carries out studies with partners around the country focused on improved understanding of atmospheric transport and dispersion, air-surface exchange of particles and gases, and atmospheric boundary layer processes.

Our Research

Meteorological Instrumentation and Mesonets

FRD has decades of experience designing, developing and deploying both permanent and temporary meteorological instrumentation, as well as establishing and operating mesonets (MESOscale meteorological monitoring NETwork), which are networks of meteorological monitoring towers and associated sensors.

FRD operates and maintains the Idaho National Laboratory Mesonet, which covers an area approximately 10,000 square miles and includes 35 meteorological towers ranging in height from 10-76 meters above ground level. Key stations in the network provide a high-quality climatological database that extends more than 60 years. The network includes a radar wind profiler with Radio Acoustic Sounding System, a sodar (a meteorological instrument used to determine wind profiles by measuring the scatter of sound waves), and a flux station for estimating surface energy balance. The network is used extensively for operations at the INL, including support related to accidental releases of hazardous substances and wildfires. In addition, the National Weather Service Weather Forecast Office (NWS WFO) in Pocatello, Idaho frequently relies on the network to assess conditions during severe weather and issue warnings and watches. Data from the Mesonet are retrieved every 5 minutes and transmitted to the NOAA Meteorological Assimilation Data Ingest System (MADIS). The data are also available through MesoWest, which is operated by the University of Utah.

A NOAA/INL tower containing meteorological instrumentation and atmospheric tracer technology for a multi-year research study called "Project Sagebrush." To improve dispersion models, this study is re-evaluating atmospheric dispersion studies conducted during the 1950s but with modern instrumentation and technologies. Photo: NOAA

Atmospheric Tracers

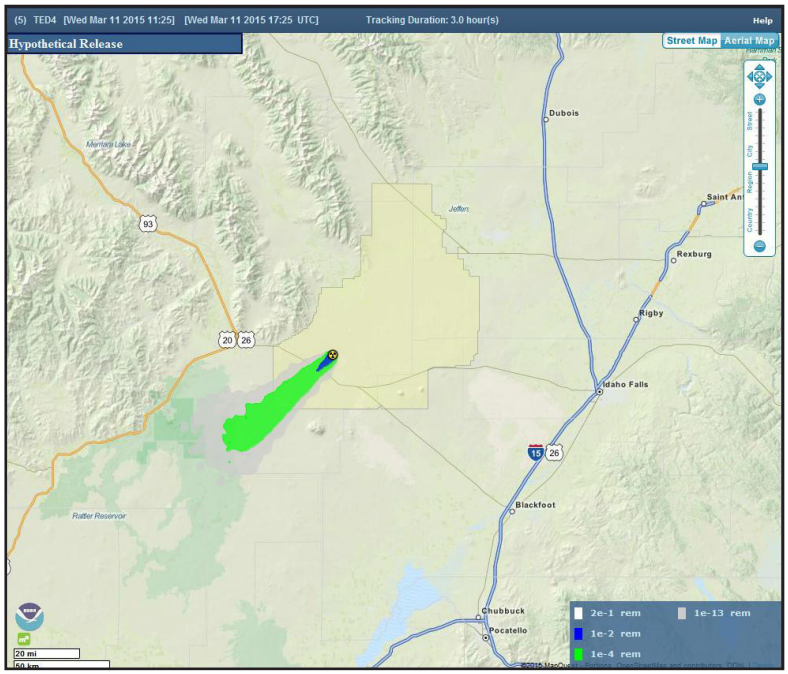
FRD is a pioneer in atmospheric tracer experiments, which date back to the 1960s. Tracer experiments involve the controlled release of a non-toxic gas at low concentrations and the subsequent tracking and measurement of the gas as it is transported and dispersed through the atmosphere. This "tracer" mimics the dispersion characteristics of an actual toxic gas release, thereby permitting evaluation of toxic gas dispersion models. Tracer experiments are important for understanding air quality and dispersion issues, as well as to national security should a harmful gas be released during an accidental or terrorist event.

Radar Wind Profiler and Sodar

FRD maintains two types of unique portable remote sensors (a radar wind profiler and two mini-sodars) that are used to acquire wind profiles in the atmospheric boundary layer. Radar wind profilers use radar pulses, whereas sodars use pulses of sound to measure wind profiles. The radar profiler and sodars are used to support field experiments, such as atmospheric tracer or air quality studies. They are also used to help improve short-term wind forecasts for wind-generated electricity. For instance, FRD's sensors are being used in the Wind Forecast Improvement Project (WFIP), a DOE-sponsored research project that seeks to improve NOAA's wind forecast accuracy, which will provide for greater reliability in the decision making process for the operation of wind farms. Measurements of the wind profile, using the sensors, as well as measurements of turbulence using ARL's windmeters, will be evaluated against predictions made by NOAA's High Resolution Rapid Refresh (HRRR) model. For the first phase of the WFIP, FRD collected data in Texas. The second phase of the WFIP is scheduled to begin in summer, 2015 in the great northwest.

Modeling

FRD has been developing and testing transport and dispersion models since the 1960s as a part of its collaboration with the INL. FRD applies a mesoscale meteorological model, the ARL HYbrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model, and two other types of transport and dispersion models to help emergency managers determine where an accidental or intentional release of a hazardous material is moving and how fast the concentration is decreasing. The radiological adaption of HYSPLIT for the INL is known as HYRad and contains accident scenarios specific to the INL. With the aid of HYRad output, managers can determine who is at risk so that appropriate evacuations can be instituted, if necessary. Managers can also determine from which direction emergency personnel should approach to avoid exposure themselves.



Example of a HYRad model plume simulation for a hypothetical pollutant release in Southeastern Idaho illustrating the estimated four-day total immersion dose (in rem).

Our Partners

- U.S. Department of Energy
- Idaho National Laboratory
- State of Idaho-INL Oversight Program
- U.S. Environmental Protection Agency
- Defense Threat Reduction Agency
- U.S. Department of Homeland Security
- U.S. Forest Service
- Environmental Science and Research Foundation
- National Weather Service Forecast Office in Pocatello, Idaho
- Academic institutions: University of Utah, Idaho State University, Washington State

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The FRD facility is located in the Upper Snake River Plain of Southeastern Idaho. Photo: NOAA

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